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SFT MISSION STATEMENT

The mission of State Fire Training is to enable the California fire service to safely protect life and property through education, training, and certification.

The California Fire Service Training and Education System (CFSTES) was established to provide a single statewide focus for fire service training in California. CFSTES is a composite of all the elements that contribute to the development, delivery, and administration of training for the California Fire Service. The authority for the central coordination of this effort is vested in the Training Division of the California State Fire Marshal’s Office with oversight provided by the State Board of Fire Services.

The role of CFSTES is one of facilitating, coordinating, and assisting in the development and implementation of standards and certification for the California fire service. CFSTES manages the California Fire Academy System by providing standardized curriculum and tests; accredited courses leading to certification; approved standardized training programs for local and regional delivery; administering the certification system; and publishing Career Development Guides, Instructors Guides, Student Manuals, Student Supplements, and other related support materials.

This system is as successful and effective as the people involved in it are. It is a fire service system developed by the fire service, for the fire service... and we believe it is the best one in the country.
ACKNOWLEDGMENTS

The State Fire Training Curriculum Development Division coordinated the development of the material contained in this guide. Before its publication, the Statewide Training and Education Advisory Committee (STEAC) and the State Board of Fire Services (SBFS) approved this guide. This guide is appropriate for fire service personnel and for personnel in related occupations that are pursuing State Fire Training certification.

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Special acknowledgement and thanks are extended to the following members of CDF/State Fire Training Curriculum Development Division for their diligent efforts and contributions that made the final publication of this document possible.

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The material contained in this document was compiled and organized through the cooperative effort of numerous professionals within, and associated with, the California fire service. We gratefully acknowledge the individuals who served as principal developers for this document.

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Carl Magann, Little Lake FPD
"We gratefully acknowledge the hard work and accomplishments of those before us who built the solid foundation on which this program continues to grow."
COURSE STRUCTURE

The revision and suggested standardization of the Fire Fighter I curriculum was a massive undertaking, geographically as well as organizationally. It required the commitment of numerous individuals and their departments throughout California as well as the input of fire service professionals and practitioners.

The Fire Fighter I curriculum was updated and developed to provide fire fighters with the base level of knowledge necessary to perform successfully. All involved have freely shared their expertise to create an updated, standardized curriculum that will benefit not only the fire fighter, but his or her department as well.

INSTRUCTOR REQUIREMENTS

Fire service personnel may qualify to teach the Fire Fighter I and II programs by meeting the criteria listed below. Additional courses not included in the Fire Fighter I and II instructor guides, but required for certification, may have additional instructor requirements. Refer to State Fire Training's Policies and Procedures Manual.

1. To qualify as a Fire Fighter Instructor, the following criteria must be met:
   a) Instructor Training (any one of the following five options)
      1) Completed Fire Instructor 1A and 1B
      2) Have a valid Community College teaching credential
      3) Completed the UC/CSU 60-hour Techniques of Teaching course
      4) Completed the NFA's Fire Service Instructional Methodology course
      5) Completed four semester units of upper division credit in educational materials, methods, and curriculum development
   b) Occupational Experience
      1) Have a minimum of 2 years suppression experience.

2. Registration Process
   a) Fire Fighter Instructors are not registered with the OSFM.
   b) Each department's Fire Chief has the responsibility to ensure the individuals teaching the Fire Fighter course(s) meets the criteria listed above.
RESPONSIBILITIES
1. Ensuring all objectives of the course curriculum are met.
2. Teaching **100%** of the course. Due to the length of Fire Fighter training, more than one qualified instructor may be utilized.
3. Ensuring all administrative requirements are completed in accordance with printed guidelines.
4. Proctoring any performance and/or written test when utilized.

MAINTENANCE
1. Maintain subject area involvement either by teaching or operational assignment.
2. Agree to comply with all published State Fire Training policies and procedures of the California State Fire Marshal's Office.
INTRODUCTION TO THE MANUAL

This publication is intended to serve as an instructor guide. Material on these pages is intended to serve as an outline of instruction in lesson plan form. For each topic identified in the course outline, a lesson plan has been developed that contains: a time frame, level of instruction, behavioral objective, materials needed, references, preparation statement, and lesson content.

- **TIME FRAME**: The estimated duration required for in-class presentation.

- **LEVEL OF INSTRUCTION**: Identifies the instructional level that the material was designed to fulfill. Obviously, you have the latitude to increase the level based on available time, local conditions, and the students' apperceptive base.

- **BEHAVIORAL OBJECTIVE**: The behavioral objective is a statement of the student's performance desired at the end of instruction. You must ensure that enough information is given in the presentation and/or activities to enable the student to perform according to the goal.

- **MATERIALS NEEDED**: This should be a complete list of everything you will need to present the lesson, including visual aids, tests, and so on.

- **REFERENCES**: These are the specific references the curriculum development team used when developing the lesson plan. In addition, references may be listed as additional study aids for instructors to enhance the lesson -- books, manuals, bulletins, scripts, visual aid utilization plans and the like.

- **PREPARATION**: The motivational statements in this section connect the student with the lesson plan topic through examples or illustrations relating to their occupation, injury, and even mortality. You may modify this section to better fit your students' environment.

- **LESSON CONTENT**: Includes information used in the four-step method of instruction.

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COURSE OUTLINE

COURSE OBJECTIVES: To provide the student with …

a) The knowledge and skills necessary to safely perform the tasks required of an entry-level fire fighter, including fire behavior, extinguishment theory, water systems, fire protection systems, fire prevention, investigation, and essential fireground operations.

b) The knowledge and skills to proficiently use, inspect, test, and maintain the tools, equipment, and accessories necessary to perform the job of fire fighter, including but not limited to hand, power, and hydraulic tools, chain and circular saws, forcible entry tools, air chisels, lighting equipment, fire service jacks, flares or fusees, thermal imaging devices, and navigational tools.

c) The common causes of injury and death associated with fire fighting and ways to improve fire fighter safety.

d) The knowledge and skills to safely use, inspect, and maintain self-contained breathing apparatus.

e) The knowledge and skills necessary to inspect and effectively operate fire extinguishers.

f) Information on the different types of fire service rope, their usage, construction, inspection, proper care, storage, and record keeping requirements.

g) Information, methods, and techniques for the use, inspection, care, and maintenance of hose, nozzles, and appliances.

h) Information, methods, and techniques for the use, inspection, care, maintenance, and testing of ground ladders.

i) The knowledge and skills necessary to safely perform search and rescue operations in varying conditions.

j) The knowledge and skills necessary to effectively perform natural, mechanical, and hydraulic ventilation.

k) The basic and complex issues of fire control, including strategy and tactics.

l) The knowledge and skills necessary to effectively perform salvage and overhaul.

m) The knowledge and skills to safely perform vehicle extrication.

n) The knowledge needed to understand the characteristics of wildland fire behavior, fire weather, and the unique aspects of wildland fire fighting, including a variety of methods and techniques for containment and extinguishment.

o) The knowledge and skills necessary to become proficient with the life saving skills required to function as an EMS first responder.

p) Training on confined space rescue to the awareness level.

q) Basic training on the Incident Command System.

r) Training on hazardous materials first responder to the operational level.
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43. How To Dismount A Ladder Into A Window ..................................................... 0:15
44. How To Dismount A Ladder Onto A Roof ......................................................... 0:15
45. How To Raise A Pole Ladder, Four-Person, Flat-Raise Method ......................... 0:45
46. How To Raise A Pole Ladder, Five To Six-Person, Flat-Raise Method ................. 0:45

UNIT J: FORCIBLE ENTRY (7:30)
1. Principles Of Breaking Or Pulling Locks .............................................................. 0:30
2. Principles Of Forcing Single-Entry Doors ......................................................... 2:00
3. Principles Of Forcing Overhead Doors ............................................................... 0:15
4. Principles Of Opening Walls .............................................................................. 0:30
5. Principles Of Opening Partitions ....................................................................... 0:30
6. Principles Of Opening Ceilings With A Pike Pole ............................................... 0:15
7. Principles Of Opening Floors ............................................................................. 0:15
8. How To Force Open And Remove Security Bars ............................................... 0:15
9. How To Force Open And Remove A Security Screen ....................................... 0:15
10. Operating Principles For Various Window Styles .............................................. 0:45
11. Principles Of Breaking Window Glass ............................................................... 0:15
12. How To Force Open A Double-Hung/Checkrail Window ................................... 0:15
13. How To Force Open A Casement (Hinged) Window .......................................... 0:15
14. How To Force Open An Awning Or Jalousie Louvered Window ...................... 0:15
15. How To Force Open A Projected (Factory) Window ........................................... 0:15
16. How To Force Open A Lexan® Window ............................................................. 0:15
17. Dangers Of Forcing Entry Through Doors, Windows, And Walls ................... 0:30

UNIT K: RESCUE (8:45)
1. Components Of Rescue Operations .................................................................... 1:00
2. Safety Considerations During A Rescue Search In A Burning Building .............. 0:30
3. Search And Rescue Procedures In A Burning, Smoked-Filled Building .......... 1:00
4. Characteristics Of Primary And Secondary Searches In A Structure ............... 0:15
5. How To Lift And Carry A Victim, One-Person, Incline Drag Method .................. 0:15
6. How To Carry A Victim, Cradle-In-Arms Method ............................................... 0:15
7. How To Drag A Victim, Turnout Coat Or Blanket Drag Method ....................... 0:15
8. How To Carry A Victim, Two-Person, Chair-Carry Method ............................... 0:15
9. How To Carry A Victim, Two-Person, Seat-Carry Method .................................. 0:15
10. How To Carry A Victim, Two-Person, Extremities Method ................................ 0:15
11. How To Carry A Victim, Three-Person Method ................................................ 0:15
12. How To Construct An Improvised Stretcher ..................................................... 0:15
13. Why Stairways Are Preferred Over Ladders For Rescue ................................. 0:15
14. How To Assist A Conscious Victim Down A Ladder, Two-Person Method ....... 0:30
UNIT L: VENTILATION (12:00)
1. Safety Considerations During Ventilation Operations ...........................................0:30
2. Fireground Use Of Forced Ventilation Equipment ..................................................0:15
3. Horizontal Ventilation Principles And Procedures ..................1:00
4. Consequences Of Improper Horizontal Ventilation ..............................................0:15
5. How To Perform Hydraulic Ventilation With A Fog Nozzle ...................................0:15
6. Considerations Given Vertical Ventilation Openings ..........................................0:30
7. Principles And Procedures For Ventilating Various Roof Designs .....................1:00
8. Principles And Procedures For Vertical Ventilation .............................................0:30
9. Consequences Of Improper Vertical Ventilation ..................................................0:30
10. Using Existing Roof Openings For Vertical Ventilation ....................................0:30
11. Principles Of Strip Ventilation .............................................................................0:30
12. Principles Of Positive Pressure Ventilation .......................................................1:00
13. How To Operate A Positive Pressure Ventilation Fan .......................................0:30
14. How To Use A Smoke Ejector To Force Ventilation Through A Horizontal Opening .................................................................0:15
15. How To Hang A Smoke Ejector Outside A Window Using A Ladder ....................0:15
16. How To Hang A Smoke Ejector In A Hall Or Archway .........................................0:15
17. How To Hang A Smoke Ejector In An A-Frame ....................................................0:30
18. How To Hang A Smoke Ejector In A Door Or Window Casing ............................0:15
19. How To Hang A Smoke Ejector On A Ladder In A Stairway ..................................0:15
20. How To Hang A Smoke Ejector From The Top Of A Door ..................................0:15
21. Using Flexible Duct Attachment For Ventilation ..................................................0:30
22. Built-In Ventilation Devices ..................................................................................0:45
23. Controlling The Spread Of Smoke And Fire Through Duct Systems ..................1:00
24. Below-Grade Ventilation ......................................................................................0:30

UNIT M: FIRE CONTROL (10:30)
1. Principles Underlying The Various Modes Of Fire Attack ....................................0:30
2. Types Of Fire Streams And Point Of Application For Class A Fires .......................0:30
3. Basic Guidelines For Initial Attack .......................................................................0:30
4. Why Water Extinguishes Class A Fires ..................................................................0:15
5. Safety Precautions When Using Water To Extinguish A Fire ..............................0:30
6. Safety Precautions When Handling Hoseline ........................................................... 0:30
7. How To Safely Attack An Interior Or Exterior Class A Fire ....................................... 1:00
8. Methods Used To Protect Exposures ........................................................................ 0:30
9. How To Protect Exposures ...................................................................................... 0:30
10. Basic Considerations For Vehicle Fires ................................................................ 0:30
11. Safety Precautions For Vehicle Fires .................................................................... 0:30
12. Accessing Passenger Vehicle Compartments During A Fire ................................... 0:30
13. Physical Properties Of Combustible And Flammable Liquids And Gases ................. 1:45
14. Extinguishing Class B Fires ................................................................................... 1:30
15. How To Control A Flammable Liquid Gas Cylinder Fire While Operating As A Member Of A Crew ................................................................. 1:00

UNIT N: SALVAGE AND OVERHAUL (23:15)
1. Purpose And Value Of Salvage Operations ............................................................. 0:30
2. Safety Considerations During Salvage And Overhaul Operations ............................ 0:30
3. Considerations For Atmospheric Monitoring ......................................................... 0:30
4. Commonly Performed Overhaul Procedures And Their Purpose ............................ 0:30
5. Characteristics And Functions Of Fire Service Salvage Equipment ......................... 1:00
6. Procedures For Detecting Hidden Fires .................................................................. 1:00
7. Principles And Procedures For Using An Infrared Scanner ..................................... 0:30
8. Procedures For Extinguishing Hidden Fires ............................................................. 1:00
9. Providing Protection During Chimney Fires ............................................................. 0:15
10. Inspection And Maintenance Of Fire Service Salvage Covers ................................ 0:45
11. Procedures For Making Buildings And Areas Safe After An Emergency ............... 2:00
12. Arranging Building Contents For Covering ............................................................ 0:30
13. Using Salvage Covers To Cover Shelves ............................................................... 0:15
14. Protecting Floors And Walls Using Salvage Covers .............................................. 0:30
15. Procedures For Constructing A Smoke Curtain ...................................................... 0:15
16. How To Roll A Salvage Cover For A One-Person Throw ....................................... 0:30
17. How To Fold A Salvage Cover For A One-Person Throw ....................................... 1:00
18. How To Perform The Accordion Fold .................................................................... 0:30
19. How To Spread A Rolled Salvage Cover ................................................................. 0:30
20. How To Spread A Folded Salvage Cover ................................................................. 0:30
21. How To Spread An Accordion Folded Salvage Cover .......................................... 0:30
22. How To Spread A Salvage Cover With The Balloon Throw, Two-Person Method .................................................................................................................. 0:30
23. How To Spread A Salvage Cover Using The Single-Edge Snap Throw, Two-Person Method ........................................................................................................ 0:30
24. How To Spread A Folded Salvage Cover Using The Double-Edge Snap Throw, Two-Person Method ...................................................................................... 0:30
25. How To Spread An Accordion Folded Salvage Cover Using The Two-Person Counter Payoff Method .................................................................................. 0:30
26. How To Remove A Salvage Cover .......................................................................... 0:15
27. How To Splice Salvage Covers, Two-Person Method ..............................................0:30
28. Principles And Procedures For Using And Constructing Water Chutes And Dikes .................................................................................................................0:15
29. How To Make A Water Chute With Pike Poles, Two-Person Method .....................0:15
30. Using Hoselines To Move, Contain, Or Divert Water ................................................0:15
31. Considerations For Constructing A Stairway Drain ...................................................0:15
32. How To Make A Stairway Drain ................................................................................0:30
33. Using Building Drains And Scuppers ........................................................................0:30
34. Characteristics And Functions Of Catchalls, Catch Basins, Sumps, And Dikes .......0:15
35. How To Make A Catchall, Two-Person Method ........................................................0:30
36. How To Make A Catch Basin ....................................................................................0:30
37. How To Make A Sump ..............................................................................................0:30
38. How To Make A Dike ................................................................................................0:30
39. Characteristics And Functions Of Water Removal Devices ......................................0:15
40. How To Use A Squeegee .........................................................................................0:15
41. Characteristics And Functions Of Industrial Water Vacuums....................................0:15
42. How To Use A Carryall To Remove Debris...............................................................0:15
43. Principles And Procedures For Restoring Premises ..................................................0:30
44. Principles And Procedures For Covering Roof Openings .......................................1:00

UNIT O: FIRE PROTECTION WATER SYSTEMS (5:15)
1. Principal Features Of Water Systems ........................................................................1:00
2. Factors Affecting Fire Hydrant Usability ....................................................................0:30
3. Sources Of Water Supply Other Than Hydrants .......................................................0:30
4. Characteristics Of Portable Water Tanks ..................................................................0:15
5. How To Use A Public Water System’s Hydrant Gate Valve ....................................0:30
6. How To Open And Close A Fire Hydrant Valve ........................................................0:30
7. NFPA Hydrant Color-Coding System ........................................................................0:30
8. Characteristics Of Wet And Dry-Barrel Hydrants ......................................................0:15
9. Inspection And Maintenance Of Fire Hydrants .........................................................0:30
10. How To Connect A Hard Suction Hoseline For Drafting .........................................0:15

UNIT P: FIRE PROTECTION SYSTEMS (12:30)
1. Components Of An Automatic Sprinkler System ......................................................2:00
2. Capabilities And Limitations Of Sprinkler Systems ..................................................0:30
3. Characteristics And Functions Of Wet-Pipe Sprinkler Systems ................................0:30
4. Characteristics And Functions Of Dry-Pipe And Pre-Action Sprinkler Systems .......0:30
5. Characteristics And Functions Of Deluge Sprinkler Systems ...................................0:30
6. Characteristics And Functions Of Residential Sprinkler Systems ............................0:30
7. Characteristics And Functions Of Standpipe Systems ..............................................0:30
8. Fire Service Support Activities And Safety Measures For Fire Protection Systems .........................................................................................................................0:30
9. How To Replace An Automatic Sprinkler System Head .............................................0:30
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<tr>
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</thead>
<tbody>
<tr>
<td>10. How To Operate A Sprinkler System’s Control Valves</td>
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<td>11. How To Connect A Hoseline To Support Wet And Dry Standpipes</td>
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</tr>
<tr>
<td>12. How To Connect A Hoseline To Support A Sprinkler System</td>
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</tr>
<tr>
<td>13. Principles Of Automatic Dry Chemical Systems</td>
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<tr>
<td>14. Principles Of Automatic Wet Chemical Systems</td>
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<td>15. Principles Of Halon Systems</td>
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<tr>
<td>16. Characteristics And Functions Of Clean Agent And Halon Replacement Systems</td>
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<td>17. Characteristics And Functions Of Automatic Foam Systems</td>
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<td>18. Characteristics And Functions Of Automatic Carbon Dioxide Systems</td>
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<td>19. Characteristics And Functions Of Ultra High-Speed Explosion Detection Systems</td>
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<td>20. Characteristics And Functions Of Water Mist Systems</td>
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<td>21. Characteristics And Functions Of Automatic Alarm Initiating Devices</td>
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<td>22. Installation Practices For Residential Smoke Detectors</td>
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UNIT Q: FIRE PREVENTION AND INVESTIGATION (4:00)

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</thead>
<tbody>
<tr>
<td>1. Basic Techniques For Public Education</td>
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<td>2. Role Of The First Responder In Fire Investigations</td>
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UNIT R: COMMUNICATIONS (4:45)

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</thead>
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<td>2. Characteristics And Functions Of A Fire Department Radio</td>
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<tr>
<td>3. How To Operate A Fire Department Radio</td>
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<tr>
<td>4. Clear Radio Text And Common Terminology</td>
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<tr>
<td>5. Methods Of Receiving Fire Alarms</td>
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<tr>
<td>6. Telephone And Communication Procedures</td>
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<td>7. Characteristics And Functions Of Traffic Pre-Emption Devices</td>
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</table>

UNIT S: VEHICLE EXTRICATION (17:30)

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<td>2. Vehicle Anatomy</td>
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<td>3. New Vehicle Safety Systems</td>
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<td>4. Vehicle Accident Size-Up</td>
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<tr>
<td>5. Principles Of Victim Disentanglement</td>
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<td>6. How To Stabilize A Vehicle On Its Wheels</td>
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<td>7. How To Stabilize A Vehicle On Its Side</td>
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<td>8. How To Stabilize A Vehicle On Its Roof</td>
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<td>9. How To Remove An Adhesive Mounted Vehicle Windshield,</td>
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<tr>
<td>Two-Person Method</td>
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<td>10. How To Remove A Channel Mounted Vehicle Windshield,</td>
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<tr>
<td>Two-Person Method</td>
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<tr>
<td>11. How To Open A Vehicle Roof Using An Air Chisel</td>
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<tr>
<td>12. Characteristics And Functions Of Light Rescue Hand Tools</td>
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<td>13.</td>
<td>How To Displace Vehicle Seats Using A Come-Along And Chains</td>
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<td>14.</td>
<td>How To Displace A Steering Wheel/Column Using A Come-Along</td>
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<td>15.</td>
<td>How To Open A Vehicle Door Using Panel Cutters And A Pry Bar</td>
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<td>Characteristics And Functions Of Hydraulic Rescue Tools</td>
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<td>How To Remove A Vehicle Roof Using Powered Hydraulic Shears</td>
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<td>How To Displace A Vehicle Seat Using A Hydraulic Jack And Ram Extension</td>
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<td>How To Displace A Vehicle Seat Using A Powered Hydraulic Tool</td>
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<td>21.</td>
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<td>How To Displace A Steering Wheel/Column Using A Powered Hydraulic Tool</td>
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<td>How To Displace A Dashboard Using A Powered Hydraulic Ram</td>
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<td>Wildland Fire Fighter Preparedness And Personal Protective Equipment</td>
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<td>Wildland Fire Fighting Safety</td>
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<td>Lookouts, Communications, Escape Routes, And Safety Zones (LCES)</td>
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<td>Safety Considerations When Working Around Dozers</td>
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<td>7.</td>
<td>Safety Considerations When Working Near Aircraft</td>
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<td>8.</td>
<td>Characteristics And Functions Of Fire Shelters</td>
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<td>How To Deploy A Fire Shelter, Standing Method</td>
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<td>How To Deploy A Fire Shelter, Lying-Down Method</td>
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<td>11.</td>
<td>Parts Of A Wildland Fire</td>
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<td>Wildland Fire Strategy</td>
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<td>Handline Construction</td>
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<td>Characteristics And Functions Of Wildland Hand Tools</td>
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<td>Inspection And Maintenance Of Wildland Hand Tools</td>
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<td>Characteristics And Functions Of Back Pumps</td>
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<td>20.</td>
<td>Characteristics And Functions Of Wildland Hose Lays</td>
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<td>21.</td>
<td>Using Water On Wildland Fires</td>
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<td>22.</td>
<td>How To Construct Progressive Hose Lays</td>
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<td>23.</td>
<td>Characteristics And Functions Of Mobile Attack Operations</td>
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<td>24.</td>
<td>How To Perform A Mobile Attack</td>
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<td>25.</td>
<td>Characteristics And Functions Of Mop-Up And Patrol</td>
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</table>
26. Methods For Scouting And Communicating Spot Fires ............................................0:30
27. Using A Wildland Map...............................................................................................1:00
28. Using A Wildland Compass ...................................................................................1:00
29. Introduction To Incident Base ..............................................................................0:30
30. Working With Wildland Fire Resources.................................................................0:30
31. Introduction To I-Zone............................................................................................0:15
32. I-Zone Safety Considerations ...............................................................................1:00
33. I-Zone Structure Protection Procedures...............................................................2:00

UNIT U: EMERGENCY CARE .........................................................................................40:00
Complete, at a minimum, an Emergency Care Of The Sick And Injured course

UNIT V: INCIDENT COMMAND SYSTEM ..................................................................12:00
Complete an ICS-200 (Introduction To ICS) course

UNIT W: CONFINED SPACE RESCUE ..........................................................................8:00
Complete a Confined Space Rescue Awareness course

UNIT X: HAZARDOUS MATERIALS .............................................................................24:00
Complete an OSFM recognized Hazardous Materials First Responder
Operations course
FIRE FIGHTER I
INSTRUCTOR GUIDE
TOPIC: RELATIONSHIP OF FIRE DEPARTMENT WITH OTHER LOCAL AGENCIES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the relationships between the fire department and other local government agencies by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: It is important to understand that no government organization can operate independent of others. The cooperative interaction between the fire department and all other departments within the system is essential. The following information will provide you with an introduction to each department interfacing with your organization.
I. DEPARTMENTS WITHIN LOCAL GOVERNMENT

A. Governing body
   1. Determines the need for fire and related services
   2. Provides finance to fire departments
   3. Fire Chief has a relationship with the governing body
   4. Types
      a) City - Council
      b) County - Board of Supervisors
      c) District - Board of Commissioners
      d) Town - Township

B. Local law enforcement
   1. Common goal with the fire department
      a) Protecting the public
      b) Cooperation between the two is imperative
   2. Depend on each other for support in crowd control, investigations, personal protection

C. Building department
   1. Local building department is responsible for enforcing various codes and regulations of local government
   2. Coordination required in plan checking to ensure building and fire codes are met
### Fire Fighter I

#### Relationship Of Fire Department With Other Local Agencies

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>3. Good working relationship in all areas of building safety</td>
<td>How are the fire department and the water department interdependent?</td>
</tr>
<tr>
<td>4. Safer structures will reduce the number of injuries and damage from fires</td>
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<tr>
<td>D. Water department</td>
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<tr>
<td>1. Water department may supply water while the fire department may or may not maintain hydrants</td>
<td></td>
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<tr>
<td>2. Fire department determines water needs for fire protection</td>
<td></td>
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<tr>
<td>3. Water department must notify fire department during times of water shutdown</td>
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<tr>
<td>E. Planning department</td>
<td></td>
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<tr>
<td>1. Zoning determines future growth factors that may influence fire protection needs</td>
<td>How might zoning affect the fire service?</td>
</tr>
<tr>
<td>a) May dictate fire station locations and apparatus needs</td>
<td></td>
</tr>
<tr>
<td>F. Public works</td>
<td></td>
</tr>
<tr>
<td>1. Responsible for transportation routes</td>
<td>How can public works be a resource during large fire incidents?</td>
</tr>
<tr>
<td>2. Must notify fire department during times of street closures</td>
<td></td>
</tr>
<tr>
<td>3. May block off streets during times of major incidents</td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
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<td>--------------------------------------</td>
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<tr>
<td><strong>G. Local judicial system</strong></td>
<td>Why might a firefighter be called into court?</td>
</tr>
<tr>
<td>1. Fire department personnel may appear in court for</td>
<td></td>
</tr>
<tr>
<td>a) Arson or insurance claims</td>
<td></td>
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<tr>
<td>b) Incidents on fireground</td>
<td></td>
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<tr>
<td>c) Code violation corrections such as</td>
<td></td>
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<tr>
<td>building inspections and weed abatement</td>
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<tr>
<td><strong>H. Local office of emergency services</strong></td>
<td></td>
</tr>
<tr>
<td>1. Large and small scale disaster planning</td>
<td></td>
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<tr>
<td>2. Assistance in large scale disasters</td>
<td></td>
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<tr>
<td><strong>I. Local emergency medical services (EMS)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Coordinate and establish protocols</td>
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</tr>
<tr>
<td>2. Oversee EMS training</td>
<td></td>
</tr>
<tr>
<td>3. Set standard for ambulance response</td>
<td></td>
</tr>
<tr>
<td><strong>J. Firefighter unions</strong></td>
<td></td>
</tr>
<tr>
<td>1. Employee rights</td>
<td></td>
</tr>
<tr>
<td>2. Bargaining</td>
<td></td>
</tr>
<tr>
<td><strong>K. Civic groups</strong></td>
<td></td>
</tr>
<tr>
<td>1. Fire department resources</td>
<td></td>
</tr>
<tr>
<td>2. Interest groups</td>
<td></td>
</tr>
<tr>
<td>3. Fire prevention program support</td>
<td></td>
</tr>
<tr>
<td>a) Stop, drop, and roll</td>
<td></td>
</tr>
<tr>
<td>b) EDITH</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

The fire department is only one part of a local government organization. It must answer to a governing body that determines the community's need for services and provides the funding for it. The fire department must interact not only with the governing body, but also with those other local government agencies that have a common goal in the delivery of services to the public such as law enforcement, and the building, water, planning, and public works departments. Other important relationships may include the court system, fire fighter unions, and various civic organizations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: NATIONAL, FEDERAL, AND STATE FIRE SERVICE ORGANIZATIONS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of fire service organizations and their related functions by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: There are a myriad of agencies and organizations at the international, national, and state level whose functions may impact the operations of fire service organizations. These agencies and organizations establish and enforce standards, staffing, and legislation, which can affect safety and efficiency and influence standard operating procedures.

Having knowledge of the basic function of these agencies and organizations gives the fire fighter an appreciation of the various influences that impact the present day fire department.
I. NATIONAL FIRE SERVICE ORGANIZATIONS

A. International Association of Fire Fighters (IAFF)
   1. Labor organization

B. International Association of Fire Chiefs (IAFC)
   1. To further professional advancement of the fire service
   2. Advisory concerned with technical and educational advancements

C. International Association of Arson Investigators (IAAI)
   1. Advisory concerned with arson problems

D. International Society of Fire Service Instructors (ISFSI)
   1. Affiliation for exchange of ideas and techniques

E. FIRESCOPE
   1. Organization that developed Incident Command System (ICS)

F. International Association of Black Professional Fire Fighters (IABPFF)
   1. Provides liaison between black fire fighters throughout the country
   2. Assists in areas of working conditions, advancement, and interracial progress

G. Women in the Fire Service (WFS)
   1. Maintains information resources of concern to fire service women
   2. Provides a support network

Why are organizations like this important to you as fire fighters?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. National Association of Hispanic Fire Fighters (NAHF)</td>
<td></td>
</tr>
<tr>
<td>1. National group promoting safety, career development, and education</td>
<td></td>
</tr>
<tr>
<td>I. Metropolitan Committee/IAFC (Metro Chiefs)</td>
<td></td>
</tr>
<tr>
<td>1. Division of IAFC</td>
<td></td>
</tr>
<tr>
<td>2. Membership is for cities with a population of 200,000 plus or 400 paid fire fighters</td>
<td></td>
</tr>
<tr>
<td>J. National Fire Protection Association (NFPA)</td>
<td></td>
</tr>
<tr>
<td>1. Organization concerned with fire safety standards development, technical advisory services, education, research, and other related services</td>
<td></td>
</tr>
<tr>
<td>K. International Fire Service Training Association (IFSTA)</td>
<td></td>
</tr>
<tr>
<td>1. Primary provider of fire service training manuals</td>
<td></td>
</tr>
<tr>
<td>2. Affiliated with Oklahoma State University</td>
<td></td>
</tr>
<tr>
<td>L. International Conference of Building Officials (ICBO)</td>
<td></td>
</tr>
<tr>
<td>1. Model code organization that provides uniform building code</td>
<td></td>
</tr>
<tr>
<td>2. Used primarily in the western states and some southern cities</td>
<td></td>
</tr>
<tr>
<td>3. Sponsors training, testing, and certification for code administrators and building inspection officials</td>
<td></td>
</tr>
</tbody>
</table>

**What is the function of the NFPA?**

**Why is this organization important to fire protection?**
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>M. International City Management Association</td>
<td></td>
</tr>
<tr>
<td>1. Association of local government executives for the purpose of strengthening urban government through quality professional management</td>
<td></td>
</tr>
<tr>
<td>2. Develops and disseminates new approaches through training programs, information services, and publications</td>
<td></td>
</tr>
<tr>
<td>N. Underwriters Laboratories, Inc. (UL)</td>
<td></td>
</tr>
<tr>
<td>1. Nonprofit organization that provides testing of hazards inherent to a material or object through normal use</td>
<td></td>
</tr>
<tr>
<td>2. Testing fire extinguishers</td>
<td>What common items do you own that are UL approved?</td>
</tr>
<tr>
<td>3. Electrical appliances, smoke detectors, etc.</td>
<td></td>
</tr>
<tr>
<td>O. Factory Mutual Research Corporation</td>
<td></td>
</tr>
<tr>
<td>1. Industry organization that conducts research in property loss control</td>
<td></td>
</tr>
<tr>
<td>P. Insurance Services Office (ISO)</td>
<td></td>
</tr>
<tr>
<td>1. Nonprofit organization of insurers to assess and rate fire department operational readiness</td>
<td>How does ISO affect everyone?</td>
</tr>
</tbody>
</table>

**II. FEDERAL FIRE SERVICE ORGANIZATIONS**

A. U.S. Forest Service

1. Agency within the Department of Agriculture that provides fire protection to national forests, grasslands, and nearby private lands across the United States
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Federal Emergency Management Agency (FEMA)</td>
<td></td>
</tr>
<tr>
<td>1. Agency designed to provide for the national need in preparing for and handling major emergencies</td>
<td></td>
</tr>
<tr>
<td>2. U.S. Fire Administration (USFA)</td>
<td></td>
</tr>
<tr>
<td>a) Assigned to reduce the nation's fire loss through education and prevention activities</td>
<td></td>
</tr>
<tr>
<td>3. National Fire Academy (NFA)</td>
<td></td>
</tr>
<tr>
<td>a) Professional development of fire personnel and others engaged in fire prevention and control</td>
<td></td>
</tr>
<tr>
<td>4. Emergency Management Institute (EMI)</td>
<td></td>
</tr>
<tr>
<td>a) Provides training to public sector managers to prepare for, mitigate, respond to, and recover from all types of emergencies</td>
<td></td>
</tr>
<tr>
<td>C. National Bureau of Standards (NBS)</td>
<td></td>
</tr>
<tr>
<td>1. Fire research and tests involving building technology</td>
<td></td>
</tr>
<tr>
<td>D. Department of Transportation (DOT)</td>
<td></td>
</tr>
<tr>
<td>1. Concerned with public safety on the nation's highways, airways, and waterways</td>
<td></td>
</tr>
<tr>
<td>2. Develops regulations that control hazardous materials and their shipping</td>
<td></td>
</tr>
<tr>
<td>3. Subdivisions</td>
<td></td>
</tr>
<tr>
<td>a) Federal Aviation Administration (FAA)</td>
<td></td>
</tr>
<tr>
<td>b) U.S. Coast Guard (USCG)</td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
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<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>c) Materials Transportation Board (MTB)</td>
<td></td>
</tr>
<tr>
<td>d) Federal Highway Administration</td>
<td></td>
</tr>
<tr>
<td>e) Federal Railroad Administration</td>
<td></td>
</tr>
<tr>
<td>f) National Highway Traffic Safety Administration</td>
<td></td>
</tr>
<tr>
<td>E. National Transportation Safety Board (NTSB)</td>
<td>1. Investigates and maintains statistics on vehicle accidents, including fire apparatus</td>
</tr>
<tr>
<td></td>
<td>2. Involved in vehicle recalls</td>
</tr>
<tr>
<td>F. Environmental Protection Agency (EPA)</td>
<td>1. Agency to coordinate efforts directed at containing and clean up of toxic or hazardous spills on inland waters</td>
</tr>
<tr>
<td>G. Department of Health and Human Services (HHS)</td>
<td>1. Agency performing research, education, and training in the fields of occupational safety and health</td>
</tr>
<tr>
<td></td>
<td>2. Parent department to NIOSH</td>
</tr>
<tr>
<td></td>
<td>a) Established to conduct research and provide educational functions to support OSHA</td>
</tr>
<tr>
<td>H. Nuclear Regulatory Commission (NRC)</td>
<td>1. Develop and enforce guidelines for operating nuclear facilities</td>
</tr>
<tr>
<td>I. U.S. Department of the Treasury-Bureau of Alcohol Tobacco and Firearms (BATF)</td>
<td>1. Assists in the investigation of arson and bomb incidents by gathering and processing evidence</td>
</tr>
</tbody>
</table>
J. Department of Labor

1. Responsible for administering and enforcing the Occupational Safety and Health Act
2. Compiles national occupational injury and illness data

K. Federal Communications Commission (FCC)

1. Develops and enforces regulations regarding the use of radio transmitting equipment

III. STATE FIRE SERVICE ORGANIZATIONS

A. State Board of Fire Services (SBFS)

1. Advisory to governor on matters relating to fire protection and education in the state
2. Adopts technical and performance standards for certification

B. Office of Emergency Services (OES)

1. Designed to provide for the state's needs in preparing for and handling major emergencies
2. California Specialized Training Institute (CSTI)
   a) Academy designed to enhance the professional development of fire service personnel in specialized areas in fire and hazardous materials prevention, protection, control, and mitigation

C. California Department of Forestry and Fire Protection (CDF)

1. Provides fire protection and rescue services to areas of state responsibility
2. Division within CDF is the Office of State Fire Marshal
   a) Fire codes

What major regulation does the department of labor administer?
### Fire Service Education

- Fire service education
- Arson and bomb investigation

### California State Firefighter's Association (CSFA)
1. Association of fire fighters to provide political input on behalf of fire fighters' interests

### California Professional Firefighters (CPF)
1. Association of fire fighters to provide bargaining and political input on behalf of fire fighters' interests
2. Joint Apprenticeship Committee (JAC)
   - An apprenticeship program

### California Conference of Arson Investigators (CCAI)
1. Association of arson investigators to exchange ideas and information on arson

### California Fire Chiefs Association (CFCA)
1. Association of Fire Chiefs to address the needs and problems of the California fire service through legislation, training, and fire prevention

### Fire Districts Association of California (FDAC)
1. Provides educational support and political advocacy for the administration of special districts that provide fire suppression, prevention, and emergency services

### California Rescue Paramedic Association (CRPA)
1. EMS issues
2. Legislation
3. Continuing education

### California Rural Fire Fighters Association (Cal Rural)
1. Organization to promote training for rural fire agencies
## IV. OTHER STATE ORGANIZATIONS RELATING TO FIRE PROTECTION, ENFORCEMENT, TRAINING

| A. Department of Transportation (CALTRANS) | 1. Public safety on state highways |
| B. Cal/OSHA | 1. Develop and enforce regulations regarding research, education, training, and reporting of occupational injuries and illness |
| C. Department of Health Services | 1. Medical care service responsible for the overall coordination and direction of health care delivery systems |
| D. Department of Fish and Game | 1. Protect the natural resources of the state, both on land and on non-navigatable waterways |
| E. Department of Water Resources | 1. Provide for the development and protection of California’s water, both above and below ground |
| 2. Flood control |
| F. California Highway Patrol (CHP) | 1. Enforcement of laws related to the highways and byways of the state |
| 2. Hazardous materials coordinator for incidents on highways and freeways |
| 3. Protect all state facilities |

### What kinds of resources are available and how can they help?

#### G. Assistance examples

1. CHP may provide traffic control and incident command
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Department of Health Services may recommend evacuations on hazardous</td>
<td></td>
</tr>
<tr>
<td>materials incidents</td>
<td></td>
</tr>
<tr>
<td>3. Department of Water Resources can provide engineering studies for</td>
<td></td>
</tr>
<tr>
<td>evacuation recommendations</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

There are a multitude of national, federal, and state organizations that have a profound impact on all areas of the fire service, particularly in prevention, training standards, safety, and fire fighter working conditions. These organizations are not only government agencies, but also professional associations and private organizations involved in the development of technical codes and standards.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: COMMUNITY ORGANIZATIONS HAVING AN INTEREST/RELATIONSHIP TO PUBLIC FIRE PROTECTION

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the local community organizations that have direct or indirect relationship with the fire department by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Public Fire Education, IFSTA, First Edition, Chapters 1 and 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Local Chamber of Commerce directory

REFERENCES:
- Fire Service Orientation and Terminology, IFSTA, Third Edition
- Public Fire Education, IFSTA, First Edition

PREPARATION: Fire fighters must be able to identify those community organizations with which they must interact. If service is the business of a fire agency, it is important to know and understand your customer.
I. COMMUNITY GROUPS
   A. Fire agencies relate directly and indirectly with many organizations in their communities

   B. The following groups could affect your fire service agency
      1. Chamber of Commerce
      2. Local service groups
         a) Kiwanis
         b) Rotary
         c) Lions
         d) Elks
         e) Optimists
      3. Local insurance groups
      4. Parent/Teacher Association (PTA)

II. AGENCY ASSISTANCE
   A. Political support
   B. Community service projects
   C. Public education
   D. Facts and information
   E. Financial support
SUMMARY:

We must recognize the groups that interact and relate with our profession. Organizations such as the Chamber of Commerce and local service groups play a valuable role for the fire service in political support, community projects, and public education, among other things.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Public Fire Education, IFSTA, First Edition, Chapters 1 and 2 in order to prepare yourself for the upcoming test. Study for our next session.
BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the functional areas and procedures of each component on a typical fire department organization chart by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Service Orientation and Terminology*, IFSTA, Third Edition, Chapter 5

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

**PREPARATION:**
The primary purpose of the fire service is to provide emergency services. Traditionally these services have been fire, rescue, and EMS activities. However, most fire agencies are not limited to those functions. Code enforcement, public education, investigation, and pre-incident planning are just a few examples of other programs that enable the fire service to provide life safety in the community.
I. FIRE PREVENTION
   A. Part of overall public protection
   B. Division of the fire department
   C. The goal is to decrease the need for extended fire suppression activities
      1. Fewer costly fires
   D. Must be performed aggressively
      1. Well-developed program of code enforcement
   E. All fire fighters should be aware of other fire prevention responsibilities
      1. Investigation, public education, plan checking, fire protection system review
   F. Code enforcement
      1. Local, state, and federal

II. FIRE SUPPRESSION
   A. When fire prevention fails, fire starts
   B. Fire suppression crews extinguish fires
   C. The general priority sequence for fire suppression is RECEO
      1. Rescue
      2. Exposure
      3. Confinement
      4. Extinguishment
      5. Overhaul
   D. Ventilation and property conservation
   E. Performing in this manner saves time and confusion
III. EMERGENCY MEDICAL SERVICE

A. Delivery of EMS is a voluntary function of each jurisdiction

B. Regardless whether or not a department provides EMS, every fire fighter must be trained to a basic level
   1. CCR Title 22, Chapter 1.5, §10005-10028
   2. For both career and volunteer

C. Vast majority of departments perform EMS as part of their normal level of service
   1. The level of emergency care provided varies depending upon local or regional needs

D. Levels of care are determined by a defined scope of practice
   1. This scope impacts the hours of training required for each level

E. Levels of emergency care
   1. Basic life support (BLS)
      a) CPR and basic first aid
         1) 21 hours
            • 6 hours CPR
            • 15 hours first aid
         2) This is the minimum level of training as required by law
      b) First responder
         1) 40 hours minimum
      c) Emergency Medical Technician-I
         1) 114 hours minimum
   2. Limited advanced life support
      a) Emergency Medical Technician-II
         1) 306 hours minimum
3. Advanced life support (ALS)
   a) Emergency Medical Technician-Paramedic
      1) 1,032 hours minimum

F. Specialized medical services will also vary between departments
   1. Emergency medical dispatcher
   2. Ambulance transportation
   3. Air ambulance or rescue
   4. First responder defibrillation

IV. TRAINING
A. Training is one of the most important aspects of the fire fighter's jobs

B. Without proper training the fire fighter is no more effective at the job than the average citizen on the street

C. Training provides the fire fighter with the skills and knowledge to perform his or her job

D. Fire fighters training begins in the recruit academy and ends when the fire fighter leaves the service

E. As the fire fighter progresses through the ranks, training programs will become as varied

   1. State Fire Marshal's Office/Fire Academy
   2. California Specialized Training Institute
   3. Community colleges
   4. Universities and colleges

Why must fire fighters continually be in this training mode?

Where do we receive training other than from departmental training programs?
5. National programs  
   a) National Fire Academy (NFA)  
   b) Emergency Management Institute (EMI)  
   c) National Emergency Training Center (NETC)

V. NONEMERGENCY SERVICES  
A. Oftentimes, the only service available for nonemergency help is the fire department  
   1. 24-hours per day  
B. Assist handicapped  
C. Take blood pressure  
D. Issue bicycle license

VI. SAFETY AND ACCIDENT PREVENTION  
A. Must begin within the department  
B. Will also become public education

VII. FIREGROUND SAFETY  
A. Everyone is responsible  
   1. Fire fighter, company officer, etc.  
B. Appropriate personal protective equipment

VIII. OTHER MUNICIPAL SERVICES  
A. There may be additional services required of a local fire agency  
   1. Water system maintenance  
   2. Property maintenance  
   3. Property security
SUMMARY:

Fire fighters need to be aware of all the functions that the fire service provides their community including fire prevention, fire suppression, emergency medical services, training, and nonemergency services. Emergency personnel must have the essential skills and knowledge to perform in both emergency and nonemergency operations. Safety and accident prevention are important within the department, on the firegrounds, and as part of public education.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FIRE DEPARTMENT PLANS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the various types of plans and their purposes used by the fire department by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 5

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION:

A plan is defined as an orderly arrangement of details worked out ahead of time to accomplish a goal or objective. The fire service plans much of its routine and emergency activities. A fire fighter should have a basic knowledge of the types of plans used.
## I. MASTER PLAN

A. These plans can refer to any subject facing the fire service.

B. Generally multi-agency or multi-jurisdictional agreements of the actions of everyone involved to obtain a common good or end.

C. Examples
   1. County training and education plan
   2. Disaster preparedness master plan
   3. Generally, long-range plans targeted for a 5-10 year timeframe

D. Steps for a master plan
   1. Analyze data
   2. Identify options
   3. Evaluate options
   4. Propose program

## II. COMMUNITY FIRE DEFENSE PLANNING (DISASTER PLANNING)

A. Although a type of master plan, this specific plan is important enough in its impact to local fire departments to warrant mentioning separately.

B. This plan involves having representatives from local government meet with public safety officials and decide what level of fire protection is acceptable and affordable in a specific community or communities.

C. Included in this plan would be specific recommendations for the method of service delivery and levels of acceptable risk.

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<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>I. MASTER PLAN</td>
<td>What are some examples of master plans?</td>
</tr>
<tr>
<td>II. COMMUNITY FIRE DEFENSE PLANNING (DISASTER PLANNING)</td>
<td>What is a community fire defense plan?</td>
</tr>
</tbody>
</table>
D. Outlines the areas of responsibilities and duties required of agencies expected to participate in large scale incidents
E. Defines roles and responsibilities ahead of time
F. Provides a predetermined course of action in the first operational period of a major disaster

What is the purpose of a mutual aid plan?

III. MUTUAL AID PLAN
A. Preagreement between jurisdictions in the event of an emergency that requires more resources to control the emergency than any single agency possesses
   1. Methods of requesting assistance
   2. Level of response for neighboring agencies to lend equipment and personnel
B. Developed and administered under OES guidelines

IV. AUTOMATIC AID PLAN
A. Agreements by neighboring agencies to have equipment and personnel that are physically closest to an emergency respond automatically
B. Response is not influenced by normal boundary line of jurisdictions

How do automatic aid plans differ from mutual aid plans?

V. PRE-INCIDENT PLAN
A. Allows first arriving company to be familiar with layout of and dangers inherent to specific targeted hazards
B. Plan for actions to be taken by first arriving company in the event of an incident at a location likely to experience an emergency
SUMMARY:

The fire service has found that planning its activities in both emergency and routine administrative areas has allowed more efficient disbursement of personnel and equipment to accomplish its overall goal. The purpose of this lesson is to acquaint the new fire fighter with some of the applications of planning to the fire service. These include master planning, disaster planning, mutual aid, automatic aid plan, and pre-incident planning.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF THE STANDARDIZED EMERGENCY MANAGEMENT SYSTEM (SEMS)

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic concepts of the Standardized Emergency Management System (SEMS) by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the California Emergency Services Act, Chapter 7 of Division 1 of Title 2, Government Code Article 9.5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- California Emergency Services Act, Chapter 7 of Division 1 of Title 2, Government Code Article 9.5

PREPARATION: As a direct result of the 1991 Oakland conflagration, legislation was enacted to ensure a coordinated and standardized response to local and statewide emergencies. Fire fighters are required by this law to have an understanding of the principles of SEMS.
## I. STANDARDIZED EMERGENCY MANAGEMENT SYSTEM (SEMS)

A. Title 19, Chapter 1 of California Code of Regulations
B. Previously known as the Petris Bill
C. Senator Petris lost a home in the Oakland Hills fire of 1991
D. Addressed the need for standardization of responding resources

## II. INTENT OF SEMS

<table>
<thead>
<tr>
<th>What is SEMS?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Standardize response to emergencies including multiple agencies and/or multiple jurisdictions</td>
</tr>
<tr>
<td>B. Flexible and adaptable to fit needs of emergency responders at all levels of response</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What are levels of response?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fire/EMS</td>
</tr>
<tr>
<td>2. Law enforcement</td>
</tr>
<tr>
<td>3. Public works</td>
</tr>
<tr>
<td>4. Government officials</td>
</tr>
</tbody>
</table>

## III. LEVELS OF ORGANIZATION

<table>
<thead>
<tr>
<th>What is SEMS?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Field</td>
</tr>
<tr>
<td>1. Initial response within jurisdiction</td>
</tr>
<tr>
<td>B. Local government</td>
</tr>
<tr>
<td>1. Cities</td>
</tr>
<tr>
<td>2. Counties</td>
</tr>
<tr>
<td>3. Special districts</td>
</tr>
<tr>
<td>C. Operational area</td>
</tr>
<tr>
<td>D. Region</td>
</tr>
<tr>
<td>E. State</td>
</tr>
</tbody>
</table>
IV. PURPOSE OF SEMS
A. Established from Incident Command System (ICS)
B. Multi-Agency Coordination System (MACS)
C. Operational Area Concept (OASIS)
D. Existing mutual aid systems
E. Evolving emergency management structures
F. Local government must use SEMS in order to be eligible for disaster reimbursement

V. BASIC PRINCIPLES
A. Modular
B. Adaptable to any emergency
C. Applicable to all users
D. Adaptable to new technology
E. Expands/contracts to meet needs
F. Common terminology, organization, and procedures

VI. TRAINING REQUIREMENT
A. Introductory
   1. Self-study or instruction-based course with four modules
B. Field level
   1. ICS
      a) Basic
      b) Intermediate
      c) Advanced
C. Emergency Operations Center (EOC) level
D. Executive level
   1. Self-study or instruction-based for local government officials
VII. FIRE HYDRANTS

A. Color coding
B. Coupling sizes

What other standards does SEMS address?
SUMMARY:

The Standardized Emergency Management System (SEMS) used in California as a result of legislation addressing the Oakland Hills fire of 1991 created standardization of response to emergencies involving multiple agencies and/or multiple jurisdictions. It fits the needs of emergency responders at all levels of response. SEMS uses Incident Command System (ICS), Multi-Agency Coordination System (MACS), Operational Area Concept (OASIS), and existing mutual aid systems. Local governments must use SEMS in order to be eligible for disaster reimbursement.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read California Emergency Services Act, Chapter 7 of Division 1 of Title 2, Government Code Article 9.5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: THE FIRE PREVENTION FUNCTION

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic components of fire prevention activities within a fire department by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Inspection and Code Enforcement, IFSTA, Sixth Edition, Chapter 1

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Inspection and Code Enforcement, IFSTA, Sixth Edition
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: The purpose of fire prevention is to reduce the loss of life and property, and provide a safer environment for all citizens of the community. We should be aware of our responsibility in this most important function of the fire service.
<table>
<thead>
<tr>
<th>I. THE PURPOSE OF FIRE PREVENTION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Reduce lives lost</td>
<td>What is the purpose of fire prevention?</td>
</tr>
<tr>
<td>B. Reduce property loss</td>
<td></td>
</tr>
<tr>
<td>C. Public safety</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>II. ORGANIZATION OF FIRE PREVENTION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Locally</td>
<td></td>
</tr>
<tr>
<td>1. Usually administered by the fire marshal</td>
<td></td>
</tr>
<tr>
<td>a) Fire inspectors/prevention officers</td>
<td></td>
</tr>
<tr>
<td>b) Civilian inspectors</td>
<td></td>
</tr>
<tr>
<td>c) Hazardous materials inspectors</td>
<td></td>
</tr>
<tr>
<td>B. State Fire Marshal</td>
<td></td>
</tr>
<tr>
<td>1. Public buildings</td>
<td></td>
</tr>
<tr>
<td>2. Schools</td>
<td></td>
</tr>
<tr>
<td>3. Day care centers</td>
<td></td>
</tr>
<tr>
<td>C. National, state, and local organizations</td>
<td></td>
</tr>
<tr>
<td>1. California Fire Chiefs Association, Fire Prevention Officers Section</td>
<td></td>
</tr>
<tr>
<td>2. National Fire Protection Association</td>
<td></td>
</tr>
<tr>
<td>3. Fire Marshal's Association of North America</td>
<td></td>
</tr>
<tr>
<td>4. Western Fire Chiefs Association</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. FIRE PREVENTION CODES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Uniform Building Code</td>
<td>What are some of the codes used to enforce fire prevention requirements?</td>
</tr>
<tr>
<td>B. Uniform Fire Code</td>
<td></td>
</tr>
</tbody>
</table>
### PRESENTATION

- **C.** California Code of Regulations
  - 1. Title 19
  - 2. Title 24
- **D.** NFPA Life Safety Code
- **E.** National Fire Code
- **F.** And a host of others

### IV. AUTHORITY AND RESPONSIBILITIES

- **A.** Determined by the amount of authority the governing body (city council, commissioners, supervisors) wants to give the Fire Chief or Fire Marshal
- **B.** Done by ordinance or declaration
- **C.** Control over new construction
- **D.** Control over existing buildings
- **E.** Control over renovation of existing building
- **F.** Some state responsibility is passed down to the local agency for inspection
  - 1. Schools, day care centers, etc.
  - 2. The local agency voluntarily accepts this responsibility; it is not required
**SUMMARY:**

Although often overlooked, the fire prevention function of a fire department plays a major role in the protection of life and property. Fire prevention functions are organized at the local, state, and national levels. Fire prevention is generally enforced by model codes and ordinances and is responsible for existing and new buildings.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Inspection and Code Enforcement*, IFSTA, Sixth Edition, Chapter 1 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FIRE SERVICE RESOURCES

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the resources available to a modern fire department by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: Frequently fire fighters think the only things a fire department needs to perform its mission are the engines and the people on them. A more in-depth look at the resources available within a modern fire department reveal the abundance of facilities required to make the system work.
I. BUILDINGS AND FACILITIES
   A. The number and size depends on the operational needs and capabilities of the individual department
      1. Administrative offices
      2. Stations
         a) Living accommodations
         b) Dining facility
      3. Dispatch center
      4. Training facilities
         a) Drill tower
         b) Burn building
      5. Maintenance facilities

II. APPARATUS
   A. Number and size depend on the operational needs and capabilities of the individual department
   B. Requirements found in NFPA Standards #1901, #1902, #1903, and #1904
   C. Engine
      1. Carries hose, water, and pump to deliver the water to the fire
      2. Functions include fire attack and extinguishments
   D. Truck companies
      1. May be either elevated platforms or aerial ladders
      2. Generally carry a compliment of ground ladders and have elevated ladder capabilities

What is an engine?
### PRESENTATION

3. Functions include search and rescue, ventilation, and forcible entry

E. Elevated water devices
   1. Several configurations available
   2. Generally consist of some sort of hydraulically operated tower connected to a pumper type apparatus

F. Wildland engine
   1. Specially adapted to combat fires in wildland areas
   2. Usually has high ground clearance, lighter weight, and frequently four-wheel drive

G. Water tender
   1. Mobile water delivery system

H. Specialized apparatus is designed for a specific function
   1. Light rescue
   2. Heavy rescue
   3. Crash fire rescue
   4. Hazardous materials response
   5. Paramedic units
   6. Ambulances
   7. Air supply units
   8. Mobile command vehicles
   9. Light units
   10. Dozers
   11. Aircraft - fixed and rotary
   12. Triage units
   13. Fire boats

### APPLICATION

What is the function of a truck company?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Mobile communication vehicle</td>
<td></td>
</tr>
<tr>
<td>15. Mobile fire investigation unit</td>
<td></td>
</tr>
</tbody>
</table>

### III. EQUIPMENT

| A. Hand and power tools |
| B. Hose |
| C. Ladders |
| D. Rope |
| E. Forcible entry tools |
| F. Pneumatic rescue tools |
| G. Extrication tools |
| H. Lighting equipment |
| I. Air chisels |
| J. Fire service jacks |
| K. Thermal imaging devices |
| L. Personal protective equipment |

### IV. HUMAN RESOURCES

| A. Most important |
| B. Most expensive |
| 1. Largest part of the budget is for personnel |
| C. Costly to |
| 1. Recruit |
| 2. Test |
| 3. Train |
| 4. Maintain |
| 5. Replace |
| 6. Retrain |
| 7. Lose a good employee |
SUMMARY:

This has been a brief overview of the myriad of resources available within a modern fire department to aid in the completion of its mission. These include facilities, apparatus, equipment, and human resources.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: DUTIES OF FIRE SERVICE RANKS AND POSITIONS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the duties of various fire department ranks and positions by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Job descriptions from local fire department

REFERENCES:
- Fire Department Company Officer, IFSTA, Third Edition
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: The job of a fire fighter may appear simple on the surface — to put out fires. The actual mission of a fire department is much more complicated with many persons working in nonsuppression roles to achieve the department's overall mission. This lesson will enable the new fire fighter to understand not only the duties of various suppression ranks but also those of the many staff and support functions required for effective service delivery.
NOTE: Distribute job descriptions from local fire departments.

I. FIRE SUPPRESSION RANKS AND POSITIONS

A. Fire Fighter
   1. This position has a broad scope of duties that cover the actual physical performance of tasks
      a) Equipment maintenance and security
      b) Emergency medical care
      c) Fire suppression
      d) Fire prevention activities
   2. This position has the least level of authority

B. Fire Apparatus Operator
   1. Sometimes called engineer or driver/operator
   2. Can perform all the duties of a fire fighter
   3. Trained to drive, operate, and maintain all types of fire apparatus
   4. Responsibilities are directly related to the operational capabilities of his or her assigned apparatus

C. Company Officer
   1. First-line supervisor of all personnel assigned to the company in both routine duties and emergency situations
   2. Authority is delegated through the chain of command by the Fire Chief
   3. All decisions are made with independence within established guidelines as set forth in department policies and procedures
   4. Levels
      a) Captain
      b) Lieutenant
D. Chief Officer
   1. Responsible for the management of all companies and personnel under his or her jurisdiction
   2. May be assigned to manage and control the efforts of the fire companies at the scene of an emergency or the individuals performing staff/support functions

What are some of the levels of chief officer?

3. Levels
   a) Battalion Chief
   b) Division Chief
   c) Deputy Chief
   d) Assistant Chief

II. EMS RANKS AND POSITIONS
A. Since the provision of EMS is voluntary, so is the specific organizational design
   1. The level of involvement of fire departments in the delivery of prehospital care has changed dramatically in the last 20 years

B. Most fire departments will participate in one or more of the following levels of emergency care
   1. First aider/initial responder
      a) Usually the initial response personnel in a tiered response system
      b) These individuals are usually engine company personnel trained to administer first aid until individuals with more advanced capabilities arrive
2. Emergency Medical Technician-I (EMT-I)
   a) Individuals who have received a specific curriculum and certified as proficient by a regulatory agency
   b) Individuals certified at this level are capable of providing
      1) Basic life support
      2) Stabilization and transportation of victims
   c) It is important to note that in many areas, the first responders are trained to this level of emergency medical care capabilities

3. Emergency Medical Technician-II (EMT-II)
   a) Individuals who have received limited training in advanced life support
   b) Certified by the local EMS agency
   c) In California, this is the intermediate level of EMS provider
   d) EMT-IIs work under supervision and control of the base station hospital and physician

4. Emergency Medical Technician-Paramedic (EMT-P)
   a) Individuals who have received training in the administration of advanced life support techniques
   b) Individuals must complete a specific curriculum and be certified by a regulatory agency

What duties can be performed by someone certified as an EMT-I?
### FIRE PREVENTION RANKS AND POSITIONS

#### A. Fire Prevention Officer or Fire Marshal

1. Assists the Fire Chief in planning and implementing fire prevention programs
   - a) Business inspection program
   - b) Fire safety school program
   - c) Handling fire hazard complaints
   - d) Maintaining records and reports on prevention activities

2. Requires a thorough understanding of related codes and ordinances and their application to local buildings and occupancies

#### B. Fire Protection Specialist

1. Reviews plans for new construction or remodeling to ensure that fire safety rules and regulations are adhered to

#### C. Public Education Specialist

1. Plans and implements public education programs

---

**NOTE:** Stress that several of the following functions may be combined and one individual may have the responsibility for performing several functions.
2. This is accomplished through media contacts, school programs, and development of fliers and pamphlets for distribution

D. Fire Investigator
   1. Determines fire origin and cause
   2. Observes fire area
   3. Collects and preserves evidence
   4. Prepares for litigation

IV. SPECIAL ASSIGNMENTS

A. Training Officer
   1. Plans, develops, and implements training courses for all areas of service delivery
   2. Position involves a high degree of personal interpretation of policies and direction from the Fire Chief

B. Hazardous Materials Technician
   1. Mitigates hazardous materials incidents in the jurisdiction

C. Dispatcher/Communications Specialist
   1. Provides information and direction to callers
   2. Receives information to dispatch the appropriate units in an efficient manner

D. Aircraft Rescue
   1. Assigned to airport fire fighting and rescue work

E. Water Rescue and Recoveries
   1. Special needs and skills are required such as scuba divers and for water rescue

F. Special Rescue Technicians
   1. Rope (high angle) rescue
   2. Trench and structural collapse
### PRESENTATION

3. Confined space entry  
4. Cave or mine rescue  
5. Urban search and rescue (USAR)

**NOTE:** Show an organizational chart of your department, or refer to chart in *Fire Department Company Officer*, IFSTA, Third Edition.

### V. CHAIN OF COMMAND

A. Every fire fighter needs to understand that although he or she only reports to one supervisor — the company officer — indirectly each member of the fire department reports to the Fire Chief.

B. This method of everyone reporting to the Fire Chief is called the chain of command.

C. Confusion would be the result if nobody (or everybody) was in charge.

D. The Fire Chief gives direction to the department through policies and procedures.

   1. These are interpreted and implemented through the chain of command into individual work assignments for each company member.

E. The chain of command should cause information to flow from the top of the department to rank and file.

F. It should also allow information to flow up the chain from the rank and file to the upper management level.

G. Conflicts in the chain of command.

What would happen at a fire if nobody were in charge?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fireground operations often reflect the need to have a solid chain of command structure in place</td>
<td>When would a conflict in the chain of command most likely occur?</td>
</tr>
</tbody>
</table>
SUMMARY:

The mission of most fire protection organizations entails many responsibilities. In order to carry out these responsibilities, they are generally organized into functional units. Typically, these units are suppression, EMS, prevention, and special assignments such as training, hazardous materials, dispatching, and specialized rescue. Personnel performing these duties are assigned a rank and position according to their responsibility and authority that is arranged into an organizational chart called a chain of command, as the most efficient means to accomplish the mission.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FIRE SERVICE AGENCY RULES AND REGULATIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the various fire service agency rules and regulations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Local fire department policy manual(s)
- Local Memorandum of Understanding (MOU)

REFERENCES:
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: All organizations must have regulations, policies, and procedures to operate in an effective manner. This is especially true in a fire department to ensure an adequate and effective emergency response. These regulations are implemented and used to establish the daily and emergency operations of the organization.
## RULES AND REGULATIONS

A. Usually written or approved by the Fire Chief

Why have rules and regulations?

B. Establish parameters and guidelines

C. Pertain to all aspects of the job
   1. Uniforms
   2. Schedule
   3. Conduct
   4. Grooming
   5. Station duties
   6. Vehicles
   7. Responses
   8. Shift trades
   9. Assigned gear and equipment
   10. Station tours
   11. Public education
   12. Promotions

D. Rules and regulations, operation manuals and/or written documents should contain guidance regarding appropriate behavior for issues sensitive to the fire fighters and public

What might be a "sensitive" issue?

1. EMS protocols
2. Child abuse reporting
3. Elder abuse reporting
4. Protecting a crime scene
5. The rape victim
6. Theft
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Drug and alcohol abuse</td>
<td></td>
</tr>
<tr>
<td>8. Sexual harassment</td>
<td></td>
</tr>
<tr>
<td>9. Workplace violence</td>
<td></td>
</tr>
<tr>
<td>10. Discrimination</td>
<td></td>
</tr>
<tr>
<td>11. Accidents involving fire department vehicles</td>
<td></td>
</tr>
<tr>
<td>12. Fire fighter deaths</td>
<td></td>
</tr>
</tbody>
</table>

**II. STANDARD OPERATING PROCEDURE (SOP)**

A. Written procedures aimed at standardizing operations and activities

B. Usually presented during in-service training

**III. CONTRACT/MEMORANDUM OF UNDERSTANDING (MOU)**

A. Many work related rules will be found in the MOU

1. Work hours
2. Probation
3. Wages
4. Overtime
5. Vacation
6. Sick leave
7. Other terms and conditions of employment

What is covered?

What are some fire fighter responsibilities?

**IV. FIRE FIGHTER RESPONSIBILITIES**

A. Safety
B. Conduct, ethics, trust
C. Health
D. Equipment/supplies
E. Maintenance
F. Training
**SUMMARY:**

Fire fighters are responsible for knowing the fire department's rules and regulations, standard operating procedures, memorandum of understanding, and fire fighter responsibilities as it applies to them. Some of the applications are uniform, grooming, conduct, promotions, station routine, and protocol on calls such as elder and child abuse.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Orientation and Terminology*, IFSTA, Third Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: DISCIPLINE IN THE FIRE SERVICE

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the necessity for obedience and obligation to duty by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 5

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES: • Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: Fire fighting is one of the world's most honored but hazardous occupations. It is the duty of every fire department to save lives and reduce injuries and property loss. In order to fulfill this duty, the fire fighter must develop a high degree of discipline and must be totally dedicated to the task. Like the military, discipline is necessary in situations where an immediate order must be followed. A lack in this type of discipline could result in a loss of life.
What does the word discipline mean?

I. DISCIPLINE

A. Discipline is the control gained by enforcing obedience or order
   1. To follow commands or guidance
   2. To comply with or execute an order without hesitation

B. The fire service is a paramilitary organization that is frequently in a combat mode against fire

C. While combating fire, the fire fighter must have a high degree of discipline in order to both win and survive

D. There are two arenas where discipline is found
   1. Emergency operations
      a) It is vitally important for the fire fighter to obey commands instantly and without questions

1) Examples: The Incident Commander gives the order to
   • "Get off the roof"
   • "Get out of the building"
   • "Let the building burn"
   • "Stay up wind"

b) This does not mean that commands cannot or should not be questioned
   1) Clarification may require questioning
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Best understood through training and experience</td>
<td></td>
</tr>
<tr>
<td>3) Trust and confidence in supervisors</td>
<td></td>
</tr>
<tr>
<td>2. Nonemergency operations</td>
<td></td>
</tr>
<tr>
<td>a) A participative approach may be used</td>
<td></td>
</tr>
<tr>
<td>1) Daily or station routine</td>
<td>What are some examples of when this level of discipline is required?</td>
</tr>
<tr>
<td>2) &quot;Clean the day room&quot;</td>
<td></td>
</tr>
<tr>
<td>3) &quot;Wash and fuel the BC's vehicle&quot;</td>
<td></td>
</tr>
<tr>
<td>E. Discipline is best accomplished by adhering to the chain of command</td>
<td></td>
</tr>
<tr>
<td>within a manageable span of control</td>
<td></td>
</tr>
<tr>
<td>1. Chain of command</td>
<td></td>
</tr>
<tr>
<td>a) The formal path of communication within the organization</td>
<td></td>
</tr>
<tr>
<td>b) Each individual should answer to only one supervisor</td>
<td></td>
</tr>
<tr>
<td>2. Span of control</td>
<td>What is chain of control?</td>
</tr>
<tr>
<td>a) One person can effectively supervise a certain number of personnel</td>
<td></td>
</tr>
<tr>
<td>b) In the Incident Command System, a manageable span of control is considered to be 3-5 personnel</td>
<td>What is span of control?</td>
</tr>
</tbody>
</table>
## II. DEDICATION TO THE MISSION

What does this phrase mean?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Fire departments provide emergency service 24-hours a day, 365 days a year</td>
<td></td>
</tr>
<tr>
<td>B. Fire fighters are responsible to provide this service</td>
<td></td>
</tr>
<tr>
<td>C. Orders and requests must be fulfilled by all members in order to mitigate hazardous conditions and provide life saving measures</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

By entering the fire service, you have become part of a paramilitary organization that requires discipline and dedication to duty in order to accomplish its mission. During emergency operations, orders such as "Evacuate," "Get off the roof," and "Stay up wind" need to be followed without question. Lives could be lost without the discipline to follow orders and the chain of command.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FIRE FIGHTER SAFETY AND PHYSICAL FITNESS

TIME FRAME: 0:45

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the various aspects of fire fighter safety, and physical fitness by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Fighter Occupational Safety, IFSTA, Second Edition, Chapters 1 and 17

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Fire Fighter Safety and Survival" video, NFA (optional)

REFERENCES:
- Fire Fighter Occupational Safety, IFSTA, Second Edition

PREPARATION: Safety is an ever-present requirement encompassing every facet of fire service operations from the station house to the fireground. To ensure a long and productive career, a fire fighter should be aware of and practice all safety guideline.
NOTE: Show "Fire Fighter Safety and Survival" video, NFA (optional).

I. ACCIDENT CONDITIONS
   A. There are a set of conditions necessary for an accident to occur
   B. "The Accident Syndrome"
      1. Social environment
      2. Human factor
         a) Improper attitude
         b) Lack of knowledge or skill
         c) Physically unsuited
      3. Unsafe acts and conditions
      4. The accident
      5. The injury
   C. If the act/hazard is removed, the injury cannot occur
      1. Can be demonstrated as the "domino" effect
   D. Physical environment
      1. Weather
      2. Natural disasters
      3. Can make it impossible to follow all safe practice rules

II. FIRE FIGHTER MORTALITY
    A. Line of duty deaths by cause (IAFF 1998 survey)
       1. Heart attack: 36%
       2. Burns/asphyxiation: 27%
       3. Trauma: 20%
       4. Air crashes: 13%
5. Electrocution: 4%

B. During 1998, job related fatalities for fire fighters were more than four times the rate of the private sector (IAFF 1998 survey)

### III. INJURY

A. Visible
   1. Fractures
   2. Burns
   3. Lacerations
   4. Contusions
   5. Abrasions

B. Invisible
   1. Muscle sprains
   2. Strains
   3. Over exertion
   4. Breathing difficulty
   5. Electric shock
   6. Heart trouble
   7. Back pain

C. 98% of all injuries are the direct result of accidents

### IV. DISTRIBUTION OF LINE DUTY INJURIES BY ACTIVITY (IAFF 1998 SURVEY)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural fire suppression</td>
<td>42%</td>
</tr>
<tr>
<td>Fire station</td>
<td>18%</td>
</tr>
<tr>
<td>EMS</td>
<td>15%</td>
</tr>
<tr>
<td>Responding to and returning from alarms</td>
<td>7%</td>
</tr>
<tr>
<td>Training</td>
<td>6%</td>
</tr>
<tr>
<td>Physical fitness</td>
<td>5%</td>
</tr>
</tbody>
</table>

What are some "Invisible" injuries?
### PRESENTATION

| G. Nonstructural fire suppression: 5% |
| H. Hazardous materials: 1% |
| I. Technical rescue: 1% |
| J. Firefighter job related injury is over 4.5 times that of workers in private industry (US Bureau of Labor Statistics) |

#### V. ACCIDENTS

**A. Types**
1. Blows
2. Falls
3. Caught in, under, or between
4. Rubbed or abraded
5. Body reaction
6. Contact with
7. Public transportation
8. Motor vehicle

**B. Learn from accidents**
1. Investigate them
2. Corrective action taken

#### VI. UNSAFE ACTS AND CONDITIONS

| A. Taking an unsafe position or posture |
| B. Improper use of equipment, apparatus, and tools |
| C. Using unsafe equipment, apparatus, and tools |
| D. Failure to use personal protective equipment |
E. Operating without authority  
F. Inattention to footing or surroundings  
G. Operating or working at an unsafe speed  
H. Improper use of hands or body parts  
I. Failure to secure or warn  
J. Making safety device inoperative  
K. Horse play  

VII. RISK MANAGEMENT CONCEPTS  
A. Technical revision  
B. Instruction and appeal  
C. Personnel adjustment  
D. Discipline  

VIII. OVERVIEW OF SAFETY PREVENTION  
A. Physical fitness program  
B. Stress management  
   1. Critical stress debriefing  
C. Employee assistance programs  
D. Training  
E. Proper lifting techniques  
F. Personal protective equipment  
   1. Wildland  
   2. Structural  
   3. Breathing apparatus  
   4. Hazardous materials  
G. Personal alert safety systems  
H. Defensive driving  

IX. PHYSICAL FITNESS AND WELLNESS PROGRAMS  
A. Many departments have instituted mandatory physical fitness programs on a regular basis
B. 30 minutes to 2 hours per shift to stay physically fit  
C. Medical examinations prior to beginning program  
D. Meet established standards  
1. NFPA Standard #1500

**X. PHYSICAL CONDITION OF RECRUITS**

**A.** Usually in reasonably good physical condition

**B.** After probation, the tendency is to relax and not stay in shape or control weight

**C.** A number of departments have fitness requirements for all personnel

**XI. HEALTH PROBLEMS**

**A.** Smoking  
1. Cancer  
2. Lung disease  

**B.** Cardiovascular diseases  
1. Heart attack  
2. Stroke  
3. High blood pressure  

**C.** Plan for regular check ups  
1. Some departments require mandatory examinations as age increases  
2. Annual health screening  

**D.** Keep a record of your blood pressure, weight, and waist size

**XII. CARDIOVASCULAR + MUSCULOSKELETAL SYSTEM**

**A.** Used more that any other system of the body
### Cardiovascular

1. Aerobic exercise for at least 30 minutes
   - a) Running
   - b) Stationary bike
   - c) Stair step
   - d) Nordic track
   - e) Rowing
   - f) Any exercise that raises the heart rate to its maximum

### Musculoskeletal system

1. Exercise for at least 30 minutes
   - a) Push ups/sit ups
   - b) Weights
SUMMARY:

We perform in areas containing a great amount of safety hazards yet most accidents to fire personnel can be avoided by adhering to safety standards, understanding accident conditions, types of accidents, unsafe acts and conditions, risk management concepts, and basic safety prevention.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Fighter Occupational Safety, IFSTA, Second Edition, Chapters 1 and 17 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FIRE SERVICE LABOR ORGANIZATIONS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the fire service labor organizations and their contributions to the fire service by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Managing Fire Services, ICMA, Second Edition, Chapter 12

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Local memorandum of understanding and union publications

REFERENCES:
- California Code of Regulation, Section 4850, Health and Welfare Code
- IAFF Human Relations Brochures
- Local IAFF Human Relations Committees brochure
- Managing Fire Services, ICMA, Second Edition

PREPARATION: With the many inherent dangers of the fire service, labor organizations were formed for the protection of the fire fighter. The labor organization's contribution to the advancement of the fire service has been invaluable.
I. HISTORY OF FIRE SERVICE LABOR ORGANIZATIONS

A. California State Firefighters Association (CSFA)
   1. Established in 1922
   2. Objectives are to
      a) Encourage friendship, harmony, cooperation, and efficiency among fire fighters throughout California
      b) Improve public service
      c) Aid in the development and improvement of the fire service
   3. Largest fire service organization that represents volunteers
      a) Currently, over 6,000 volunteers are members

B. Labor unions
   1. California Professional Firefighters (CPF)
      a) Affiliated with the International Association of Fire Fighters (IAFF)
      b) Established in 1938
      c) Sponsored legislation establishing the heart, lung, and cancer presumption laws for fire fighters
      d) Established the California Fire Fighter Joint Apprenticeship Committee (CFFJAC) with the State Fire Marshal's Office
      e) 20,000 members

What are some labor groups within California?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>f) Developed and maintained the Personal Exposure Record System</td>
<td></td>
</tr>
<tr>
<td>1) Assists fire fighters in documenting toxic exposure</td>
<td></td>
</tr>
<tr>
<td>g) Maintains a health and safety program</td>
<td></td>
</tr>
<tr>
<td>1) Conducts research and education to improve safety for fire fighters</td>
<td></td>
</tr>
</tbody>
</table>

C. Unions (locals)
   1. Local fire fighter unions are affiliated with the IAFF
   2. May also affiliate with California Professional Firefighters
   3. Conduct collective bargaining for members

D. Associations
   1. Not unions
   2. Conduct collective bargaining for the members

E. Collective bargaining

1. Allowed by law per the government code
2. Wages, hours, and other terms and conditions of employment
3. Fair Labor Standards Act (FLSA)

II. MEDICAL LEGISLATION

A. Has benefited fire service personnel, including a consideration of protection against
   1. Heart, lung disorders
   2. Carcinogens
   3. Acquired Immune Deficiency Syndrome (AIDS)
   4. Communicable diseases
   5. Hernia

How is this provided for in California?
III. STATE DISABILITY AND FATALITY LEGISLATION
   A. Has benefited fire service personnel, which may include
      1. Comparison between safety and miscellaneous employees
      2. Employee benefits (Section 4850, California Health & Welfare Code)
      3. Worker's compensation survivor benefits
      4. Worker's compensation disability benefits

IV. FEDERAL DEATH BENEFITS
   A. For federal employed fire fighters and safety classifications
   B. PERS death benefits
   C. Private insurance

V. THE BENEFITS OF COOPERATION BETWEEN LABOR/MANAGEMENT
   A. The bargaining table
   B. Mediation of disputes
   C. Arbitration process
   D. Enhanced work environment

What are the benefits of cooperation between labor and management?
SUMMARY:
Legislation has benefited the fire service through medical protections, disability, retirement, and fatality benefits. Unions and the California Fire Fighters Joint Apprenticeship Committee have improved working conditions, safety, and training within the fire service.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Managing Fire Services, ICMA, Second Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: WORK SITE HEALTH AND SAFETY LEGISLATION

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the legislation relating to work site health and safety by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Fighter Occupational Safety, IFSTA, Second Edition, Chapters 1 and 7

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Barclays Official California Code of Regulations Title 8, West Group
- California Labor Code, Division 4
- Fire Fighter Occupational Safety, IFSTA, Second Edition
- Occupational Safety and Health in the Emergency Services, Delmar, 1999 Edition

PREPARATION: Federal and state governments have prescribed by law a number of programs designed specifically to protect the individual. Fire service personnel should be aware of them.
I. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)
   A. Legislation began at the federal level
   B. California followed by passing their own
      1. Designed after the federal
      2. California Code of Regulations Title 8 (Cal/OSHA)
   C. The law provides for safety in the workplace and is quite specific
   D. Specifies personal protective equipment

   1. Turnout clothing
      a) Coat
      b) Pants
      c) Boots
   2. Helmets
   3. Gloves
   4. SCBA
   E. Dictates the minimum number of personnel for certain jobs
   F. Job site safety procedures

II. WORKER'S COMPENSATION PROGRAM
   A. Assists the employee when injured on the job
      1. Temporarily
      2. Permanently
   B. Provides funds for training when appropriate
   C. The training can be for a complete new career field

What are some of the personal protective equipment OSHA mandates for the fire service?
D. Section 4850 of the Health and Welfare Code covers benefits available when injured

E. Division 4 of the California Labor Code covers worker’s compensation, survivor, and disability benefits

What illnesses or medical conditions are presumed to arise out of fire service employment?

### III. CALIFORNIA CODE PRESUMPTIONS

A. The definition of presumption is an illness or condition assumed to have resulted out of and in the course of employment as a fire fighter

B. The presumption is disputable, but unless controversy by other evidence the appeals board is bound to find in accordance with it

1. Section 3212 Heart, Hernia, and Pneumonia Presumption
2. Section 3212.1 Cancer Presumption
3. Section 3212.6 Tuberculosis Presumption
4. Section 3212.8 Hepatitis Presumption
5. Section 3212.9 Meningitis Presumption

### IV. GOVERNMENT CODE PRESUMPTIONS

A. Section 21720.7 Blood-Borne Infections Presumption

B. Must complete five years of service under PERS system prior to illness
SUMMARY:

Even fire service agencies must comply with occupational safety and health regulations at both the state and federal levels. Cal/OSHA has specific requirements for fire fighter safety such as appropriate personal protective equipment and two-in/two-out. Fire fighters must be familiar with these regulations, since they have a responsibility for their compliance. Worker's compensation programs are available to assist employees who are injured on the job. This also covers benefits for survivors, should the fire fighter die in the line of duty.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Fighter Occupational Safety, IFSTA, Second Edition, Chapters 1 and 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CALIFORNIA JOINT APPRENTICESHIP PROGRAM

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the components and purpose of the California Joint Apprenticeship Program by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Federated Fire Fighter's Joint Apprenticeship Program Handbook, Current Edition

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Federated Fire Fighter's Joint Apprenticeship Program Handbook, Current Edition

REFERENCES:
- Federated Fire Fighter's Joint Apprenticeship Program Handbook, Current Edition

PREPARATION: In order to provide an opportunity for personnel to reach the skill level of an entry-level fire fighter, an apprentice program has been devised and is used in some areas.
NOTE: Distribute the Federated Fire Fighter's Joint Apprenticeship Program Handbook.

I. CALIFORNIA JOINT APPRENTICESHIP PROGRAM
   
   A. Sponsored by the California State Fire Marshal and the Federated Fire Fighters of California, AFL-CIO
   B. Increases worker productivity and provides the versatility necessary to meet constantly changing conditions
   C. Standardizes on-the-job training and related technical instruction for a specified length of time and for a specific range of skills
   D. Provides a supply of skilled workers adequate to meet present and future employer needs
   E. Establishes a written agreement between the program sponsor and the apprentice at predetermined rates of training pay
   F. Attracts capable young men and women to careers in specified occupations
   G. Prospective apprentices must have
      1. The ability to comprehend and learn the skills and knowledge required to perform the demands of the occupation
      2. Be physically capable of performing the work required of the occupation

II. PROFESSIONAL FIRE FIGHTER STANDARDS
   
   A. Formulated in 1980 by California State Fire Marshal and Federated Fire Fighters
   B. Close relationship with Cooperative Personnel Services
   C. Standards developed for employment and uniform selection procedures for entry-level fire fighter
   D. Emphasis placed on statewide fire fighter apprenticeship program designed to bring more diversity, women, and minorities into the fire service
E. In 1981, a Fire Fighter Apprenticeship Program Selection Advisory Committee (JAC) was founded
   1. Members represented
      a) A variety of disciplines
      b) All size jurisdictions, state, and local agencies
   2. The JAC is composed of 14 members
      a) Seven represent labor and are appointed by the Federated Fire Fighters
      b) Seven represent management and are appointed by the California State Fire Marshal
   3. Developed job-related selection procedures and training standards

F. Training standards
   1. State standards developed through the State Fire Marshal and approved by the State Board of Fire Services
   2. National apprenticeship standards developed by International Association of Fire Chiefs and International Association of Fire Fighters, AFL-CIO

III. OUTREACH RECRUITMENT AND PREPARATION
   A. Designed to attract capable young men and women to careers in the fire service
   B. To assist in preparation for written, physical agility, and oral examinations inherent in the screening and selection process
C. Job-related instruments for the written, physical agility, and oral examination have been developed by Cooperative Personnel Services for testing and qualifying candidates

### IV. PREEMPLOYMENT ACADEMY TRAINING

A. Usually 10-12 week academy training conducted by local fire department

B. Successful candidates qualify for Fire Fighter I certification by the State Fire Marshal

### V. POST EMPLOYMENT DEVELOPMENT AND TRAINING

A. Following graduation, apprentices become probationary employees of the subscribing employer

B. Receive on-the-job training and 144 hours per year of supplemental related instruction

### VI. IMPLEMENTING LOCAL APPRENTICESHIP PROGRAM

A. CFF-JAC apprenticeship program can be implied in a local jurisdiction after a subscription agreement has been negotiated between employer and CFF-JAC

B. Agreement spells out specific responsibilities of both parties

### VII. APPRENTICESHIP TRAINING COSTS

A. An elaborate funding mechanism has been developed which trims the cost to the employer

B. Most funding is developed from various state agencies and CFF-JAC

C. Local costs are minimal to the subscribing employer
VIII. APPRENTICESHIP SELECTION PROCEDURES

A. Screening and selection instruments developed by Cooperative Personnel Services include
   1. Written examination
   2. Physical agility
   3. Oral interview
   4. Pre-employment medical
   5. Background check

IX. APPRENTICESHIP STANDARDS

A. Begin with the requirements for entry-level fire fighter and progress to the journeyperson level

B. Requirements include
   1. Training
   2. Education
   3. Experience
   4. Performance objective for each level of competency

X. DURATION OF APPRENTICESHIP PROGRAMS

A. 10-12 weeks academy training

B. 36 months on-the-job training
SUMMARY:

California Joint Apprenticeship Program is clearly designed to benefit both the employer and apprentice fire fighter. It allows the apprentice fire fighter the opportunity to gain experience and receive education to become marketable in the workforce and receive education to become marketable in the workforce as a fully trained fire fighter. The employer benefits through this program by being compensated monetarily for the training of the apprentice as well as augmenting the workforce with minimal expense.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Federated Fire Fighter's Joint Apprenticeship Program Handbook, Current Edition in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SEXUAL HARASSMENT RECOGNITION AND PREVENTION

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the laws pertaining to sexual harassment recognition and prevention by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Title VII Civil Rights Act of 1964, Government Code Section 12920, and the American Disabilities Act of 1992

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- American Disabilities Act of 1992
- Civil Rights Act of 1964 (amended in 1972)
- Government Code Section 12920

PREPARATION:
Why should we be so concerned about sexual harassment?
Recent surveys indicate that from 42%-90% of all working women report experiencing some form of sexual harassment in the workplace. High cost in terms of reduced work performance, absenteeism, and health costs are in the millions of dollars. One of the obvious differences between fire fighters today and those of a generation ago is gender. Departments that employ at least one female fire fighter are now the rule, rather than the exception. Title VII specifically prohibits gender-based discrimination, and the courts here ruled that on-the-job harassment is a form of discrimination.
What amendments to the U.S. Constitution protect your rights as an individual?

I. AMENDMENTS
   A. The Fifth Amendment
      1. Due process of the law
   B. The Thirteenth Amendment
      1. Abolishment of slavery
   C. The Fifteenth Amendment
      1. Citizens right to vote

What Act prohibits discrimination in employment practices?

II. TITLE VII OF THE CIVIL RIGHTS ACT OF 1964
    A. Amended in 1972
    B. Prohibits discrimination in all phases of the employment process because of
       1. Race
       2. Color
       3. Religion
       4. Sex
       5. National origin

What does the employment process mean as defined by Title VII?

III. THE EMPLOYMENT PROCESS
    A. Defined by the court to mean
       1. Recruitment
       2. Hiring
3. Placement  
4. Transfers  
5. Shift assignments  
6. Wages and benefits  
7. Education and training  
8. Terminations  
9. All other conditions of employment

What areas of the employment process would affect you in your daily work?

IV. EFFECTS OF POLICIES ON EMPLOYEES
   A. Promotional procedures  
   B. Transfers  
   C. Shift assignments  
   D. Wage and benefit negotiations  
   E. Placement of personnel  
   F. Promotion  
   G. Transfers

V. EQUAL EMPLOYMENT OPPORTUNITY COMMISSION (EEOC)
   A. Established to eliminate inequities found in the employment process  
   B. Strives for everyone to be treated equally and fairly

VI. AFFIRMATIVE ACTION
   A. Goal of affirmative action  
      1. To have a work force that reflects, at every job level, the sexual and ethnic composition of the surrounding area
VII. HOSTILE ENVIRONMENT

A. Harassment complaint must be
   1. Sexual in nature or based on gender and
   2. The conduct must be sufficiently pervasive to so alter the conditions of employment and create an abusive working environment

B. Environmental factors
   1. Nature of the unwelcome sexual acts or words
   2. The frequency of the offensive encounters
   3. The total number of days over which the sexually harassing conduct occurred
   4. The context in which the sexually harassing conduct occurred
   5. Whether the harasser was a supervisor or a co-worker
   6. Whether others perpetuated the harassment
   7. Whether the harassment was directed at more than one person

C. Behavior contributing to a sexually hostile environment
   1. Discussing sexual activities
   2. Telling off color jokes
   3. Unnecessary touching
   4. Commenting on physical attributes
   5. Displaying sexually suggestive pictures

What behaviors could be interpreted to contributing to a sexually hostile environment?

Can the harassment be nonverbal?
6. Using indecent gestures
7. Using demeaning terms such as "Babe"
8. Sabotaging the victims work
9. Using crude offensive language
10. Granting favors to those who participate in consensual sexual activity

D. Reasonable woman test
   1. Requires analysis by placing emphasis on the perspective of the victim
      a) Standard applies to men if victim is male
   2. Intent of the harasser is irrelevant
      a) Example: Just joking around

E. Offensive conduct

1. Conduct creating a hostile work environment does not have to be sexual in nature
2. Claims may be made based on threatening, demeaning, hostile, or offensive conduct by a supervisor in the workplace because of the gender of the victim
3. No sexual advances are required to claim sexual harassment under Title VII

F. Sexual harassment of males
   1. Men, as well as women, can be victims of sexual harassment

G. Sexual favoritism
   1. Employment opportunities or benefits granted because of an individual's submission to the employer's advances or favors

Do all hostile environment allegations need to be sexually based?
2. Employer's liability for favoritism depends on how frequently it occurs, whether it is coerced sexual conduct, and if it creates a hostile sexual environment

H. Homosexual harassment


2. Title VII bans harassment against individuals of the same sex because it is based upon the victim's gender

3. Harassing conduct need not be motivated by sexual desire

I. Forms of sexual harassment

<table>
<thead>
<tr>
<th>Physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Assault</td>
</tr>
<tr>
<td>b) Unwanted touching</td>
</tr>
<tr>
<td>c) Patting</td>
</tr>
<tr>
<td>d) Fondling</td>
</tr>
<tr>
<td>e) Blocking</td>
</tr>
<tr>
<td>f) Leaning</td>
</tr>
<tr>
<td>g) Exposing</td>
</tr>
<tr>
<td>h) Staring</td>
</tr>
<tr>
<td>i) Leering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Pornographic materials</td>
</tr>
</tbody>
</table>

What are some physical forms of sexual harassment?

What are some visual forms of sexual harassment?
b) Photos depicting either men or women as sexual objects (beefcake photos)

J. Unwelcome behavior
   1. Even if a person is not forced to do something against his or her will, the sexual behavior of the offender may have been "unwelcome"

   2. Person claiming harassment need not have directly rejected the sexual advances or chastised the harasser
      a) However, they must demonstrate by their conduct that the advances were unwelcome

K. Hostile environment nonsexual
   1. Anytime the workplace becomes uncomfortable for an individual because of the actions or treatment of other employees or an employee
   2. Hazing of new employees or employees which have been transferred to a new assignment
      a) "New kid on the block"
   3. Promotion in rank and still working with or supervising your former peers!
   4. Treatment of individuals in groups not accepted
      a) Example - (3 person Engine Company) "Two is company, 3 is a crowd."
   5. New person assigned to station is of different ethnic origin, race, or religion

How do you demonstrate that the offender's behavior is "unwelcome?"
L. Who is liable?
   1. Individuals
      a) Personal liability
   2. Managers and supervisors
      a) Liable for not taking actions to correct the situations of harassment
      b) Must be determined that the supervisor or manager knew or should have known about a particular situation
   3. Employer
      a) If a supervisor sexually harasses an employee, employer is liable even if employer did not know about problem
      b) If a nonemployee or a nonsupervisory employee sexually harasses another employee, employer is liable if they know or should have known about the problem and fail to remedy the problem

What are some preventative measures?

M. Prevention
   1. Employees need to be aware of how their behaviors may be perceived by others
   2. Would I want to be treated like that?
   3. Would I stand for someone treating a family member that way?
   4. Would you make the same comment or act in the same manner if your spouse/partner and the other person's spouse/partner were present?
   5. Would you want to read about your comments or conduct on the front page of the morning newspaper?
SUMMARY:

Sexual harassment is a form of sex discrimination. It is illegal under Title VII of the Civil Rights Act of 1964 and it is a concept that is well accepted in the courts. It is also widespread in the fire service, with 42%-90% of women having experienced some form of sexual harassment at work. This is consistent with data from women in other fields. Sexual harassment takes two forms, which in legal terms are called quid pro quo and sexually hostile environment harassment. Quid pro quo harassment involves demands for sexual favors in return for an employment-related benefit. Sexually hostile environment harassment involves behavior motivated by the target's gender that makes the workplace offensive, hostile, or intimidating. The courts generally have held that sexual harassment exists whenever an employee complains and the situation is not corrected.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CULTURAL DIVERSITY, PART 1

TIME FRAME: 2:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of cultural diversity in society and the fire service and acknowledge their differences by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Cultural Diversity for Fire and Emergency Services Instructors, FEMA, 1994 Edition, pages 11-22 and 39-60

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Cultural Diversity for Fire and Emergency Services Instructors, FEMA, 1994 Edition

PREPARATION:
As part of the fire service, you have your own identity as an individual, yet you work side-by-side with others who think, look, sound, and behave quite differently than you. However, your success depends upon good working relationships with everyone at the fire station. Not only are you and your crew interdependent among yourselves, you are also interdependent with others providing public services and contributing to the overall harmony of society. The public you serve is also diverse. Improving your ability to understand
your colleagues will not only make the job easier for you, but will help you in dealing with the public under sometimes stressful conditions.

You are about to journey into the world of individual perceptions. As you start, put aside any preconceived ideas you may have had about cultural diversity training. If you keep an open mind and an inquisitive attitude, you may come away with a new awareness that will support and enhance your work environment.
I. RECOGNIZING CULTURAL DIVERSITY

A. Predicted changes
   1. Workforce will grow slowly
   2. Become older, more females, more disadvantaged
   3. Include more people of color
   4. White males will be a smaller percentage
   5. Minorities will be a larger share of new entrants in the labor force

B. Action items to address changes
   1. Develop and conduct training programs to address diversity
   2. Develop orientation programs that emphasize cultural diversity
   3. Develop multilingual training programs and multilingual public education literature
   4. Establish policies that enhance diversity
   5. Be proactive, rather than reactive

II. DEFINING CULTURE

A. Definition of culture
   1. An integrated system of learned behavior patterns that are characteristic of any given society
   2. Includes everything that a group of people thinks, says, does, and makes
### B. Cultural characteristics

1. Composed of a group of people with commonalities
2. Not restricted to groups of people of different nationalities

**What are some commonalities?**

### C. Commonalities

1. Dialect
2. Religion
3. Age
4. Gender
5. Physical condition
6. National origin
7. Socio-economic status

### III. DEFINING DIVERSITY

#### A. Definition of diversity

1. The characteristics of people which make them distinct or different from other people
2. Differences are based on a number of factors

**What is meant by the word "diversity"?**

#### B. Differences

1. Based on a number of factors, but not limited to
   a) Race
   b) Skin color
   c) Gender

**What factors could be included in the differences?**
d) Age  
e) National origin  
f) Disability  
g) Religion  
h) Sexual orientation

IV. DIVERSITY IN THE UNITED STATES

NOTE: A Hispanic female, 65-years-old, teaching aerobics at a health club.

A. Trends in the United States workforce
   1. White males will be a minority in the workforce by the year 2080
   2. Hispanic and Asian females will experience the largest rate of growth in the labor force
      a) Between 1993-2080
   3. Fire services must evolve with changing workforce

B. Supporting cultural diversity
   1. Becoming a "change agent" to value diversity

   2. Support actions
      a) Perceive cultural differences objectively
      b) Support nondiscrimination legal requirements
      c) Use interpersonal skills to manage potentially disruptive situations
      d) Be a "valuing diversity" role model

Give an example of an individual with diverse characteristics.

What could be some other supporting actions?
V. CULTURAL BACKGROUNDS, PERCEPTIONS, AND BIASES

A. Cultural backgrounds

1. Made up of two distinct elements or characteristics
   a) First set of elements or characteristics includes
      1) Gender
      2) Ethnicity
      3) Physical abilities/challenges
      4) Race
      5) Age
      6) Sexual orientation
   b) Second set of elements or characteristics includes
      1) Religion
      2) Marital status
      3) Employment experience
      4) Geographical location
      5) Education

2. The second set of elements or characteristics can be obtained or changed during our lives

NOTE: List the cultural background elements of some of the students on the writing board. Include gender, ethnicity, physical abilities, race, age, and possibly sexual orientation. Review responses.
Which were the most influential in your development?

a) This is the beginning of cultural awareness

B. Perception
   1. Helps us to relate effectively to our world
   2. Must distinguish between information or facts on the one hand, and the conclusions we draw from those facts
   3. Run the risk of generating misconceptions about what we experience
   4. Subjective conclusions are more likely to influence the facts or information we receive

What will happen if we do not distinguish between facts and conclusions?

What is another term for misconception?

C. Bias
   1. One form of misconception
   2. A preference without basis in fact
   3. Influences the way we relate to others
   4. Everyone has biases about people and other parts of our life
   5. Be aware of them and how they form
   6. Strive to better biases in relation to the interactions with different people and with people who are different

Does everyone have biases?
SUMMARY:

There are many benefits to be received from learning to value differences. To name a few, a more cohesive workforce can be fostered, better preparation for serving our diverse public, greater problem solving ability by looking at things in a different way, and increased acceptance of self and others. Our world is not yet diversity-friendly, but we can make a difference. We can help by being aware of cultural backgrounds, understanding diversity, and not allowing perceptions and biases to form into misconceptions that are judgmental.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Cultural Diversity for Fire and Emergency Services Instructors, FEMA, 1994 Edition, Pages 11-22 and 39-60 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CULTURAL DIVERSITY, PART 2

TIME FRAME: 2:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of cultural diversity by completing the written test

Standard: With a minimum 80% accuracy according to the Diversity The Impact of Perceptions Student Workbook, CFF-JAC, 1994 Edition, Pages 20-71

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Cultural Diversity for Fire and Emergency Services Instructors, FEMA, 1994 Edition
- Diversity The Impact of Perceptions, CFF-JAC, 1994 Edition

PREPARATION:

With such a large variety of cultures in our country, there are inevitable clashes between these cultures. Through understanding the issues and reasons for these conflicts, we can gain better insight into multicultural diversity.

What does the word "multicultural" or "diversity" stir up in you? Do you welcome the term or find it foreboding? Multicultural training in the past focused on affirmative action or the subtle warnings that an undereducated, unskilled workforce filled
with women, minorities, and immigrants needing training were on the horizons. This earlier training emphasized the wrong things, reinforced stereotypes, and left some of us with a sense of wrongdoing and guilt. The changing workforce today challenges us for better training. Diversity training is not just a human relations exercise, but also an organizational philosophy with results orientation to assist us in making decisions and modifying behavior as necessary.
I. GOALS AND BENEFITS OF DIVERSITY TRAINING

A. Major objectives
   1. Promote the value of differences
   2. Promote human dignity and respect
   3. Promote social integrity and equal treatment

B. Benefits
   1. A more supportive working environment
   2. A more cohesive workforce
   3. Increased ability to work in diverse crews
   4. A better preparation for serving our diverse public
   5. Increased acceptance of self and others

C. Value of a culturally diverse workforce
   1. Broader range of talents and skills among employees
   2. A larger labor pool
   3. More satisfied productive workers
   4. Share and enjoy different customs and traditions
   5. Increase problem solving options
   6. Be better prepared for our increasingly diverse population

Are there any benefits to learning value differences?

What values are there in working in culturally diverse environments?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Becoming diversity friendly</td>
<td></td>
</tr>
<tr>
<td>1. The emergence and dominance of the computer is an example of resistance to change</td>
<td>Are people naturally resistant to change?</td>
</tr>
<tr>
<td>a) People philosophically embraced it, but avoided it at all costs</td>
<td></td>
</tr>
<tr>
<td>2. The same resistance holds true for diversity</td>
<td></td>
</tr>
<tr>
<td>3. Only when we understand differences do we appreciate their value</td>
<td></td>
</tr>
<tr>
<td>E. Diversity friendly</td>
<td></td>
</tr>
<tr>
<td>1. Don't judge, listen</td>
<td>What does it mean to be diversity friendly?</td>
</tr>
<tr>
<td>2. Respect other points of view</td>
<td></td>
</tr>
<tr>
<td>3. Include others who are different</td>
<td></td>
</tr>
<tr>
<td>4. Develop flexible behaviors</td>
<td></td>
</tr>
<tr>
<td>5. Treat all people fairly</td>
<td></td>
</tr>
<tr>
<td>6. Eliminate unequal privileges</td>
<td></td>
</tr>
<tr>
<td>7. Allow others to be themselves</td>
<td></td>
</tr>
</tbody>
</table>

II. ORGANIZATIONAL CONFLICT

A. Some groups maintain the philosophy that persons are either in the group or out of the group

1. Religious organizations
2. Ethnic communities
3. Status groups
4. Families and friends
5. Educational communities
6. Fraternity and sorority organizations
7. Gangs and mobs
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Gays and lesbians</td>
<td></td>
</tr>
<tr>
<td>9. Political organizations</td>
<td></td>
</tr>
<tr>
<td>10. Labor organizations</td>
<td></td>
</tr>
<tr>
<td><strong>B. Reference group theory notes that when groups come into contact with each other they begin to define and maintain group boundaries, rules, and parameters</strong></td>
<td><strong>How does conflict occur?</strong></td>
</tr>
<tr>
<td>1. Group perceives themselves in competition with one another</td>
<td></td>
</tr>
<tr>
<td>2. They perceive themselves superior to other groups</td>
<td></td>
</tr>
<tr>
<td>3. They view themselves as the in-group and others as the out-group</td>
<td></td>
</tr>
<tr>
<td>4. They hold on to certain values and perceptions</td>
<td></td>
</tr>
<tr>
<td>5. They reject people seen as nonmembers of their group</td>
<td></td>
</tr>
<tr>
<td>6. Competition over such things as jobs, positions in society, and power can be gender based</td>
<td><strong>How does gender fit under the reference group theory?</strong></td>
</tr>
<tr>
<td>7. Overcoming stereotyping and conforming to images of one's own sex</td>
<td></td>
</tr>
<tr>
<td><strong>C. Language conflict</strong></td>
<td></td>
</tr>
<tr>
<td>1. Signs and symbols are arbitrary</td>
<td><strong>Why would perceptions or conflicts result in language differences?</strong></td>
</tr>
</tbody>
</table>
1) In the Greek culture the body sign for "no" is a nod of the head up and down, "yes" is a shake of the head side to side
2. Meanings of words often vary from culture to culture
3. Body language (nonverbal communication) differs greatly in various cultures

### III. INTOLERANCE AND PREJUDGING

<table>
<thead>
<tr>
<th>Definition of prejudice</th>
<th>Positive sense of prejudice</th>
<th>Negative sense of prejudice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Literally means to pre-judge without sufficient knowledge or facts</td>
<td>1. It is a preference towards a group or individual members</td>
<td>1. It is an attitude or perception expressing unfavorable feelings or behaviors towards a group or individual</td>
</tr>
<tr>
<td>2. Not necessarily good or bad or right or wrong</td>
<td>3. Influences positive behavior</td>
<td>2. Not necessarily good or bad or right or wrong</td>
</tr>
<tr>
<td>3. Influences negative behavior</td>
<td></td>
<td>3. Influences negative behavior</td>
</tr>
</tbody>
</table>
## D. Principle of least effort

1. The mind filters information and avoids restructuring its categories unless it has to
2. This is considered resisting change naturally
3. Categories modify to varying degrees to only fit perceived reality better
4. Thinking in categories and stereotypes is natural and does not necessarily lead to prejudice and hostility

## E. Racism

1. Definition of racism
   a) The perception and attitude that one racial group is inherently superior to another

2. Results of racist attitudes and behaviors
   a) Exclusion
   b) Fear
   c) Ridicule
   d) Hate
   e) Violence
   f) Rejection

<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does everyone have the same prejudices?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is racism?</td>
</tr>
<tr>
<td>What can result when racist attitudes and perceptions are carried out into behaviors?</td>
</tr>
</tbody>
</table>
What is the critical factor in understanding racism?

F. The majority group has power over the minority group
   1. This power can be used as a barrier to the "out-group" from securing the same privileges and status
   2. Racism is evident in all groups and not an exclusive feature of the dominant group

IV. CHANGING BEHAVIORS AND ATTITUDES
A. Levels of change
   1. Knowledge
   2. Attitudes
   3. Individual behavior
   4. Group behavior

Which level is the most difficult to change?

B. A change in group behavior is the most difficult of all
   1. Afraid of losing something we care about
   2. The familiar is most comfortable and less threatening
   3. Changing the groups past perceptions attitude and behavior may mean a loss of the group
SUMMARY:

There is a need for the awareness of diversity. Awareness of the impact that our perceptions have on our feelings and behavior is the key to understanding and overcoming biases and prejudices that may trigger undesirable behavior. Diversity generates a lot of talk regarding, prejudices, stereotypes, various "ism's" -- racism, sexism, classism, ageism, etc. What "ism's" all have in common is that they categorize all members of a particular group as the same and promotes an "in-group" versus "out-group" mentality.

However, being aware of the benefits and value that diversity and multiculturalism can bring will prepare us to examine those negative perceptions when they are triggered and generate new experiences. If our life experiences have taught us these stereotypes then additional new life experiences and knowledge can teach us new patterns. If we recognize and acknowledge those sources of new information then we can more consciously decide what is valid and what should be discarded. All too often, when we run into an individual that does not meet the stereotype we have for certain groups, we say that person is an exception and keep right on thinking of other members of that group in the same old way. It is truly the enlightened individual that can examine a stereotype when a person does not fit it and say, "perhaps my stereotype and values need adjusting."

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Diversity The Impact of Perceptions Student Workbook, CFF-JAC, 1994 Edition, Pages 20-71 in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

TOPIC: TRAINING AND EDUCATION PROGRAMS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the training available at in-service, regional, state, and national locations by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 2

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION:

From the day you enter the fire service until the day you leave, you will be receiving ongoing continuous training and education. Training is our most valuable tool in keeping us safe and efficient in our jobs.
I. FIRE ACADEMY
   A. Upon acceptance into a department, training begins
   B. Most academies run 6-14 weeks
   C. Cover all basic fire fighting skills required
   D. Often academies are run through a community college
   E. Many fire departments have their own

II. ON-THE-JOB TRAINING (OJT)
   A. At the company level
   B. During probation
      1. Six months to two years
   C. Skills tested periodically
   D. Provides the department the opportunity to see if a candidate is suited for the fire service

III. COMMUNITY COLLEGE SYSTEM
   A. AA degree (60 college units) in fire science
   B. State certification tracks
      1. Fire Fighter
      2. Fire Apparatus Driver/Operator
      3. Fire Officer/Chief Officer/Fire Chief
      4. Fire Prevention Officer
      5. Fire Marshal
      6. Fire Instructor
      7. Fire Investigator
      8. Fire Mechanic
      9. Hazardous Materials Technician/Specialist
10. Public Education Officer
11. EMT-I

What are some specialized career tracks?

C. Specialized training
   1. Rescue Systems

IV. THE NATIONAL FIRE ACADEMY
   A. Resident programs, Emmitsburg, Maryland
   B. Field programs, delivered regionally

V. BACHELORS DEGREE PROGRAMS
   A. UC campuses, CSU campuses, private universities
      1. Public Administration
      2. Fire Administration
      3. Fire Protection Engineering
      4. Vocational education
   B. Programs scheduled to accommodate people currently working

VI. ADDITIONAL SPECIALIZED COURSES
   A. CSTI, Camp San Luis Obispo
   B. Local training courses
   C. Emergency Management Institute, NETC, Maryland
   D. Distance learning programs
SUMMARY:
As you grow into the fire service, education opportunities will increase. In order to keep up with changes and rapid advances, you must take advantage of ongoing learning to stay current with the industry. Training is available through local, state, and national fire academies, on-the-job, community colleges, and universities as well as private programs.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: WHY WE PLAN FOR MUTUAL AID

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-1.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of a mutual aid plan by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the California Fire Service and Rescue Emergency Mutual Aid Plan, OES Fire and Rescue, 1999 Edition

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials


PREPARATION: California communities have historically used mutual aid on incidents that exceed the capability of a single jurisdiction. Mutual aid is an integral part of California's emergency defense system. The increased potential for catastrophic losses in lives and property resulting from a disaster and the economic factors involved in providing adequate fire protection mandate an understanding of the functions of a mutual aid plan.
## I. MUTUAL AID

**A. Mutual aid** is an agreement in which two or more agencies agree to help each other when emergency conditions exist within the jurisdiction of a local agency that overwhelms the services, personnel, equipment and facilities of that agency.

**B. Two basic types of mutual aid**
1. Voluntary
2. Mandatory

**C. Voluntary mutual aid**
1. Mutual aid is considered voluntary when an agency enters into an agreement either verbally or in writing
2. Written agreements specify exactly what and how much of a department's resources may be committed during local and state emergencies
3. Local emergencies include conditions within the territorial limits of a local agency
4. A state of emergency includes any single city, county, or combination of both

**D. Mandatory mutual aid**
1. Mutual aid under a state of war emergency is mandatory
   a) A state of war emergency exists whenever this state or nation is attacked by an enemy or upon receipt of warning from federal government indicating that such an attack is probable

---

What does the term "mutual aid" mean?

What are two different types of mutual aid?

When is mutual aid mandatory?
### E. Emergencies that would necessitate mutual aid

1. Air pollution
2. Extraordinary fire
3. Wildland fires
4. Flooding
5. Storms
6. Earthquake
7. Hazardous materials releases
8. Terrorist events
9. Other large catastrophic emergencies

### F. Automatic aid

1. Automatic aid is when two or more agencies respond automatically across jurisdictional borders to render mutual assistance in combating emergencies by prior agreement

What are some examples of situations where automatic aid would apply?

2. Typical automatic aid would include emergency responses where the potential exists for extreme losses of life and property

3. An agreement where the mutual aid response is automatically part of a full alarm assignment

What are some examples of federal agencies that could provide mutual aid assistance?

### G. Federal agencies that you might use for mutual aid

1. Environmental Protection Agency
2. United States Coast Guard
3. Corps of Engineers
### What are some state agencies that could respond to a mutual aid request?

#### H. State agencies
1. California Highway Patrol
2. Health Department
3. State Fire Marshal
4. Department of Forestry and Fire Protection
5. Department of Transportation
6. National Guard
7. Office of Emergency Services
8. California Conservation Corps
9. Department of Corrections

### What are some local resources that could be requested to provide mutual aid assistance?

#### I. Local agencies
1. Interstate agencies
2. County agencies
3. Municipal agencies
4. Volunteer groups
### PRESENTATION

#### APPLICATION

What are some examples of industry and private organization resources that could be requested to provide mutual aid assistance?

<table>
<thead>
<tr>
<th>Industry and private organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chemical manufacturers</td>
</tr>
<tr>
<td>2. Chemical processors</td>
</tr>
<tr>
<td>3. Chemical users</td>
</tr>
<tr>
<td>4. Petroleum companies</td>
</tr>
<tr>
<td>5. Truckers</td>
</tr>
<tr>
<td>6. Other contractors as appropriate</td>
</tr>
</tbody>
</table>
SUMMARY:

The key to successful fire service emergency operation planning is knowledge. Numerous local resources may be accessed and used in an emergency by the fire department. Usually these resources are within close proximity and a "take it for granted" attitude is developed. This is both dangerous and embarrassing. All fire fighters must be aware and informed regarding potential resources that are available in the local community, county government, state and federal agencies, as well as those found in the private sector. A well-prepared plan, filed in the Chief's office is of little value if the personnel at the scene of the emergency are not knowledgeable in all aspects of the plan. It is an understanding of the plan that translates into effective on-the-scene action. Prior knowledge of available resources will ensure a rapid and efficient response to any type of emergency. Fire fighters must have access to the plan and know how to use it. Some instances requiring mutual aid include wildland fires, flooding, storms, etc.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read California Fire Service and Rescue Emergency Mutual Aid Plan, OES Fire and Rescue, 1999 Edition in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

TOPIC: CALIFORNIA FIRE SERVICE AND RESCUE EMERGENCY MUTUAL AID PLAN

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the key components of the California Fire Service and Rescue Emergency Mutual Aid Plan by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the California Fire Service and Rescue Emergency Mutual Aid Plan, OES Fire and Rescue, 1999 Edition

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- California Disaster and Civil Defense Master Mutual Aid Agreement
- California Fire Service and Rescue Emergency Mutual Aid Plan, OES Fire and Rescue, 1999 Edition

PREPARATION: California communities have historically relied upon mutual aid resources at incidents exceeding the capability of a single jurisdiction. Since 1950, the California Disaster and Civil Defense Master Mutual Aid Agreement and the Fire Service and Rescue Emergency Mutual Aid Plan have provided the basis for development of a statewide fire and rescue service mutual aid system. The complexity, frequency, and magnitude of calamitous events places an ever-increasing demand upon California's fire and rescue services for coordinated mutual aid operations. Future success of the mutual aid system is dependent upon the continued acceptance, participation, and
support of every element of the fire and rescue service.
I. ESTABLISHMENT

A. Established in four parts
   1. Basic Emergency Plan
   2. Peacetime Emergency Plan
   3. Compendium of Legislation and References
   4. War Emergency Plan

B. Parts 1, 2, and 4 provide the planning basis and concepts for the development of the State Fire and Rescue Emergency Plan
   1. More detailed operational plans supplement this document at the local area and regional levels
   2. California fire service conducts emergency operations planning at four levels
      a) Local
      b) Area
      c) Regional
      d) State

II. PREPARATION AND ADOPTION

A. Adopted in 1950 to provide
   1. Systematic mobilization, organization, and operation of fire and rescue resources
   2. Comprehensive and compatible plans for expedient mobilization and response of available fire and rescue resources
   3. Guidelines for recruiting and training auxiliary personnel

What type of mutual aid plans do we need?

What do you think these plans are designed to accomplish?
4. An annually updated inventory of fire and rescue personnel, apparatus, and equipment

5. A plan and communication facilities for the interchange and dissemination of data, directives, and information between local, state, and federal fire officials

Can any one agency handle every emergency alone?

B. Planning basis

1. No community has resources sufficient to cope with all emergencies for which potential exists

2. Emergency operations must be preplanned to insure efficient utilization of available resources

3. The need for a statewide system of mutual aid in which each local jurisdiction relies upon its own resources first

4. Signatories to the California Disaster and Civil Defense Master Mutual Aid Plan are State of California, all 58 counties, incorporated cities, and fire protection districts that

a) Create formal structure for provision of mutual aid

b) Provide that no party need to unreasonably deplete its resources in furnishing mutual aid

c) Provide that the responsible local official requiring mutual aid remains in charge of the incident

d) Require countywide and local mutual aid plans be developed

Does a mutual aid agreement mean that you will compromise your area’s response to help another area?
e) Provide for mutual aid extended under this agreement to be without reimbursement

5. The state is divided into six mutual aid regions

6. Public and private agencies, with support capability and/or emergency operation responsibilities, should be included in emergency operations plans

7. All management, command, operational, and support personnel should have input into emergency operations plans

8. Emergency operations plans must be continuously reviewed and revised

III. DEFINITIONS

A. Local emergency

1. A public calamity that is or is likely to go beyond the control of a local agency and requires the combined forces of other local agencies to combat

a) Examples

1) Air pollution
2) Extraordinary fire
3) Flood
4) Storm
5) Earthquake
6) Civil disturbance, etc.
B. State of emergency
   1. The duly proclaimed existence of conditions or extreme peril to the safety of persons and property beyond the control of any single county, city, and county or city, and requiring the combined forces of a mutual aid region or regions to combat

Does the "state of war" mean we operate this way anytime we are at war or just when we are invaded?

C. State of war emergency
   1. The condition that exists whenever the state or nation is attacked by an enemy or warning that such attack is probable or imminent

D. Disaster service worker
   1. Registered with a disaster council for the purpose of engaging in disaster service, without pay or other consideration

Can you think of some types of disaster service workers?

   a) Volunteer civil defense workers
   b) Public employees
   c) Unregistered persons impressed into service during a state of emergency by a person having authority to command the aid of citizens in the execution of his/her duties
   d) Does not include an active fire service member
## E. Mutual aid

1. An agreement in which two or more parties agree to furnish resources and facilities and to render services to each and every other party of the agreement to prevent and combat any type of disaster or emergency
   
a) Volunteer mutual aid is voluntary when an agreement is initiated either verbally or in writing

   b) Obligatory mutual aid is mutual aid under a state of war emergency
      1) Mutual aid under a state of emergency may also be obligatory

## F. Mutual aid region

1. A subdivision of the state’s fire and rescue service organizations, established to facilitate the coordination of mutual aid and other emergency operations within a geographical area of the state, consisting of two or more county operational areas

## G. Operational area

1. Normally consists of a county and all fire and rescue organizations within the county

## IV. POLICIES

A. The basic tenets of emergency planning are self-help and mutual aid

B. Emergency planning and preparation must be shared by all political subdivisions and industries as well as every individual citizen
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>C. The fire and rescue emergency plan provides a practical and flexible pattern for the orderly development and operation of day-to-day mutual aid</td>
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<tr>
<td>D. Emergency plans provide for integrating fire and rescue resources into mutual aid organizations for both fire and non-fire related disasters</td>
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<tr>
<td>E. Emergency preparedness plans must include provisions for liability and property damage insurance coverage on apparatus and equipment used beyond the territorial limits of the political subdivisions</td>
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<tr>
<td>F. Local mutual aid and emergency preparedness plans should reference the master mutual aid agreement</td>
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<tr>
<td>G. The state provides worker's compensation coverage for disaster service workers</td>
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<tr>
<td>H. A political subdivision (city, county, or fire district) will</td>
<td>Who is responsible for training personnel for mutual aid responses?</td>
</tr>
<tr>
<td>1. Reasonably exhaust local resources before calling for outside assistance</td>
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<tr>
<td>2. Render the maximum practical assistance under provisions of the master mutual aid agreement</td>
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<tr>
<td>3. Provide a current annual directory of all fire department personnel, apparatus and equipment to the area fire and rescue coordinator</td>
<td></td>
</tr>
<tr>
<td>4. Provide for receiving and disseminating information, data and directives</td>
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<tr>
<td>5. Conduct the necessary training to adequately perform their functions and responsibilities during emergencies</td>
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</table>
V. ASSUMPTIONS

A. Major fire rescue emergencies may reach such magnitude as to require mutual aid resources from adjacent local and state levels

B. Natural disasters may necessitate mobilization of fire and rescue resources for preservation and protection of life and property from threats other than fire

<table>
<thead>
<tr>
<th>Can you think of any recent natural disasters that occurred in California?</th>
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</thead>
<tbody>
<tr>
<td>1. San Francisco earthquake in 1906</td>
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<tr>
<td>2. Loma Prieta earthquake in 1989</td>
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<tr>
<td>3. Northridge earthquake in 1994</td>
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</table>

C. Sabotage is an enemy capability

D. Civil disturbances are likely to require mobilization of fire and rescue mutual aid resources

<table>
<thead>
<tr>
<th>What civil disturbances have used mutual aid in California?</th>
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<tbody>
<tr>
<td>1. Watts riots in 1965</td>
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<tr>
<td>2. Los Angeles riots in 1992</td>
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E. Political violence and terrorism may require mobilization of fire and rescue mutual aid resources

<table>
<thead>
<tr>
<th>Can you think of any national terrorist incidents?</th>
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</thead>
<tbody>
<tr>
<td>1. New York World Trade Center bombing in 1993</td>
</tr>
<tr>
<td>2. Oklahoma Federal Building bombing in 1995</td>
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</table>
F. Attack upon California or adjacent states could require utilization of all fire and rescue resources within the state and the exchange of resources between states.

G. Crisis relocation of a significant population from target areas may require mobilization of fire and rescue mutual aid resources to maintain fire and rescue capability consistent with population density in host areas and along evacuation routes.

VI. ORGANIZATION

A. The fire service includes all public and private entities furnishing fire protection within the state.

B. During a state of war, or when ordered by the governor, all such fire protection agencies become an organizational part of the Office of Emergency Services, Fire and Rescue Division.

1. Local fire official
   a) The chief of the local fire protection entity will serve as fire and rescue representative to their Operational Area Fire and Rescue Coordinator.

2. Operational Area Fire and Rescue Coordinators are selected by the fire chiefs of local fire and rescue entities within an operational area.

3. Regional Fire and Rescue Coordinators are selected for three year term by area fire and rescue coordinators within their respective regions.

4. State Fire and Rescue Coordinator is the Chief of the Fire and Rescue Division of the Office of Emergency Services and a staff member of the Director of the Office of Emergency Services.
5. Other state agencies
   a) The governor may assign to state agencies any activities concerned with the mitigation of the effects of an emergency

6. The Department of Forestry and Fire Protection (CDF) provides fire protection services to those forest and wildland areas designated as State Responsibility Areas (SRA), and to those areas and/or communities in which CDF has contractual agreements

7. State Fire Marshal Office assists OES Fire and Rescue Division by providing personnel to facilitate coordination of mutual aid fire and rescue operations

8. Department of Fish and Game assists other agencies in search and rescue missions

9. Military department, at the direction of the governor, assists civil authorities in protecting life and property from fires, and conducts support operations designed to minimize devastation by fire

VII. RESPONSIBILITIES

What responsibilities do you think the local fire chiefs will assume?

A. Local fire and rescue administrator
   1. Directs all action towards controlling fires, saving lives, safeguarding property, and assisting other emergency services in restoring normal conditions
   2. Develops an effective fire and rescue emergency plan
3. Makes maximum use of local resources prior to requesting assistance from neighboring jurisdictions

4. Conducts all mutual aid activities in accordance with established operational area procedures

5. During emergency operations, keeps the Operational Area Fire and Rescue Coordinator informed on all matters

6. Prepares personnel and equipment inventories and forwards copies to the Operational Area Fire and Rescue Coordinator annually

7. Maintains an up-to-date schedule for alerting fire and rescue personnel

8. Establishes emergency communications capabilities with the Operational Area Fire and Rescue Coordinator

9. Anticipates emergency needs for emergency fire equipment, spare parts, expendable supplies, and accessories, and ensures functional availability of these in locations convenient for ready use

10. Develops a radiological monitoring capability and comprehensive training program within his/her department

11. When requesting aid, will be in charge of all manpower and apparatus sent

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<tr>
<td>Do you know who your area coordinator is?</td>
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</table>

B. Operational Area Fire and Rescue Coordinator

1. Organizes and acts as chair of an Area Fire and Rescue Coordinating Committee
2. In cooperation with the Area Fire and Rescue Committee will
   a) Organize, staff, and equip area fire and rescue (f/r) dispatch centers
   b) Select and submit to the Regional Fire and Rescue Coordinator the names of individuals to serve as alternates at the dispatch centers
   c) Aid and encourage development of uniform fire and rescue emergency operational plans within the area
   d) Aid and encourage development of countywide fire and rescue service communication nets
   e) Maintain an up-to-date inventory system on fire and rescue apparatus and personnel within the area for use in dispatching
   f) Develop a dispatching procedure for all OES fire apparatus, rescue trucks, and communication vehicles assigned within the area
   g) Provide fire rescue coordination to the operational area civil defense official

3. During a state of war emergency, shall report to the area control center to serve on the staff of the Operational Area Civil Defense Director

What is the difference between a state of war and a state of emergency, as it pertains to the Operational Area Fire and Rescue Coordinator?
4. During a state of emergency, shall report to the area control center or other such location as directed by the Regional Fire Rescue Coordinator

5. Responsible for dispatching all OES and/or local fire rescue resources within the operational area on major mutual aid operations
   a) If the emergency is within his/her jurisdiction and overloads the communications facility, assigns dispatching of mutual aid equipment to an alternate fire rescue dispatch center
   b) Shall keep the Regional Fire Rescue Coordinator informed of all operations
   c) Evaluates requests for assistance, determines the local sources for such assistance, and initiates appropriate response thereof

6. Area Fire Rescue Coordinator is not responsible for any direct fire or other emergency operations except those that occur within the jurisdiction of his/her own department, agency, etc.

C. Regional Fire and Rescue Coordinator
   1. Organizes and acts as chair of a Regional Fire Rescue Coordinating Committee
   2. Is responsible for coordination and dispatch of regional mutual aid resources
   3. In cooperation with the Fire Rescue Coordinating Committee will
      a) Organize, staff, and equip a Regional Fire Rescue Dispatch Center
b) Submit to State Fire Rescue Coordinator the names of individuals to serve as alternates at the Regional Fire Rescue Dispatch Center

c) Aid and encourage development of uniform fire and rescue emergency plans within the region

d) Aid and encourage development of countywide fire and rescue service communications net

e) Maintain an up-to-date inventory of fire and rescue apparatus, equipment, and personnel within the region

4. During a state of war emergency, the Regional Fire and Rescue Coordinator shall report to the Regional Emergency Control Center as liaison to the Office of Emergency Services Regional Manager

5. During a state of emergency, the Regional Fire and Rescue Coordinator will report to the Regional Emergency Coordinating Committee

6. Is responsible for dispatching all OES and/or local fire and rescue resources within the region on major mutual aid operations

   a) If the emergency exists in his/her jurisdiction and overloads the communications facilities, assigns dispatching to an alternate Regional Fire and Rescue Dispatch Center

   b) Keeps the State Fire and Rescue Coordinator informed of all operations within the region

   c) Evaluates requests for assistance, determines regional resources, and initiates appropriate response
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<tr>
<td>7. Calls and conducts elections in his/her operational areas for Operational Area Fire and Rescue Coordinator</td>
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<td>8. Is not responsible for any direct fire or other emergency operations except those in his/her own department, agency, etc.</td>
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**D. The chief of the OES Fire and Rescue Division is the State Fire and Rescue Coordinator**

1. **OES Fire and Rescue Division**
   
a) Prepares, maintains, and distributes the basic state fire and rescue plan for coordinating statewide fire and rescue resources

b) Develops and maintains an Emergency Operations Plan and Standard Operating Procedure for the use and dispatch of OES personnel, apparatus, and other fire and rescue resources as necessary

c) Organizes, staffs, and equips the State Fire and Rescue Dispatch Center and alternate facilities

d) Monitors ongoing emergency situations, anticipates needs, prepares for use of inter-regional mutual aid resources, establishes priorities, and authorizes dispatch

e) Consults with and keeps the Director of OES informed on all matters pertaining to the fire and rescue services

f) Consults with and assists federal and other state agency representatives on all matters of mutual interest to the fire and rescue service

g) Coordinates fire and rescue emergency mutual aid operations throughout the state, both on and off-scene
PRESENTATION

h) Assists state and local agencies in using federal assistance programs available to them and keeps them informed of all new legislation effecting these programs

i) Coordinates the application and use of other state agency resources during a state of emergency or state of war emergency

j) Develops and provides training programs and materials for effective application and utilization of the California Fire Service and Rescue Emergency Mutual Aid Plan

k) Encourages development of training programs for specialized emergencies involving fire and rescue services

l) Calls for and conducts elections for Regional Fire and Rescue Coordinators
   1) Every 3 years or when a vacancy occurs

2. California Department of Forestry and Fire Protection
   a) Provides fire protection services to those forest and wildland areas for which the state is responsible
   b) Provides supervision for adult conservation camp inmates, Youth Authority wards, and conservation center corps in fire defense improvement work, fire fighting, and other emergency activity

APPLICATION

How often are elections held for the Regional Fire and Rescue Coordinator?

1) Every 3 years or when a vacancy occurs
c) Maintains a statewide VHF radio and microwave communications system throughout administrative districts and all counties in which CDF has fire protection responsibilities.

d) Has agreements with federal, state, and local jurisdictions providing for contract fire protection, assistance by hire, and/or mutual aid.

What are some of CDF's responsibilities for preparing for disasters?

e) CDF/OSFM assists by

1) Maintaining emergency operations plans and resource inventories of the departments' fire fighting equipment and personnel and making those available.

2) Working cooperatively with state, regional, and area fire coordinators to integrate CDF's resources into the state, regional, and local emergency plan.

3) Providing personnel and equipment to the OES Fire and Rescue Division.

4) Initiating requests to OES for federal fire suppression assistance and working directly with the appropriate federal agency to secure assistance.

5) Assists OES by providing personnel to facilitate coordination of mutual aid fire and rescue operations.

6) Cooperates with OES in training State Fire Marshal personnel for emergency operations.
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<tr>
<td>7) Assists OES and local jurisdictions in post-emergency damage surveys, building inspections, and advice on use and/or hazards of damaged facilities</td>
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<tr>
<td>3. California Conservation Corps (CCC)</td>
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<tr>
<td>a) Provides personnel and/or equipment for the prevention and suppression of fire</td>
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<tr>
<td>b) Search and rescue of lost or injured persons</td>
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<tr>
<td>c) Support of other emergency operations</td>
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<tr>
<td>4. California Highway Patrol (CHP)</td>
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<tr>
<td>a) Emergency highway traffic regulations and control</td>
<td>How do you think the CHP will assist?</td>
</tr>
<tr>
<td>b) Evacuation of residents/inhabitants</td>
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<tr>
<td>5. Department of Corrections (CDC)</td>
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<tr>
<td>a) Supplies inmate support in emergency operations</td>
<td>How do you think inmates can assist in emergencies?</td>
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<tr>
<td>b) Provides congregate care for displaced persons at departmental facilities</td>
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<tr>
<td>c) Prepares food for consumption in the disaster area</td>
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<tr>
<td>6. Military may be activated by the governor to provide any of the following support services</td>
<td></td>
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<tr>
<td>a) Air and transportation of authorized personnel, equipment, and supplies</td>
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<tr>
<td>b) Provisions of interim voice, telegraph, and teletype communications</td>
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</table>
c) Surface and aerial reconnaissance and photography

d) Mass feeding

e) Medical treatment and evacuation

f) Clearance of debris and rubble

g) Explosive ordinance disposal

h) Search and rescue

i) Emergency housing

j) Maintaining law and order

k) May respond directly to requests from CDF to aid in suppressing forest fires

7. Department of Youth Authority

a) Ward camp crews assist in emergency operations

b) Provides congregate care for displaced persons at department facilities

c) Prepares food for consumption in the disaster area

VIII. PROCEDURES

A. An incremental and progressive system of mobilization

B. Concept of providing local fire and rescue authority sufficient resources without extraordinary depletion of fire defense outside the area of disaster

C. Activation in ascending order

D. Local fire and rescue resources include resources available through automatic and/or day-to-day agreements with neighboring jurisdictions

E. Operations area fire and rescue resources are those that are made available to a participating agency through the approved and adopted area fire and rescue mutual aid plan
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<tr>
<td>F. Regional fire and rescue resources include all resources available to a participating agency through the approved and adopted regional fire and rescue mutual aid plan</td>
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<tr>
<td>G. Inter-regional fire and rescue mutual aid id mobilized through the OES Fire and Rescue Coordinator in the afflicted mutual aid region</td>
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<tr>
<td>H. Dispatch centers must be carefully selected and be adequately equipped for emergency operations</td>
</tr>
<tr>
<td>1. 24-hours a day operations</td>
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<tr>
<td>2. Have direct communications capabilities with all fire and rescue service agencies within their area of operations</td>
</tr>
<tr>
<td>3. Staffed with trained, competent personnel</td>
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<tr>
<td>4. Be equipped with maps, charts, records, and operational data as necessary to perform emergency operations</td>
</tr>
<tr>
<td>I. Training of emergency action personnel in specialized skills and techniques is essential if each level of fire and rescue services is to successfully discharge assigned emergency responsibilities</td>
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When do we begin planning for disasters?

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<tr>
<td>J. Planning – failure to plan assures failure</td>
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<tr>
<td>1. Pre-emergency</td>
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<td>2. Emergency</td>
</tr>
<tr>
<td>3. Post-emergency</td>
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**SUMMARY:**

Since 1950, the California Disaster and Civil Defense Master Mutual Aid Agreement and the California Fire Services and Rescue Emergency Mutual Aid Plan have provided the basis for development of the statewide fire and rescue mutual aid system. How local, state, and federal agencies interact during emergencies.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read California Fire Service and Rescue Emergency Mutual Aid Plan, OES Fire and Rescue, 1999 Edition in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE HAND TOOLS

TIME FRAME: 2:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service hand tools by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Forcible Entry, IFSTA, Seventh Edition

PREPARATION: A variety of hand tools have been adapted for fire suppression and rescue operations. When properly maintained and used, they are tremendously effective. Selection of the proper tool may make the difference in whether the job faced is successful. Efficiency in the use of a tool under emergency situations is directly affected by your familiarity with the tools' function.
I. HAND TOOL CATEGORIES
   A. Hand tools may be grouped in accordance to their primary application

   B. Four universal categories
      1. Cutting tools
      2. Prying tools
      3. Pushing/pulling tools
      4. Striking tools

   C. A fifth category includes wildland hand tools
      1. Scraping tools

II. CUTTING TOOLS
   A. Uses
      1. Primary use is forcible entry
      2. Cut or chop open a roof
      3. Pierce walls or ceilings
      4. Cut material away
      5. Cut around locking devices

   B. Axes
      1. Most common type of cutting tool

      2. Types
         a) Flat-head axe
            1) 6 or 8 pound head weights
            2) Wood or fiberglass handles
            3) Commonly used as a striking tool for forcible entry
### Characteristics And Functions Of Fire Service Hand Tools

**C. Handsaws**

1. **Great advantage is portability**
2. **Disadvantage**
   - a) Extremely slow
3. **Can be used in places where power equipment is not feasible**
4. **Should be chosen according to type of material to be cut**
5. **Most cut in one direction only**
6. **Uses**
   - a) Cut a specific type of material at a specific rate
7. **Types**
   - a) Carpenter's saw
      1) Rip cut or crosscut
      2) Used for cutting wood

---

**When paired with a prying tool**

**b) Pick-head axe**

1) 6 or 8 pound head weights
2) Handle sizes vary
   - Wood or fiberglass
3) More versatile to piercing and pulling
   - Pick end used to make a starting point to begin cutting or to pierce materials

---

What types of handsaw are used in the fire service?
b) Keyhole saw  
   1) Used for cutting keyholes in wood  

c) Hacksaw  
   1) Most common  
   2) Used for cutting metal  

d) Coping saw  
   1) Used for cutting small curves in wood  

D. Metal cutting devices  
1. Uses  
   a) Cut bolts, metal bars, pins, cables, hasps, chains, wires, and some padlock shackles  

2. Types  
   a) Bolt cutter  
      1) Variety of sizes  
      2) Most common is 36 inches  
      • Will cut steel up to $\frac{3}{8}$ inches thick  
      3) High-security chains, hasps, and padlock shackles cannot be cut with bolt cutters  
      • May have to use a torch  

III. PRYING TOOLS  
A. Use the basic principle of a lever to provide a mechanical advantage  
   1. Can generate more force on an object with the tool than without it  

B. Must select the proper tool  

C. Bit part must have a long, narrow taper  
   1. For entering into narrow spaces to start or widen openings
D. Uses
   1. Break locks
   2. Open doors
   3. Force windows
   4. Pry up objects
   5. Spread apart a door from its jamb

What are some tools used for prying?

E. Types
   1. Claw tool
   2. Crowbar
   3. Flat bar
   4. Halligan-type bar
   5. Hux bar
   6. Kelly tool
   7. Pry axe
   8. Pry (pinch) bar

F. Tool names may be different from department to department

IV. PUSHING/PULLING TOOLS
   A. Provide a reach advantage when performing certain tasks
      1. Stay out of the way of falling glass when used to break a window
   B. Available in various styles and lengths
   C. Should not be depended upon for leverage
   D. Come in lengths from 6 feet to 16 feet
### E. Uses

1. Forcible entry
   a) Break glass, gypsum board, and sheetrock
   b) Open up concealed spaces, walls, and ceilings
2. Vent windows
3. Pull up roof boards or other building materials
4. Hoisting tools

### F. Types

1. Standard pike pole
2. Clemens hook
3. Drywall hook
4. Multipurpose hook
5. Plaster hook
6. Roofman’s hook
7. San Francisco hook

### V. STRIKING TOOLS

A. Basic hand tool
B. Consisting of a weight head and a handle
   1. Wood or fiberglass handles
C. Uses
1. Deliver impact force on an object
2. Drive another tool

D. Types
1. Flat-head axe
   a) Used to drive the Halligan tool
   b) Together they form the "irons"
      1) The most important and useful of all forcible entry tools
2. Sledgehammer/maul
   a) 8-16 pounds
      1) 10-pound most common
   b) Can also be combined with the Halligan tool to form the "irons"
3. Battering ram
   a) Used by two or more rescuers to break through a door or wall
      1) Swinging motion
   b) Round end for battering
   c) Forked end for breaking and penetrating
4. Hammer
5. Lock breaker
6. Mallet
7. Pick
8. Punch and chisel

VI. LOCK-ENTRY TOOLS
A. Many of these have been developed by fire fighters after years of experimentation
B. Uses
1. Pull lock cylinders
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<tr>
<td>2. Break heavy-duty padlocks</td>
<td>What are some tools designed to open doors with little or no damage to the door?</td>
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<tr>
<td>3. Pull out lock cylinder and expose mechanism</td>
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<tr>
<td><strong>C. Types with doors and locks</strong></td>
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</tr>
<tr>
<td>1. K tool and lock puller</td>
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<tr>
<td>2. Pick and key tool</td>
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<tr>
<td>3. A tool</td>
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<td>4. J tool</td>
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<tr>
<td>5. Bam bam or dent puller</td>
<td></td>
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<td>6. Vise grip pliers</td>
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<tr>
<td>7. Channel lock pliers</td>
<td></td>
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<td>8. REX tool</td>
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<tr>
<td>9. Duck bill lock breaker</td>
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<td><strong>D. Types used with vehicles</strong></td>
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<tr>
<td>1. Slim jim</td>
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<td>2. Center punch</td>
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<tr>
<td>3. Wonder tool</td>
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**VII. SAFETY CONSIDERATIONS**

A. Can be extremely dangerous if misused or used carelessly

B. Read and follow manufacturer's guidelines as well as the department's Standard Operating Procedures (SOPs)
What are some safety precautions you should follow?

C. Always wear appropriate personal protective equipment (PPE)

D. Do not attempt to cut material other than that for which a blade or tool was designed

E. Ensure tools are in proper working condition

F. Never attempt to use tools alone that require two or more fire fighters

G. Operate with regard to safety for others in the immediate work area

What type of obstructions might you expect around the fire or rescue scene?

H. Watch for obstructions
   1. Bystanders
   2. Overhead
   3. Anything within arc of swing

I. Concentrate on impact area
   1. Prevent ricochet or glancing blow
   2. Avoid rocks and other hard objects
   3. Avoid hazards
      a) Beehives
      b) Electrical wires
      c) Barbed wires

J. Secure each tool when done using
   1. Prevent injury to self and others

K. Store tools in an easily accessible area
L. Choose the proper tool for the job

VIII. CARRYING HAND TOOLS

A. Cutting tools
   1. Axes
      a) Carry blade away from the body
      b) Pick head covered
      c) Never carry over/on the shoulder

B. Prying tools
   1. Sharp or pointed edges away from the body
   2. Covered if possible
   3. Tools with multiple surfaces may require additional safety precautions

C. Pushing/pulling tools
   1. While on a fire scene
      a) Tool head down
      b) Close to the ground
      c) Ahead of the body when outside the structure

   2. While in a structure
      a) Tool head upright
      b) Close to the body

What might be the most important safety rule for hand tools?

How are pike poles and hooks carried on a fire scene?

How are pike poles and hooks carried while in a structure?
D. Striking tools
   1. Tool head close to the ground
   2. Maintain a firm grip
      a) These tools are heavy and may slip
SUMMARY:

Hand tools are often the best choice for the job or assignment. Fire fighters must be able to identify the proper application and safety concerns related to each hand tool available to them.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: INSPECTION AND MAINTENANCE OF FIRE SERVICE HAND TOOLS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance procedures of fire service hand tools by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Examples of fire service hand tools

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Safe use of fire service hand tools requires that they are regularly inspected and well maintained. Tool failure on the fireground may have harsh consequences, including severe injury or death.
I. OVERVIEW

A. Proper tool maintenance is the first step to tool safety
   1. Will function as designed if properly maintained

B. Tools must be inspected and cleaned on a regular basis

C. Check for worn and damaged parts

D. Always read manufacturers’ recommended maintenance guidelines

E. Tools should be removed from service or repaired when defects are found

II. WOOD HANDLES

A. Inspection
   1. Cracks, blisters, burns, roughness, or splinters
   2. Tightness of the tool head
      a) Head ½ inch or less from shoulder
      b) Head 90° to handle axis

B. Maintenance
   1. Sand with fine grain paper
      a) Prevents roughness and warping
   2. Apply a thin coat of boiled linseed oil
      a) Oiled rags may spontaneously ignite
      b) Do not store used rags in closed areas

What do you look for when inspecting wood handles?

What hazard is associated with linseed oil?

What do you look for when inspecting wood handles?

What hazard is associated with linseed oil?
Should wood handles be painted?

3. Do not paint or varnish
   a) May disguise wear or damage

4. Limit tool marking
   a) A small stripe to identify station, etc. is permissible, but it is better to use colored electrical tape

5. Clean after every use
   a) Wash the handle with mild detergent, rinse, and wipe dry
   b) Do not soak
      1) Wood will swell

III. CUTTING EDGES

What do you look for when inspecting cutting edges?

A. Inspection
   1. Nicks, tears, or metal spurs
   2. Rust

B. Maintenance
   1. Remove any rust or dirt with steel wool or emery cloth
   2. Sharpen edges and remove burrs as needed
      a) Always wear appropriate PPE
      b) Use a metal file to maintain the proper profile and cutting edge
      c) Do not grind
         1) It will destroy temper and become soft
d) Do not keep too sharp
   1) May cause it to chip when used

3. Do not paint metal parts
   a) May disguise damage

4. Coat head with a small amount of linseed or machine oil

**NOTE:** Repeat hazard associated with linseed oil.

5. Replace cutting edges when required

6. Clean after each use

**IV. PAINTED AND PLATED SURFACES**

A. Inspection
   1. Damage

B. Maintenance
   1. Clean after each use
      a) Wipe clean
      b) Wash with mild detergent, rinse, and wipe dry

**V. UNPROTECTED METAL SURFACES**

A. Inspection
   1. Spurs, burrs, or sharp edges
   2. Rust

B. Maintenance
   1. File when needed
   2. Oil lightly
      a) Light machine oil works best
      b) Avoid metal protectant that contains 1,1,1-trichloroethane
         1) May cause material of the handle to decompose
3. Avoid painting  
   a) Hides defects

VI. FIBERGLASS AND COMPOSITE CARBON FIBER HANDLES
   A. Inspection  
      1. Cracks and nicks  
      2. Tightness of the tool head  
      3. Metal parts are secure
   B. Maintenance  
      1. Clean after each use  
         a) Wash the handle with mild detergent, rinse, and wipe dry
SUMMARY:

Many of a fire fighter's fire line duties involve the use of hand tools. It is imperative that fire fighters have knowledge of these tools, their inspection, and maintenance.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE POWER TOOLS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service power tools by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: A variety of power tools have been adapted for the fire service. When properly maintained and used, they are tremendously effective. Selection of the proper tool may make the difference in whether the job faced is successful. Efficiency in the use of a tool under emergency situations is directly affected by your familiarity with the tools' function.
I. POWER TOOL CATEGORIES

A. Power tools may be grouped in accordance to their primary application.

1. Cutting tools
2. Prying tools

**NOTE:** Hydraulic prying tools are used primarily for vehicle extrication. Lesson plans for hydraulic tools can be found in Unit S.

II. CUTTING TOOLS

A. Uses

1. Make fast, efficient cuts in a variety of materials

B. Rotary (circular) saw

1. Most often powered by a two-cycle gasoline engine
   a) Maintain full rpms to avoid having the saw bind in the material being cut

2. Changeable blades
   a) Carbide tipped
      1) Cut a variety of natural materials
      2) Can also cut light-gauge metal
      3) Teeth
         • Large-toothed blades for quick rough cuts
         • Fine teeth for a more precise cut
### Characteristics And Functions Of Fire Service Power Tools

#### C. Reciprocating saw

1. Very powerful, versatile, and highly controllable
2. Variety of blades for cutting different materials
3. Has a short straight blade that moves forward and backward
   - a) Similar action to a handsaw
4. Drawback
   - a) Most require electricity
   - b) Cordless, battery-powered saws are becoming available

#### D. Chain saw

1. Used primarily for ventilation purposes
2. May also be used to cut through wood siding, wood frame walls, certain doors, light-gauge metal, and to clear trees and limbs
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E. Ventilation saw</strong></td>
<td></td>
</tr>
<tr>
<td>1. Relative newcomer to the fire service</td>
<td></td>
</tr>
<tr>
<td>2. Sometimes more efficient than the rotary saw</td>
<td></td>
</tr>
<tr>
<td>3. Powerful enough to penetrate dense material, but lightweight for easy handling</td>
<td></td>
</tr>
<tr>
<td>4. Used for cutting through natural materials</td>
<td></td>
</tr>
<tr>
<td>a) No metal</td>
<td></td>
</tr>
<tr>
<td><strong>F. Cutting torch</strong></td>
<td>What is a cutting torch?</td>
</tr>
<tr>
<td>1. A versatile cutting tool to quickly gain entry through metal barriers</td>
<td></td>
</tr>
<tr>
<td>2. NFPA Standard #1901 recommends each truck company have a thermal cutting device</td>
<td></td>
</tr>
<tr>
<td>3. The torch preheats metal to ignition temperature, then the injection of oxygen causes the metal to burn</td>
<td></td>
</tr>
<tr>
<td>a) Actually burns the metal in an oxygen enriched atmosphere</td>
<td></td>
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<tr>
<td>4. Components</td>
<td></td>
</tr>
<tr>
<td>a) Regulator</td>
<td></td>
</tr>
<tr>
<td>b) Acetylene and oxygen cylinders</td>
<td></td>
</tr>
<tr>
<td>c) Cutting torch and hose</td>
<td></td>
</tr>
<tr>
<td>d) Strike lighter</td>
<td></td>
</tr>
<tr>
<td>5. Used to remove bolt heads</td>
<td></td>
</tr>
<tr>
<td><strong>G. Exothermic torch</strong></td>
<td></td>
</tr>
<tr>
<td>1. Similar to a cutting torch</td>
<td></td>
</tr>
<tr>
<td>2. Quicker cutting than cutting torch</td>
<td></td>
</tr>
<tr>
<td>3. Leaves jagged edges</td>
<td></td>
</tr>
</tbody>
</table>
4. Cuts at 8,000°F
   a) Does not transfer as much heat as an acetylene/oxygen torch
   b) Oxygen bottle and 220V arc

III. SAFETY CONSIDERATIONS

NOTE: Safety considerations listed for hand tools apply to power tools as well.

A. Saws
   1. Ensure angle of cut is not toward your body
   2. Do not use any power saw when working in a flammable atmosphere
   3. Be aware of hidden hazards
      a) Electrical wires
      b) Gas lines
      c) Water lines
   4. Do not put hands or arms inside the arms or blades of an operating tool
   5. Maintain your balance
   6. Ensure no victims or rescuers are in the way when cutting
   7. Use caution when cutting hardened steel
      a) Blades may chip and/or break

B. Cutting torches

Should we take extreme safety precautions when working in a confined space?

1. Acetylene has a wide explosive range, so that accumulation of this gas in a confined space could result in a violent explosion
2. Anyone using a torch should properly use welder's gloves
3. A second person standby to watch for fires

4. Fire departments require businesses operating cutting torches and cutting equipment to have portable fire extinguishers
   a) Do not be negligent
   b) Have an extinguisher with you while cutting

C. Choose the proper tool for the job

IV. CARRYING POWER TOOLS
   A. Never carry a power tool that is running
      1. Take the tool to the area where the work will be performed and start it there
   B. Never carry tools on your shoulder
   C. Use common sense
   D. Carry blade down and away from body
SUMMARY:

Understanding the importance of safety when power tools are involved is of vital importance to fireground operations as well as to routine training. If safety is overlooked, the potential for injury or even death is tremendously magnified. It is critical that the safe work concepts are instilled in fire fighters early in their development.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: INSPECTION AND MAINTENANCE OF FIRE SERVICE POWER TOOLS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance procedures of fire service power tools by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Manufacturer's literature
- The Rescue Company, Downey, 1992 Edition
- Tools of the Trade, Fritz, 1997 Edition

PREPARATION:
Emergency operations involve a variety of power tools. Regular inspection and maintenance is essential to safe and efficient operations. The success of emergency services being provided is directly proportional to the constant state of readiness of emergency fire service equipment.
I. OVERVIEW
   A. Proper tool maintenance is the first step to tool safety
   B. Tools must be inspected and cleaned on a regular basis
   C. Check for worn and damaged parts
   D. Always read manufacturers' recommended maintenance guidelines
   E. Tools should be removed from service or repaired when defects are found

II. GASOLINE POWERED
   A. Inspection
      1. Daily
         a) Check fluid levels
            1) Fresh fuel
               • Fuel mixture may deteriorate over time
            2) Lubrication reservoirs full
         b) Check for leaks
         c) Check for rust
         d) Check for broken or missing parts

      2. Weekly
         a) Start engine and allow to warm up
         b) Check filters
         c) Check fluid reservoirs
         d) Check spark arrester, if applicable

What do you check on a weekly basis?
What steps are taken before restoring a power tool to the apparatus?

B. Maintenance
   1. After each use
      a) Replenish fluid reservoirs
      b) Clean/replace air filter
      c) Clean/replace spark plugs
      d) Remove all debris dirt and oil from all surfaces
   2. Routine
      a) Clean all surfaces
      b) Replenish fluid reservoirs
      c) Change fluid as needed

III. ELECTRIC POWERED
   A. Weekly
      1. Inspect cords and plugs for damage
      2. Run equipment to check operation
         a) Smoothness, if applicable
         b) Absence of an ozone smell
            1) Arcing electrical
         c) Not receiving an electrical shock when operating within manufacturer's specifications
         d) Starting and stopping according to manufacturer's specifications
   B. After each use
      1. Inspect cords and plugs for damage
   C. Maintenance
      1. Clean thoroughly
D. Grounding of some electrical equipment may be required if generator is not protected by "ground fault indicator" (GFI)

IV. SAW BLADES AND CUTTING EDGES

A. Inspection
   1. Check for damage and defects
      a) Nicks
      b) Burrs
      c) Cracks
      d) Rust
      e) Pits
      f) Chips
      g) Sharpness
      h) Excessive wear
   2. Check alignment and tension
   3. Inspect chains and pulleys
   4. Check for evidence of overloading or other abuse

B. Maintenance
   1. Clean
   2. Adjust chains and pulleys as needed
   3. Sharpen cutting edges as needed
SUMMARY:

Every fire fighter should have the knowledge required to inspect and maintain the power tools used by their departments. These tools may be powered by gasoline or electricity; but all are essential to fireground and emergency functions and must be kept in good working order.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:


**TOPIC:** RECORD MANAGEMENT SYSTEMS FOR HAND AND POWER TOOLS

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.3

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the concepts of record management systems for hand and power tools by completing the written test

*Standard:* With a minimum 80% accuracy according to the information contained in *The Rescue Company*, Ray Downey, First Edition, Chapter 6

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *The Rescue Company*, Ray Downey, First Edition

**PREPARATION:**

Hand and power tools are an important part of a fire fighter's daily routine. It is extremely important that these tools' inspection and maintenance records be accurately maintained.
I. RECORD MANAGEMENT SYSTEM

A. Maintenance checks
   1. Nonscheduled maintenance checks
      a) After each use
   2. Scheduled maintenance checks
      a) Daily
      b) Weekly
      c) Monthly
      d) Annually

B. Recording system
   1. Informal
      a) After each use
   2. Formal
      a) Monthly/annually
         1) Kept in a computer-generated database
         2) Hard copy kept with the tool
      b) Pass down/shift notation journal
      c) Manufacturer's guidelines, recommendations, and specifications are kept with the formal record

C. Inventory control system
   1. Compartment number system
      a) Spreads workload throughout the workforce
      b) Allows all personnel to be familiar with the tools and equipment
   2. Grouping system
      a) Allows the fire fighters to test all similar equipment and tools together
**SUMMARY:**

Effective fireground operations rely on tools and equipment operating efficiently. Proper tool and equipment maintenance and records keeping is essential.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *The Rescue Company*, Ray Downey, First Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
HOW TO OPERATE A CHAIN SAW

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A chain saw, chain saw chaps, 4"x4"x8' post or a 6-8-inch diameter log, set of saw horses with braces to stop the post or log from rolling or a set of log cradles, and appropriate personal protective equipment

Behavior: The student will demonstrate how to operate a chain saw while wearing appropriate personal protective equipment

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Chain saw
- Chain saw chaps
- One 4"x4"x8' post or a 6-8-inch diameter log
- Set of saw horses with braces to stop the 4"x4" from rolling or a set of log cradles
- Appropriate personal protective equipment

REFERENCES:

- Forcible Entry, IFSTA, Seventh Edition, Chapter 2
- Manufacturer’s recommendations

PREPARATION:

Chain saws in the fire service have become an integral part of the job today. They are used in line construction, ventilation, and heavy rescue applications. The ability to safely and competently use a chain saw could make the difference between a successful operation, or an operation that fails and is prone to serious safety risks.
## Operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Push chain brake lever</td>
<td>1a. Forward</td>
</tr>
<tr>
<td></td>
<td>b. Engaging brake</td>
</tr>
<tr>
<td>2. Place saw</td>
<td>2a. On firm, level ground</td>
</tr>
<tr>
<td></td>
<td>b. Clear of bystanders</td>
</tr>
<tr>
<td>3. Place foot</td>
<td>3a. Into chain saw handle</td>
</tr>
<tr>
<td></td>
<td>b. Toe of boot through handle opening</td>
</tr>
<tr>
<td></td>
<td>c. Controlling chain saw</td>
</tr>
<tr>
<td>4. Grasp handle bar</td>
<td>4a. Nonworking hand</td>
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<td></td>
<td>b. Firmly</td>
</tr>
<tr>
<td></td>
<td>c. Thumb around bar</td>
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<tr>
<td>5. Flip stop switch</td>
<td>5a. With working hand</td>
</tr>
<tr>
<td></td>
<td>b. To &quot;On&quot; position</td>
</tr>
<tr>
<td>6. Close choke</td>
<td></td>
</tr>
<tr>
<td>7. Set throttle latch</td>
<td>7a. To &quot;On&quot; position</td>
</tr>
<tr>
<td>8. Grasp starter rope handle</td>
<td>8a. With working hand</td>
</tr>
<tr>
<td>9. Pull up</td>
<td>9a. On starter rope</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Until starter mechanism engages</td>
</tr>
<tr>
<td>10. Pull up</td>
<td>10a. On starter rope</td>
</tr>
<tr>
<td></td>
<td>b. Short, sharp pull</td>
</tr>
<tr>
<td>11. Hold starter handle</td>
<td>11a. As the rope retracts</td>
</tr>
<tr>
<td></td>
<td>b. Until engine fires (bubbles)</td>
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<tr>
<td></td>
<td>c. Never drop start a saw</td>
</tr>
<tr>
<td>12. Open choke</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>13. Pull up</td>
<td>13a. On starter rope</td>
</tr>
<tr>
<td></td>
<td>b. Short, sharp pull</td>
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<tr>
<td></td>
<td>c. Until engine starts</td>
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<td></td>
<td>b. Until brake is free</td>
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<tr>
<td>15. Grip saw</td>
<td>15a. Firmly</td>
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<td></td>
<td>b. With both hands</td>
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<tr>
<td></td>
<td>c. Thumbs and fingers encircling the handles</td>
</tr>
<tr>
<td>16. Throttle engine</td>
<td>16a. Briefly</td>
</tr>
<tr>
<td></td>
<td>b. Finger on throttle trigger</td>
</tr>
<tr>
<td>17. Release throttle trigger</td>
<td>17a. Returning engine to idle</td>
</tr>
<tr>
<td>18. Observe chain</td>
<td>18a. For movement</td>
</tr>
<tr>
<td></td>
<td>b. Should be no chain movement at idle</td>
</tr>
<tr>
<td>19. Push chain brake lever</td>
<td>19a. Forward</td>
</tr>
<tr>
<td></td>
<td>b. Engaging brake</td>
</tr>
<tr>
<td>20. Check chain brake</td>
<td>20a. Finger on throttle</td>
</tr>
<tr>
<td></td>
<td>b. Checking chain for no movement</td>
</tr>
<tr>
<td>21. Check throttle trigger lockout</td>
<td>21a. For obstacles</td>
</tr>
<tr>
<td></td>
<td>b. For proper functioning</td>
</tr>
<tr>
<td></td>
<td>c. For free movement</td>
</tr>
<tr>
<td>22. Warm up saw</td>
<td>22a. Checking warmth of exhaust</td>
</tr>
<tr>
<td>23. Stand up</td>
<td>23a. While holding saw</td>
</tr>
<tr>
<td></td>
<td>b. Proper hand position</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<td>------------------------------------------------</td>
<td>------------------------------------------------</td>
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<tr>
<td></td>
<td>b. Maintaining control</td>
</tr>
<tr>
<td>25. Tip bar down</td>
<td>25a. Pointing tip of bar towards ground</td>
</tr>
<tr>
<td>26. Check oilers and chain movement</td>
<td>26a. For free operation</td>
</tr>
<tr>
<td>27. Rev-up engine</td>
<td>27a. Half throttle maximum</td>
</tr>
<tr>
<td></td>
<td>b. Allowing chain to rotate with minimal drag</td>
</tr>
<tr>
<td></td>
<td>c. Mist of oil should come off tip of bar</td>
</tr>
<tr>
<td>28. Push chain brake lever</td>
<td>28a. Forward</td>
</tr>
<tr>
<td></td>
<td>b. Engaging brake</td>
</tr>
<tr>
<td>29. Carry saw</td>
<td>29a. To cutting area</td>
</tr>
<tr>
<td></td>
<td>b. Holding with both hands</td>
</tr>
<tr>
<td></td>
<td>c. Bar tip pointed down</td>
</tr>
<tr>
<td>30. Position yourself</td>
<td>30a. Facing the object to be cut</td>
</tr>
<tr>
<td>31. Plant feet</td>
<td>31a. Widely-balanced stance</td>
</tr>
<tr>
<td></td>
<td>b. Saw close to body</td>
</tr>
<tr>
<td>32. Assume proper hand position</td>
<td>32a. Right hand on rear handle</td>
</tr>
<tr>
<td></td>
<td>b. Left hand on front handle bar</td>
</tr>
<tr>
<td></td>
<td>c. Gripping with thumb</td>
</tr>
<tr>
<td></td>
<td>d. Fingers encircling the handles</td>
</tr>
<tr>
<td></td>
<td>e. Same for left-handed and right-handed people</td>
</tr>
<tr>
<td>33. Position body</td>
<td>33a. To the left of the bar</td>
</tr>
<tr>
<td>34. Pull chain brake lever</td>
<td>34a. Back</td>
</tr>
<tr>
<td></td>
<td>b. Brake off</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<td>-------------------------</td>
<td>---------------------------------------------------------------------------</td>
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<tr>
<td>35. Open throttle</td>
<td>35a. Fully</td>
</tr>
<tr>
<td></td>
<td>b. Just before starting cut</td>
</tr>
<tr>
<td>36. Cut post or log</td>
<td>36a. Completely through</td>
</tr>
<tr>
<td></td>
<td>b. Bar tip slightly up when starting cut</td>
</tr>
<tr>
<td></td>
<td>c. Cut should be made by the back third of the bottom of the bar</td>
</tr>
<tr>
<td></td>
<td>d. Set dogs in wood to help stabilize cut</td>
</tr>
<tr>
<td></td>
<td>e. Maintaining working position</td>
</tr>
<tr>
<td>37. Push chain brake lever</td>
<td>37a. Forward</td>
</tr>
<tr>
<td></td>
<td>b. Engaging brake</td>
</tr>
<tr>
<td>38. Flip stop switch</td>
<td>38a. To &quot;Off&quot; position</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO OPERATE A ROTARY (CIRCULAR) SAW

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.3

**BEHAVIORAL OBJECTIVE:**

**Condition:** A rotary (circular) saw, appropriate material to cut, and appropriate personal protective equipment

**Behavior:** The student will operate a rotary saw to cut test material

**Standard:** Completing all operations within ___________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Rotary (circular) saw
- Appropriate material to cut
- Appropriate personal protective equipment

**REFERENCES:**
- Forcible Entry, IFSTA, Seventh Edition, Chapter 8

**PREPARATION:**
A circular saw is a fast and effective tool with many uses. It can be used for ventilation, forcible entry, fire fighter and civilian rescue, and vehicle extrication, to name a few. By changing blades, it can cut a variety of materials. Although the saw operates at high rpm's it can be very dangerous if not properly used.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ready saw</td>
<td>1a. On solid surface</td>
</tr>
<tr>
<td></td>
<td>b. Adjust blade guard</td>
</tr>
<tr>
<td></td>
<td>c. With choke on</td>
</tr>
<tr>
<td></td>
<td>d. With throttle lock engaged</td>
</tr>
<tr>
<td>2. Place foot</td>
<td>2a. Through saw handle</td>
</tr>
<tr>
<td>3. Grasp saw</td>
<td>3a. With hand</td>
</tr>
<tr>
<td></td>
<td>b. On wrap-around cross bar</td>
</tr>
<tr>
<td>4. Pull starting cable</td>
<td>4a. With working hand</td>
</tr>
<tr>
<td></td>
<td>b. With short snap motion</td>
</tr>
<tr>
<td>5. Hold saw</td>
<td>5a. With both hands</td>
</tr>
<tr>
<td></td>
<td>b. Away from body</td>
</tr>
<tr>
<td></td>
<td>c. Firmly</td>
</tr>
<tr>
<td></td>
<td>d. One hand on wrap-around cross bar</td>
</tr>
<tr>
<td></td>
<td>e. One hand on handle</td>
</tr>
<tr>
<td>6. Operate saw</td>
<td>6a. Balanced stance</td>
</tr>
<tr>
<td></td>
<td>b. Perpendicular or parallel to cut</td>
</tr>
<tr>
<td></td>
<td>c. Knees bent</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td></td>
<td>e. Maintaining clear safe area</td>
</tr>
<tr>
<td>7. Begin cut</td>
<td>7a. At full throttle</td>
</tr>
<tr>
<td>8. Pull saw</td>
<td>8a. To make cut</td>
</tr>
<tr>
<td></td>
<td>b. In straight line</td>
</tr>
<tr>
<td></td>
<td>c. Towards self</td>
</tr>
<tr>
<td></td>
<td>d. Slowly</td>
</tr>
<tr>
<td></td>
<td>e. At proper blade depth</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>9. Remove saw</td>
<td>9a. From cut</td>
</tr>
<tr>
<td></td>
<td>b. At idle speed</td>
</tr>
<tr>
<td>10. Secure saw</td>
<td>10a. To &quot;Off&quot; position</td>
</tr>
<tr>
<td></td>
<td>b. Ensuring blade has been stopped</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF PNEUMATIC AIR CHISELS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of pneumatic air chisels by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Rescue, IFSTA, Sixth Edition, Chapter 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Air chisel with attachments

REFERENCES:
- Fire Service Rescue, IFSTA, Sixth Edition
- Forcible Entry, IFSTA, Seventh Edition

PREPARATION: The air or pneumatic chisel is very effective for forcible entry and auto extrication. Effectiveness is usually determined by the skill of the operator. Becoming familiar with the air chisel requires a commitment to training that helps develop the fire fighters.
I. COMPONENTS

A. Chisels
   1. Panel cutter
      a) For cutting box beams
   2. Chisel or spade bit
      a) For cutting box beams and other like elements
   3. Cold chisel
      a) For cutting bolts, pins and rivets, and for breaking welds
   4. Come in various lengths and styles depending on the manufacturer

B. Gun
   1. Chuck
      a) Retains chisels
      b) Several styles
         1) Spring type
         2) Screw-on
         3) Quick release
      c) Cylinder
         1) Houses piston
      d) Trigger
         1) Activates chisel
      e) Air inlet

C. Hose
   1. Supplies air from regulator to gun

D. Regulator
   1. May be adjustable

What type is best used for breaking welds?
2. May have one or two gauges
   a) Storage pressure
      1) How much air you have left in pounds per square inch on the regulator gauge
   b) Regulated (working) pressure
      1) The pressure in psi being delivered to the tool

3. Most designed to screw on breathing apparatus cylinders are 2.2 type

4. Will have quick connect fitting or other method of attachment for the air hose

II. CONSIDERATIONS WHEN PURCHASING AN AIR CHISEL

A. High pressure vs. low pressure
   1. There are two basic divisions to air chisels found on the market today
      a) Low pressure
         1) Generally considered to operate at air pressures between 90 and 120 psi
         2) Most commercially available air chisels fall into this category
         3) Working pressure is most usually 90 psi and 120 psi
         4) Air consumption rates usually fall in the area of 4 cubic feet per minute

What is the operating pressure for low-pressure air chisels?
b) High pressure

1) Generally operates at pressures above 120 psi
2) Is usually a standard chisel with aftermarket modifications
3) Working pressure can vary, as well as consumption rates
   • Chisel will operate with less than 120 psi
   • Consumption rates will generally be greater than low pressure models

B. Air supply and consumption

1. Types of supply
   a) Stores
      1) Precompressed volume of air stored in some type of reservoir
         • Breathing apparatus bottles
         "H" cylinder or other reservoir
      2) Air can be stored at relatively high pressure, but volumes are limited by reservoir size
   b) Compressors
      1) The use of air that is compressed and delivered at the time of use
      2) Portable vehicle mounted or part of vehicle air brake systems
      3) Available pressures and volumes are usually limited due to compressor size
### Characteristics And Functions Of Pneumatic Air Chisels Page 5

<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Total available volume is greater</td>
</tr>
<tr>
<td>5) Not limited to a reservoir of specific volume but is limited as to speed of delivery (CFM), due to delivery rate of compressor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why will high-pressure chisels have higher consumption rates?</td>
</tr>
</tbody>
</table>

2. Consumption
   a) High pressure chisels will generally have higher consumption rates than low pressure models

   b) The higher pressures will move the piston faster (more blows per minute) using more air (CFM)

   1) The effectiveness of an air chisel will go down as the available pressure falls below the recommended working pressure

   - The piston will not strike the bit as hard or as often

   2) Stored air supplies will usually provide higher flow rates (CFM) at higher pressures (psi) than compressors but only for a limited time

   3) A compressor's capacity dictates how fast it can compress air which limits pressures and flow rates

Why will the effectiveness of an air chisel go down?
### Characteristics And Functions Of Pneumatic Air Chisels

#### 1. Manufacturers recommendation
- **Minimum** \( \frac{3}{8} \)-inch hose for short runs
- **Long runs could require** \( \frac{1}{2} \) inch or larger depending on CFM being plowed

#### 2. The longer the hose, the larger the diameter needs to be

#### C. Air supply

1. Self-contained breathing apparatus
2. "H" bottles or other storage bottles
3. **Other**
   - a) Vehicle compressor
   - b) Glad hand connections on trucks (hose connection between tractor and trailer)

### III. USES

#### A. Cutting
1. Sheet metal panels
2. Box beams
3. Bolts and pins
4. Metal welds

#### B. General set-up
1. Select air supply and install regulator, if required
2. Select chisel and install in chuck, check and make sure chisel is retained in chuck
3. Connect air hose to gun and air supply
4. **Turn on air supply**  
   a) Do not look at dial face of gauge when turning air on  

C. **Panel cutter - with shaft of chisel perpendicular to work surface**  
   1. Place sharp tip of panel cutter firmly on surface to be cut  
   2. Squeeze trigger and initiate cut  
   3. With tip of chisel in hole bring gun nearly parallel to work surface  
   4. Proceed with cut  
      a) Squeeze trigger and push chisel firmly in desired direction  
      b) Cuts can be curved or turned by turning the gun while cutting to direct the chisel  

D. **Chisel/spade bit**  
   1. Can be used as panel cutter but is not as effective  
      a) Use it the same as panel cutter  
   2. For cutting box beams and other structural members  
      a) Holding shaft of chisel perpendicular to work surface  
      b) Firmly press one tip of chisel against material to be cut  
      c) Squeeze trigger and initiate cut  
      d) Using the center of the cutting edge, cut first around the outside of the object, then cut interior partitions  
      e) Cutting through center of an object first will usually result in wedging the chisel, requiring it to be cut out
### Characteristics And Functions Of Pneumatic Air Chisels

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E. Cold chisel</strong></td>
<td></td>
</tr>
<tr>
<td>1. For cutting bar type stock bolts, rivets, pins, etc.</td>
<td>What are some of the safety considerations when utilizing the air chisel?</td>
</tr>
<tr>
<td>2. Hold cutting edge of chisel firmly against object to be cut</td>
<td></td>
</tr>
<tr>
<td>3. Depress trigger and initiate cut</td>
<td></td>
</tr>
</tbody>
</table>

### IV. SAFETY

- **A. Use appropriate personal protective equipment, gloves, goggles, or face shield, etc.**
- **B. Do not activate gun without chisel**
- **C. Do not point chisel at anyone while activating gun**
SUMMARY:

The air chisel with its various cutters can quickly open sheet metal panels. Air chisels are operated on either low or high pressure and supplied by a stored-air bottle, portable compressor, or chassis air. Numerous bits and blades are available for the cutting metal panels and chiseling metal components. Air chisels are applicable to rescue forcible entry and vehicle extrication scenarios.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Rescue, IFSTA, Sixth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:**  
INSPECTION AND MAINTENANCE OF PNEUMATIC AIR CHISELS

**TIME FRAME:**  
0:30

**LEVEL OF INSTRUCTION:**  
Level II

**AUTHORITY:**  
1997 NFPA 1001 3-3.3

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test

- **Behavior:** The student will confirm a knowledge of the inspection and maintenance of pneumatic air chisels by completing the written test

- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Service Rescue*, IFSTA, Sixth Edition, Chapter 2

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Air chisel with attachments

**REFERENCES:**

- *Fire Service Rescue*, IFSTA, Sixth Edition
- *Forcible Entry*, IFSTA, Seventh Edition

**PREPARATION:**
The air or pneumatic chisel is very effective for forcible entry and auto extrication. Regular inspection and maintenance is essential to safe and efficient operations. The success of emergency services being provided is directly proportional to the constant state of readiness of emergency fire service equipment.
I. INSPECTION

A. In accordance with manufacturer's directions and recommendations

B. Weekly
   1. Air source
      a) Operate system
      b) Check for adequate pressure
      c) Check for leaks
      d) If using SCBA compressed air cylinder, check hydrostatic test date
   2. Bits
      a) Cracks
      b) Dullness
      c) Other damage
   3. Gun
      a) Condition of the chuck
      b) Tight cylinder
         1) Can come loose
         2) Will crack the handle
      c) Trigger works freely
      d) Condition of the handle
      e) Air inlet is tight
   4. Regulator
      a) Connection to air supply
         1) There is usually an O-ring or gasket that could be damaged or missing due to foreign objects or over-tightening
         2) Both connections are clean
         3) Connection is hand tight
What should you look for when inspecting pneumatic hoses?

5. Hose
a) Check for cracks, fraying
b) Check for contamination
   1) Dirt in the air will damage the piston and can make the quick couplings difficult to operate

What should you look for when inspecting pneumatic-type couplers?

6. Couplings
a) Check for smooth operation
b) Check for cracks
c) Listen for air leakage

What do you check for after each use?

C. After each use
   1. Inspect for damage

II. MAINTENANCE
A. Clean unit
B. Air source
   1. Refill
      a) Clean air only
2. Keep couplings free of oil or oil based lubricants

C. Bits
   1. Sharpen
      a) Overheating while sharpening will cause bit to lose temper

D. Gun
   1. In accordance with manufacturer's recommendations and directions

E. Hose
   1. Keep ends coupled together or protected when not in use
   2. Replace as needed

F. Couplings
   1. Repair or replace as needed

G. Regulator
   1. Do not oil unless directed by manufacturer
   2. Clean with compressed air

H. Air cylinder
   1. Test
   2. Fill

I. Fluid reservoirs
   1. Fill
SUMMARY:

Every fire fighter should have the knowledge required to inspect and maintain the pneumatic air chisels used by their departments. These chisels are essential to fireground and emergency functions and must be kept in good working order.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Rescue, IFSTA, Sixth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE LIGHTING EQUIPMENT

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.16

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service lighting equipment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Power generator
- Portable light
- Extension cord(s)
- Pigtail
- Junction box
- Hand lantern
- Appropriate manufacturer's literature

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: The fire fighter is often called upon to perform emergency operations in the worst possible environment. One environmental element that can be controlled to a certain degree is darkness. With modern day portable lighting equipment, you can safely provide "working" light for fire fighting, rescue, etc. In order to exercise this control, you must know the portable lighting equipment within your department.
I. SYSTEM DEFINED
   A. An entity in which various components come together for a purpose
   B. When discussing lighting equipment, it is important to remember that portable lighting is used as a "system"
   C. The fire fighter brings together various pieces of equipment and "plays" them together to form a system
   D. It is essential that the fire fighter understand the equipment within this system
      1. Terminology
      2. Function
      3. Relationship of one component to another

II. PORTABLE LIGHTING EQUIPMENT

A. Power source
   1. Fire service generators
      a) Used to provide electrical power at emergency scenes
      b) If large, may be mounted on an axle and towed by staff vehicle
      c) If small, may be mounted onto apparatus, often in compartments
      d) Rating of generator determines amount of appliance that can be operated
   2. Domestic power
      a) Power prewired into structures
         1) 110v A/C
2) Ordinary house outlets
   b) Most fire department lighting equipment can be operated with domestic power if it is grounded

B. Extension cords
   1. Use all extension cords and adapters specific to your department
   2. Precut, 3-strand industrial grade wire (#12-10)
   3. Used to route electrical power from the source to the site where needed
   4. Plugs must be compatible with all appliances
   5. Types/configurations
      a) Reel mounted
         1) Fixed on apparatus or portable
         2) 50-300 feet in length
      b) Coiled or nested
         1) Carried in compartments
         2) Generally 10-100 feet in length
         3) Require uncoiling or stretching per deployment
      c) Pigtails
         1) "Short" extension cords
         2) 1-5 feet in length
         3) Often carried in a box or fastened to appliances
         4) Used for short span connections or to connect components of the system together which may have incompatible plugs
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C. Junction boxes</strong></td>
<td>What are junction boxes used for?</td>
</tr>
<tr>
<td>1. Used to divert main extension cord to separate circuits</td>
<td></td>
</tr>
<tr>
<td>2. Similar in function to a wye gate for a hoseline</td>
<td></td>
</tr>
<tr>
<td>3. Usually made of lightweight metal alloy</td>
<td></td>
</tr>
<tr>
<td>4. Often has a light on top which illuminates when box is &quot;hot&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>D. Lighting</strong></td>
<td></td>
</tr>
<tr>
<td>1. Fixed</td>
<td>What are fixed lights?</td>
</tr>
<tr>
<td>a) Lights that are mounted onto apparatus</td>
<td></td>
</tr>
<tr>
<td>b) Frequently removable</td>
<td>How are they used and powered?</td>
</tr>
<tr>
<td>c) Usually on mast that can be turned or raised</td>
<td></td>
</tr>
<tr>
<td>d) Generally operated by plugging into outlet on apparatus</td>
<td></td>
</tr>
<tr>
<td>e) Wattage varies</td>
<td>What are portable lights?</td>
</tr>
<tr>
<td>1) 500-1,000 watts</td>
<td></td>
</tr>
<tr>
<td>2. Portable</td>
<td></td>
</tr>
<tr>
<td>a) Lights that are removed from apparatus and carried into area needed</td>
<td></td>
</tr>
<tr>
<td>b) Wattage varies</td>
<td></td>
</tr>
<tr>
<td>1) 300-1,000 watts per light</td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics And Functions Of Fire Service Lighting Equipment

#### III. SAFETY CONSIDERATIONS

**A. Emergency scene**
1. Avoid tunnel vision
2. Awareness
   a) Type scene

**B. Specific consideration for each type/component**
1. Power sources
   a) Generator

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<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>3. Battery-operated</td>
<td>What is a self-contained lighting system?</td>
</tr>
<tr>
<td>a) Common flashlight</td>
<td>What are some safety factors to be considered at the emergency scene?</td>
</tr>
<tr>
<td>b) May be mounted onto helmet</td>
<td></td>
</tr>
<tr>
<td>c) Powered by dry cell batteries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What types of lighting are suitable for explosive environment?</td>
</tr>
<tr>
<td>1) Explosive environment</td>
<td></td>
</tr>
<tr>
<td>2) Use UL approved equipment</td>
<td></td>
</tr>
<tr>
<td>b) Topography</td>
<td></td>
</tr>
<tr>
<td>c) Water</td>
<td></td>
</tr>
<tr>
<td>1) Electrical shock hazards</td>
<td></td>
</tr>
<tr>
<td>d) Weather</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics And Functions Of Fire Service Lighting Equipment

What safety factors should be remembered when using petroleum products for fuel?

1. Store fuel away from heat sources
2. Keep fuel fresh
3. Keep fuel storage area clean
4. Remember that petroleum products can damage other equipment
5. Use correct fuel type/mixture (e.g., gasoline, 2 cycle)
6. Avoid spilling fuel onto clothing, gloves during filling
7. Do not fill generator while it is running
8. Make sure generator is properly ventilated and grounded
9. Ensure exhaust is away from combustible
10. If portable
   - Do not set generator onto wet ground
   - Set generator on level base
11. Ensure that fly wheel is free of obstructions

What safety considerations are important when using domestically powered lighting?

b) Domestic power

1. Do not use extension cords found on scene
### Characteristics And Functions Of Fire Service Lighting Equipment

#### Extension cords
- **a)** Do not use if frayed, bare wire exposed, or connections are loose
- **b)** Avoid deploying in areas of obvious water
- **c)** Use pigtails
- **d)** Lay cords "out of way" as much as possible
- **e)** Do not tie knots in cords

#### Junctions
- **a)** Do not use if obviously damaged or connections are difficult to make
- **b)** Do not overload the system
  - 1) May not be able to use all of the available junction outlets
- **c)** Place junctions "out of way" as much as possible

#### Lighting
- **a)** Mobile electrical lights
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Ensure light is securely anchored into holder</td>
<td>What are safety factors when using portable electric lighting?</td>
</tr>
<tr>
<td>2) Point light in appropriate direction prior to plugging in</td>
<td></td>
</tr>
<tr>
<td>3) Do not &quot;force&quot; connection</td>
<td></td>
</tr>
<tr>
<td>4) Do not look into light when making connection</td>
<td></td>
</tr>
<tr>
<td>b) Portable electrical lights</td>
<td></td>
</tr>
<tr>
<td>1) Do not set light into water</td>
<td></td>
</tr>
<tr>
<td>2) Keep light &quot;out of way&quot; as much as possible</td>
<td></td>
</tr>
<tr>
<td>3) Remember that the globe can cause painful burns even after short</td>
<td></td>
</tr>
<tr>
<td>operation</td>
<td></td>
</tr>
<tr>
<td>4) Avoid setting light where fire fighters become &quot;blinded&quot; by glow</td>
<td></td>
</tr>
<tr>
<td>5) Do not look at light</td>
<td></td>
</tr>
<tr>
<td>c) Battery-powered lights</td>
<td></td>
</tr>
<tr>
<td>1) Ensure lights mounted to helmets are securely in place</td>
<td>What are safety factors when using battery-powered lights?</td>
</tr>
</tbody>
</table>
**SUMMARY:**

Portable lighting is a frequently used application at emergency scenes and is comprised of a "system." The components usually consist of generator, extension cord, junction box, and portable lights.

Use of electrical portable lighting at an emergency is a common evolution. However, the fire fighter must always exercise caution and adhere to sound safety practices, the most important of which is to ensure all electrical systems are grounded and safe. Failure to do so can result in equipment damage and/or personal injury.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF FIRE SERVICE LIGHTING EQUIPMENT

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-5.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance procedures of fire service lighting equipment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Manufacturer's literature

PREPARATION: Emergency operations involve a variety of power tools and lighting equipment. Regular inspection and maintenance is essential to safe and efficient operations. The success of emergency services being provided is directly proportional to the constant state of readiness of emergency fire service equipment.
I. PURPOSE
   A. Familiarity
   B. Ensure equipment is operating properly
   C. Determine if equipment is damaged or unsafe for operation

Name some lighting equipment your department carries.

II. TYPES OF LIGHTING EQUIPMENT
   A. Generators
   B. Alternators
   C. Lamps and floodlights
   D. Hand lanterns
   E. Flashlights
   F. Invertors

What would you want to check on lights?

III. INSPECTION
   A. Lighting equipment
      1. Visual inspection
         a) Clear of dust and debris
         b) Damaged or worn parts
            1) Switches
            2) Plugs
            3) Fuses
   B. Generators
      1. Weekly
         a) Check gas and oil levels
         b) Inspect spark plug, spark plug wire, and carburetor
C. Extension cords  
   1. Weekly  
      a) For damage  

D. Batteries  

E. Light bulbs  

IV. MAINTENANCE  

A. Generators  
   1. Change extra gasoline every three weeks  
      a) To ensure freshness  

V. RECORDING EQUIPMENT PROBLEMS  

A. Tag "Out-of-Service"  
B. Report problem to company officer  
C. Complete documentation per departmental policy  

What are some considerations regarding taking equipment out-of-service?
SUMMARY:

Every fire fighter should have the knowledge required to inspect and maintain the power tools and lighting equipment used by their departments. These tools may be air-driven, electric, or pneumatic; but all are essential to fireground and emergency functions and must, therefore be kept in good working order.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO SET-UP PORTABLE LIGHTS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.16

BEHAVIORAL OBJECTIVE:

Condition: A handheld flashlight, power generator, extension cord, pigtail, junction box, and portable light

Behavior: The student will set-up portable lights and illuminate the scene

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Handheld flashlight
- Power generator
- Extension cord
- Pigtail
- Junction box
- Portable light

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7

PREPARATION:

The fire fighter is often called upon to perform emergency operations in the worst possible environment. One environment that he/she can control to certain degree is darkness. Using modern day portable lighting equipment, you can safely provide "working" light for fire fighting, rescue, etc. In order to exercise the element of environmental control, the fire fighter must have knowledge of the components and types of portable lighting equipment and the necessary skills to operate them.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Doff apparatus</td>
<td>1a. With a handheld flash light</td>
</tr>
<tr>
<td>2. Set-up power generator</td>
<td>2a. Away from apparatus</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding hazards; water, uneven ground, etc.</td>
</tr>
<tr>
<td>3. Check fuel level</td>
<td></td>
</tr>
<tr>
<td>4. Start generator</td>
<td>4a. Ensuring proper ventilation</td>
</tr>
<tr>
<td>5. Extend extension cord</td>
<td>5a. No kinks</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding water and high traffic areas</td>
</tr>
<tr>
<td>6. Connect junction box</td>
<td>6a. Enabling multiple use</td>
</tr>
<tr>
<td>7. Connect pigtail</td>
<td>7a. If needed, some lights require twist locks</td>
</tr>
<tr>
<td>8. Connect portable light</td>
<td>8a. Ensuring light won't tip over</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding high traffic areas</td>
</tr>
<tr>
<td></td>
<td>c. Remember, some lights get HOT</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF HEADLAMPS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of headlamps by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the manufacturer's instructions

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Hard hat
- Headlamp
- Batteries

REFERENCES:
- Manufacturer's recommendations and directions

PREPARATION: Using a headlamp for illumination is a common practice when working at night. The headlamp is designed to allow both hands to be free for work. Thus, the headlamp is particularly useful while using hand tools or making hose lays.
I. **TERMINOLOGY**

A. Batteries
   1. Four
   2. Dry cell
   3. AA
   4. 1½ volt

B. Battery case

C. Head strap

D. Bulbs
   1. Two
   2. 2.2 VO.25A or equivalent

E. Lamp

F. Adjustable lens

G. Toggle switch

H. Battery case terminal

I. Contact prongs

II. **USE**

A. Batter operated

B. Mounted on helmet
   1. Straps under helmet clips

C. Discard all used batteries
   1. In a proper receptacle
      a) Batteries are considered a hazardous material

How often should batteries be changed?

2. After each operational period
III. INSPECTION AND MAINTENANCE

A. Check batteries and bulb

1. Ensure cardboard is removed from between batteries and contacts
   a) Save cardboard and replace for storage

B. Keep electrical prongs on inside of case bent slightly outward

C. Check that all contacts are
   1. Clean
   2. Free of corrosion
   3. Tightly screwed on

D. Check switch for proper operation

E. Keep lens clean

F. If headlamp does not function, check
   1. Batteries
      a) Inserted wrong
      b) Worn out
   2. Burned out bulb
   3. Dirty terminals
   4. Loose batteries in case
   5. Faulty toggle switch
   6. Cardboard between batteries and electrical contacts

What is the purpose of cardboard between batteries and contacts?
### IV. STORAGE

A. Place cardboard between batteries
   1. Prevents accidental drain on batteries

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>How are the batteries protected against accidental discharge?</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

A properly maintained headlamp is a critical component of the wildland fire fighter's personal gear. Without illumination during night operations or times of poor visibility, a fire fighter is rendered ineffective. The headlamp is essential safety equipment. Thus, the headlamp is an extremely valuable tool enabling the fire fighter to work safely and effectively during night operations or poor visibility.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read the manufacturer's instructions in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE JACKS

TIME FRAME: 1:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service jacks by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Student Information Sheet
- Examples of hydraulic, ratchet, and screw jacks

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Rescue Practices, IFSTA, Fifth Edition

PREPARATION: The fire service employs a wide variety of tools during emergency operations. Some tools are used almost daily, while others may only be used twice a year. The jack is one of these less frequently used tools. However, when a heavy object or load must be moved or raised, the jack is one of the first tools applied. The fire fighter must be thoroughly familiar with this tool if he or she is to employ it effectively.
What is a jack's function?

I. FUNCTION
   A. Designed to raise or move an object or load by employing mechanical advantage

   B. Mechanical advantage is simply a method by which work power is increased
   C. Use proper jack for the job
      1. Space available
      2. Load estimate versus rated capacity

   What is mechanical advantage?

II. TYPES
   A. Ratchet jacks
      1. One of the most common
         a) High-lift jack
      2. Uses the "lever" to develop mechanical advantage
      3. Movement of the jack relies upon teeth (or pins) which alternately engage to move and hold
      4. Nomenclature
         a) Base
         b) Loading point(s)
         c) Shaft
         d) Ratchet mechanism
         e) Toggles
         f) Handle and lever

   What types of jacks are used in the fire service?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B. Screw jacks</strong></td>
<td>Are there different types of screw jacks?</td>
</tr>
<tr>
<td>1. Probably the most simple type</td>
<td></td>
</tr>
<tr>
<td>2. Uses the screw to develop mechanical advantage</td>
<td></td>
</tr>
<tr>
<td>3. Movement of the jack relies upon a revolving, threaded, screw to engage and move/hold loads</td>
<td></td>
</tr>
<tr>
<td>4. Two types</td>
<td></td>
</tr>
<tr>
<td>a) Scissor or floating jacks</td>
<td></td>
</tr>
<tr>
<td>1) Collapse to small size</td>
<td></td>
</tr>
<tr>
<td>2) Will fit into small openings</td>
<td></td>
</tr>
<tr>
<td>3) Often operated with a rod turning the screw</td>
<td></td>
</tr>
<tr>
<td>b) &quot;Bor&quot; or house moving jack</td>
<td></td>
</tr>
<tr>
<td>1) Threaded vertical bar moving in a housing</td>
<td></td>
</tr>
<tr>
<td>2) Usually stronger than a scissor jack</td>
<td></td>
</tr>
<tr>
<td>3) Operated by turning the bar</td>
<td></td>
</tr>
<tr>
<td>5. Nomenclature</td>
<td></td>
</tr>
<tr>
<td>a) Base</td>
<td></td>
</tr>
<tr>
<td>b) Load point(s)</td>
<td></td>
</tr>
<tr>
<td>c) Threads</td>
<td></td>
</tr>
<tr>
<td>d) Sleeves</td>
<td></td>
</tr>
<tr>
<td>e) Handle and lever</td>
<td></td>
</tr>
<tr>
<td><strong>C. Hydraulic jacks</strong></td>
<td></td>
</tr>
<tr>
<td>1. Often considered the most useful of the three types</td>
<td></td>
</tr>
<tr>
<td>2. Employs the &quot;piston&quot; and &quot;lever&quot; to attain mechanical advantage</td>
<td></td>
</tr>
</tbody>
</table>
3. The lever operates a piston, which moves fluid through various sizes of changers to develop pressure
4. The pressure is applied to a bar which moves within the housing
5. Nomenclature
   a) Base
   b) Load point(s)
   c) Shaft
   d) Handle and lever
   e) Hoseline and couplings
   f) Reservoir

In what type of emergencies could a jack be used?

III. USE

A. Vehicle rescue
   1. Lift, pull, spread
   2. Displace pedals/steering wheel
   3. Stabilize (with cribbing)

B. Building collapse
   1. Lift
   2. Move
   3. Stabilize (with cribbing)

C. Forcible entry
   1. Pry
   2. Lift

How would you use a jack for forcible entry?
### D. Agriculture rescue
1. Pry
2. Lift
3. Move

### E. Trench/excavation rescue
1. Stabilize with shores
2. Stabilize with cribbing

### F. Application considerations
1. Rated capacity of jack
   - a) Imprinted on the jack
     1) Plate
     2) Stencil
     3) Stamp
   - b) Expressed in pounds and tons
   - c) Estimate the weight of the load before applying the jack
2. Type of work to perform
   - a) Life-threatening versus dead-enacting
   - b) Stable versus unstable environment
   - c) Direction of movement or displacement
   - d) Size of working space
3. If you do not use it properly, unsafe situations can arise

### IV. OTHER LIFTING DEVICES
A. Hand-held hydraulic spreading device
B. Hoist
C. Cable come-along
D. Pry bar (lever)
E. Wedge
F. High-lift jack
G. Hydraulic shore
H. Rescue rams

V. SAFETY CONSIDERATIONS
A. Always check jack’s rated load capacity
B. Check jack’s operating mechanism prior to use
C. Always have a sound, solid base
   1. May require digging, use of cribbing, or ground jack plates

D. Use a header plate between load and contact point with jack, if necessary
   1. Distributes load evenly
   2. Prevents breaking of load
E. Always keep jack at right angle to load and base
   1. Offset greatly reduces jack’s rating capacity and stability
F. Operate jack smoothly
G. Do not overextend the jack
   1. Greater extension = reduced load rating
   2. Take small "bites"
      a) Move-crib-lower-raise base, move-crib-lower, etc.
H. Always crib as jack moves load
   1. If jack fails, all gain is not lost

What does a header plate do?

What is the advantage of cribbing?
I. Do not place fingers/limbs between load and base

J. Never support a load entirely on a jack
   1. Not designed to be a "shore"
   2. Use crib-lower load to crib

K. When employing jack as a "stabilizing" device, constantly monitor jack's position, security, etc.
   1. Should only be done when absolutely necessary (e.g., trench rescue)

L. When using jacks with lever type handles, do not lean face or body over handle

M. Never leave handle/lever in jack when not in use

| What are some special considerations when using two jacks at the same time? |
|---|---|
| N. Using jacks in unison (two on a load) |
|   1. Raise in unison |
|   2. Do not rock load |
|   3. One fire fighter should call cadence |
|   4. Jacks should be matched, equally rated |

VI. INSPECTION AND MAINTENANCE

A. As with any tool, the jack will only be as good as the care given to it prior to the emergency

B. Routine inspection and maintenance should include
   1. Inspect
      a) Cracks
      b) Metal fatigue
      c) Deformity
      d) Oil reservoir level, hose, and couplings in hydraulic jacks
   2. Clean and lube working members periodically
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Exercise moving parts of jack</td>
<td></td>
</tr>
<tr>
<td>4. Store in dry clean area</td>
<td></td>
</tr>
<tr>
<td>C. Thorough maintenance check should be provided</td>
<td></td>
</tr>
<tr>
<td>after every use</td>
<td></td>
</tr>
<tr>
<td>1. Emergency operation</td>
<td></td>
</tr>
<tr>
<td>2. Training exercise</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Situations will arise that require the use of jacks to raise, move, rotate, or stabilize heavy objects. Jacks develop mechanical advantage and can be categorized into three general types: ratchet, screw, and hydraulic. Jacks have various applications usually centered on rescue operations.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: HOW TO IGNITE AND EXTINGUISH ROAD FLARES OR FUSEES

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A road flare or fusee, cleared area, and appropriate personal equipment

Behavior: The student will ignite and extinguish a road flare or fusee under simulated fire conditions

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- One road flare or fusee per student
- Cleared area
- Appropriate personal protective equipment

REFERENCES:

- S-130 Instructor Guide, NWCG (NFES 1510), 1995 Edition, Unit 4

PREPARATION: Road flares and fusees are used interchangeably as warning devices to stop, slow, or divert traffic and as firing devices. Each burn at approximately 1,400°F and can drip or splatter hot phosphorus. The vapor emitted during burning is toxic. Care must be exercised to prevent injuries to personnel and equipment.
## IGNITING

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp flare/fusee</td>
<td>1a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. Near base</td>
</tr>
<tr>
<td></td>
<td>c. Back towards wind</td>
</tr>
<tr>
<td>2. Remove cap</td>
<td>2a. With free hand</td>
</tr>
<tr>
<td></td>
<td>b. Twisting either direction</td>
</tr>
<tr>
<td></td>
<td>c. Exposing igniter</td>
</tr>
<tr>
<td>3. Remove striker cap</td>
<td>3a. Placing thumb under edge</td>
</tr>
<tr>
<td></td>
<td>b. Forcing upward</td>
</tr>
<tr>
<td></td>
<td>c. Exposing striker</td>
</tr>
<tr>
<td>4. Place igniter and striker together</td>
<td>4a. Exposed igniter in one hand</td>
</tr>
<tr>
<td></td>
<td>b. Fusee/flare cap with exposed striker</td>
</tr>
<tr>
<td></td>
<td>in the other</td>
</tr>
<tr>
<td>5. Rub striker across igniter</td>
<td>5a. Rapidly</td>
</tr>
<tr>
<td></td>
<td>b. To ignite flare</td>
</tr>
<tr>
<td></td>
<td>c. Hands fully extended from body</td>
</tr>
<tr>
<td></td>
<td>d. Eyes turned away</td>
</tr>
<tr>
<td></td>
<td>e. Movement of flare/fusee away from the body</td>
</tr>
<tr>
<td>6. Hold lit flare</td>
<td>6a. At arms length from body</td>
</tr>
<tr>
<td></td>
<td>b. Pointed away from body</td>
</tr>
<tr>
<td></td>
<td>c. Without looking directly at flame</td>
</tr>
<tr>
<td></td>
<td>d. Without inhaling toxic smoke</td>
</tr>
</tbody>
</table>
## Extinguishing

<table>
<thead>
<tr>
<th>Operations</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp flare/fusee</td>
<td>1a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. Near base</td>
</tr>
<tr>
<td></td>
<td>1b. Back towards wind</td>
</tr>
<tr>
<td>2. Grind lit end</td>
<td>2a. Into the ground</td>
</tr>
<tr>
<td></td>
<td>b. Until extinguished</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF THERMAL IMAGING DEVICES

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.8

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of thermal imaging devices by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the manufacturer's instructions

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Manufacturer's instructional manual

PREPARATION: Thermal imaging units have several applications beyond victim rescue. Fire fighters should make an effort to keep up with the technology being used in the fire service. These devices are invaluable to the modern day fire department.
I. HOW THERMAL IMAGING WORKS
   A. Senses "infrared light" known as "thermal energy"
      1. Not detected by the eyes
   
      B. Emitted from all objects above 0° Kelvin
         1. -459.67°F

II. LIMITATIONS OF THERMAL IMAGING
   A. Cannot "see" through glass
      1. Thermal imaging sees a pane of glass as a mirror
   B. Cannot "see" through walls
      1. They can only tell you if the adjacent room is extremely hot
   C. Without proper training, units can be more of a burden than a useful tool

III. TYPES OF THERMAL IMAGING DEVICES
   A. Hand-held imaging devices
   B. Hands-free devices
      1. Helmet mounted
         a) Monocular vision

How does thermal imaging work?

What is the temperature in which objects begin to emit thermal energy?

What are some of the limitations of thermal imaging?

What types of thermal imaging units are available to the fire service?
b) Binocular vision

IV. USES FOR THERMAL IMAGING DEVICES

A. Search for victims
B. Look for hidden fires
C. Training
D. Find a heat source
   1. Bad light ballast

V. ACCESSORIES

A. Transmitters
   1. Incident Commander (IC) or Rapid Intervention Crew (RIC) can see what you see
   2. Make tapes for critiques or training

What are some uses for thermal imaging devices?

What kinds of accessories are available for thermal imaging units?
SUMMARY:
Without proper training, thermal imaging devices can become a hindrance to your fireground operations. You should take the time to train with the thermal imaging devices available to you. They can be very useful in finding victims or determining fire spread if properly used.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and the manufacturer’s instructions in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS FOR UTILITY INTERRUPTIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.17 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the safety considerations for interruption of utility services to structures by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 14

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Fire fighting is a job in which any number of conditions can cause harm, injury, or death to a fire fighter. Many conditions that are associated with such a demise of a fire fighter are generally associated with emergency incidents on the interior of either residential or commercial buildings. Many hazards can be reduced while performing a size-up as a fire fighter makes a lap around a structure. The following information may be considered routine and yet is essential for a fire fighter to safely complete his or her shift.
I. INITIAL APPROACH TO A STRUCTURE

A. Overall scene scan
   1. Size-up the structure itself
      a) Viewing only two sides of the structure provides a limited size-up
      b) Viewing three sides of the structure provides more information than only two side viewing, depending on apparatus placement on the scene
   2. Initial walk-around
      a) Maximum safety by observing all four sides of the structure
      b) Better knowledge is gained of the structure with complete lap around structure
         1) Take note of hazards on exterior
         2) Initially attempt to identify location and severity of the emergency

II. ACCESS TO THE STRUCTURE

A. Shut-off of appropriate utilities may occur by first-in officer or assigned personnel
   1. Electricity
      a) Aboveground service
         1) Traditional for older residential and commercial services
### PRESENTATION

2) Easily noted by observation unless there is heavy fog or smoke conditions laying low on the ground  

b) Underground service  
   1) Usually associated with newer construction for both residential and commercial

### APPLICATION

- What type of service delivery is unique to commercial occupancies?

### PRESENTATION

c) Vault service  
   1) Associated with commercial services  
   2) Identified with aboveground cabinets or boxes using metal construction

d) Control of residential electrical services  
   1) Pay particular attention to the position of the switches  
      - Information needs to be accurately relayed to fire investigators

### APPLICATION

- What should be observed before disconnecting electrical service?

### PRESENTATION

2) Usually located in common area between two houses in track residential  
   - Between garages or the living space areas

### APPLICATION

- Where are residential service boxes usually located?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>
| 3) Control is usually done by shutting down main breaker  
  • Confirm with local electrical provider | What one method is not used to disconnect electric service? |
| | |
| 4) **Do not remove** electrical meters  
e) Control of commercial electrical services  
  1) Pay particular attention to position the switches are in  
  • Information needs to be accurately relayed to fire investigators  
  2) Usually located in common box areas on exterior of building | What are the rules when interrupting commercial service? |
| | |
| 3) Follow local fire agency protocols or electrical company protocols  
  • Generally, small commercial businesses may be controlled by shutting down main breaker  
  • Large commercial business controlled by stair stepping  
  • Smaller breakers to the main breaker | What assumptions can be made regarding all electric service? |
| | |
| f) In all situations, assume…  
  1) There may be additional electrical supply or services **not secured** | |


<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Residential services with illegal wiring</td>
<td>How can a building with gas service be identified?</td>
</tr>
<tr>
<td>3) Commercial services with backup generators or battery electrical services</td>
<td></td>
</tr>
</tbody>
</table>

2. Natural gas

a) Identified with service meter
   1) Small meters for residential
   2) Larger meters for commercial

b) Control of gas meters is shut-off with a quarter turn valve
   1) Crescent wrench
   2) Spanner wrench with gas shut-off configuration

3. Propane service

a) Usually identified as a round ended tank (compressed gas)

b) Residential services can range in size from 20-300 gallons

c) Commercial services can range in size from 500-3,000 gallons and bigger for institutional facilities

How is natural gas service shut-off?

What is the average size of a residential tank?
### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>d)</td>
<td>Control of these tanks or containers involves controlling a screw valve into the shut-off position</td>
</tr>
<tr>
<td></td>
<td>1) Be aware of multiple shut-offs depending on type of occupancy</td>
</tr>
<tr>
<td>4.</td>
<td>Water service</td>
</tr>
<tr>
<td>a)</td>
<td>Usually a single entry service line</td>
</tr>
<tr>
<td>b)</td>
<td>Size can be dependant on type of occupancy</td>
</tr>
<tr>
<td>c)</td>
<td>Be aware of multiple shut-offs</td>
</tr>
<tr>
<td>d)</td>
<td>Fire agency policies may dictate shut-off at the meter location</td>
</tr>
<tr>
<td>e)</td>
<td>Control is usually completed with screw down type valve</td>
</tr>
<tr>
<td></td>
<td>1) May be necessary if water lines are damaged or to control water flow</td>
</tr>
</tbody>
</table>

### APPLICATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>How is the flow shut-off on a propane tank?</td>
<td></td>
</tr>
<tr>
<td>What diameter is the average water service?</td>
<td></td>
</tr>
<tr>
<td>What is the purpose of scene perimeter control?</td>
<td></td>
</tr>
</tbody>
</table>
### III. SCENE AND BUILDING CONTROL

A. Maintain scene access for security purposes and safety considerations

B. May need to provide escort services for home owners or business owners
   1. If need is identified for citizen(s) needing access
   2. Appropriate safety gear such as hard hats and appropriate shoes

C. Depending on operations, fire agency may need to apply
   1. Lockout kit to prevent re-energizing
   2. Red tag services advising conditions
   3. Sentry or guard posted to prevent re-energizing of electrical services may be necessary

### IV. RESTORING SERVICES

A. Dependant on agency policies

B. If damage is superficial without penetration of the building's fire protective qualities services may be restored

C. If damage is extensive
   1. Request utility company services for control of meters, valves, and/or other components
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Usually requires building inspector or other county/city department for release or service restoration</td>
<td>Who would make the decision to restore services?</td>
</tr>
</tbody>
</table>
SUMMARY:

Many conditions will exist during fire fighting operations that may cause harm, injury, or death. By being aware of potential hazards associated with electricity, gas, and water fire fighters will be better prepared to deal with the most common services associated with both residential and commercial buildings. Following the basic guidelines should confirm the fire fighter's successful completion of another shift.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 14 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: NAVIGATIONAL TOOLS USED BY THE FIRE SERVICE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of navigational tools used by the fire service by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Map Interpreting Program Text, CDF

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Various samples of maps and navigational tools

REFERENCES:

- Map Interpreting Program Text, CDF

PREPARATION:

Maps have long been an integral element in the fire service. From urban incidents to wildland operations, maps, compasses, and GPS receivers have provided the fire service with the information necessary to perform their required task. In order to plan for and respond to various incidents, a familiar understanding of maps and navigational tools becomes essential for making intelligent decisions.
## I. MAP TERMINOLOGY

### A. Map

1. Permits you to visualize a portion of the earth's surface with pertinent features properly positioned to facilitate planning
2. North is normally at the top of all maps
3. Additional information is found on most maps at the bottom and on the margins

### B. Land measurements

1. Sections
2. Townships
3. Ranges

### C. Symbols

1. Indicate objects on the ground
2. May differ on different maps

### D. Colors

1. Used alone or with symbols
2. Easier identification of features
3. Provide a more natural appearance and contrast

### E. Scale

1. The scale of the map is the ratio of horizontal distance on the map to the corresponding horizontal distance on the ground
2. Normally found on the bottom of the map

---

**APPLICATION**

What is the purpose of a map?

What are some common symbols found on maps?
II. TYPES OF MAPS
A. Administrative maps
   1. Breakdown of boundaries and districts
   2. Provide access to emergency scenes
   3. Response areas for dispatch
B. Highway maps
   1. Best used for long travel runs
   2. Most maps show distance between cities and towns
   3. Many different styles of highway maps
C. Street maps
   1. Best used in heavy populated areas with many streets and buildings
   2. May provide hydrant locations
   3. May provide city and county boundary lines
   4. Many different styles of street maps
      a) Thomas Brothers is most popular

III. COMPASS
A. An instrument used for showing direction
B. Consists of a magnetic needle that moves freely on a pivot and pointing to magnetic north
C. Magnetic north and true north do not coincide
D. Three basic parts
   1. The magnetic needle
   2. A revolving 360° dial

What types of maps are commonly used in the fire service?

Where would you most likely use a compass in the fire service?
3. A transparent base plate

D. For correct readings, always hold the compass level so that the needle swings freely

IV. GLOBAL POSITIONING SYSTEM (GPS)

A. Satellite system used in navigation

B. Allows you to determine your position 24-hours-a-day, any place on the globe, and in any kind of weather

C. Advantage is that you know your location with certainty
   1. GPS will show your position on a map with a error of between 15-100 feet

D. Incorporated into dispatch and radio systems
   1. May be mounted in vehicles
      a) Provide maps and directions to emergency incidents

E. Provide a latitude and longitude coordinates of a certain location
   1. Helicopters and airplanes use latitude and longitude for navigation
   2. Emergency personnel can relay latitude and longitude coordinates to aircraft responding to an emergency incident to provide a precise location for a landing zone

What is the advantage of using a GPS?
**SUMMARY:**

As a fire fighter, it is possible you will be called upon to determine the best route from any point to an emergency scene. It is important to be familiar with the use of maps, compasses, and GPS receivers. Having the skills of these navigational tools, allows you to effectively locate and respond to emergency incidents.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Map Interpreting Program Text, CDF in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INTRODUCTION TO BUILDING CONSTRUCTION

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9, 3-3.11, 4-3.2, and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of basic building construction by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Building Construction Related to the Fire Service, IFSTA, Second Edition
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION:

It is essential that you understand how a building is constructed in order to understand the behavior of the building under fire conditions. A basic knowledge of buildings is an important element of the decision-making process in successful fireground operations. History has shown that failure to recognize the potential dangers presented by a particular type of construction and the effects a fire has on it can lead to deadly results.
I. TYPES OF BUILDING CONSTRUCTION
   A. Construction classifications
      1. Type of materials used during construction
      2. Fire-resistance rating of structural components
   B. Five types
      1. Type I
         a) Fire-resistive construction
      2. Type II
         a) Noncombustible or limited combustible construction
      3. Type III
         a) Ordinary construction
      4. Type IV
         a) Heavy timber construction
      5. Type V
         a) Wood-frame construction
   C. Construction type is determined by the building's
      1. Size (floor area)
      2. Height
      3. Occupancy
      4. Architecture

II. TYPE I CONSTRUCTION
   A. Provides structural integrity during a fire
   B. May be referred to as
      1. Fire-resistive construction

What factors will influence the type of construction required for a given building?
2. Type I – fire-resistive construction  
   a) May be written as I-FR  
3. Type FR  

C. Structural elements must be  
   1. Steel  
   2. Iron  
   3. Concrete  
   4. Masonry  

D. Compartmentation provided by walls and permanent partitions  
   1. Noncombustible, fire-resistive construction  
      a) Exterior walls are rated 3 or 4-hour  
      b) Interior structural members are rated 1, 2, or 3-hour  
   2. Exception for permanent, nonbearing partitions  

E. Unlimited in height with a few exceptions  
   1. H-1 (1 story)  
   2. H-6 and H-7 (3 stories)  
   3. H-8 (10 stories)  

F. Usually sound in a fire  
   1. Collapse threat is minimal  
   2. Primary fire hazard is the contents of the structure  
      a) Occupants and fire fighters often endangered by products of combustion  

G. Examples  
   1. Hospitals  
   2. High-rise buildings
III. TYPE II CONSTRUCTION

A. Often referred to as noncombustible construction

B. Three subcategories

1. Type II-fire-resistive
   a) May be written as II-FR
   b) Structural elements same as Type I
   c) 4-hour exterior walls

2. Type II-1-hour
   a) May be written as II-1-Hour
   b) Any approved noncombustible materials
   c) 1-hour exterior with 1-hour throughout

3. Type II-nonrated
   a) May be written as II-N
   b) Noncombustible structural members
   c) Sheet metal buildings

4. Primary differences
   a) Hourly fire-resistive ratings
   b) Allowable materials in the construction assemblies

C. Provides less fire resistance than Type I

Why is "noncombustible" a misleading term?

1. Noncombustible is misleading because
   a) Refers to the fuel contributed by the structural components, not its resistance to the spread of fire

2. Does not withstand the effects of fire
   a) Large content fires may destroy the structural integrity of unprotected steel

3. Less stable in terms of collapse
4. Another potential problem is the type of roof
   a) Often have flat, built-up roofs
   b) Contain felt, insulation, and roofing tar
   c) Fire extension to the roof can eventually cause the entire roof to become involved and fail

D. Examples
   1. Factories
   2. Mid-rise buildings
   3. Stores
   4. Warehouses

IV. TYPE III CONSTRUCTION
A. Often referred to as ordinary construction
   1. Brick
   2. Wood joist
   3. Floors, roofs, and interior partitions often wood
B. Easier to ignite and less resistance to burn-through or collapse than Types I, II, and IV
C. Exterior walls and structural members constructed of noncombustible or limited combustible materials
D. Interior structural members are completely or partially constructed of wood
   1. Smaller dimension than wood required for heavy timber construction
E. Primary fire concern is fire and smoke spreading through concealed spaces
   1. Between walls, floors, and ceilings
   2. Fire may burn here and feed on the combustible construction materials in the space

What is an example of Type II construction?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Hazard can be reduced by placing fire stops inside these spaces</td>
<td>What is a fire stop?</td>
</tr>
<tr>
<td>a) Wood block placed within a wall to prevent the spread of fire</td>
<td></td>
</tr>
<tr>
<td>F. Two subcategories</td>
<td></td>
</tr>
<tr>
<td>1. Type III-1-hour</td>
<td></td>
</tr>
<tr>
<td>a) May be written as III-1-Hour</td>
<td></td>
</tr>
<tr>
<td>b) 4-hour exterior walls with 1-hour throughout</td>
<td></td>
</tr>
<tr>
<td>2. Type III-nonrated</td>
<td></td>
</tr>
<tr>
<td>a) May be written as III-N</td>
<td></td>
</tr>
<tr>
<td>b) 4-hour exterior walls with any approval material throughout</td>
<td></td>
</tr>
<tr>
<td>3. Structural elements may be of any approved material</td>
<td></td>
</tr>
<tr>
<td>4. Primary difference between III-1-hour and III-N</td>
<td></td>
</tr>
<tr>
<td>a) III-1-hour requires 1-hour fire-resistant construction throughout</td>
<td></td>
</tr>
<tr>
<td>b) No requirement in III-N structures</td>
<td></td>
</tr>
</tbody>
</table>

What are some examples of Type III construction?

G. Examples
1. Concrete tilt-up buildings
2. May also include residential, commercial, and manufacturing properties
V. TYPE IV CONSTRUCTION

A. Often referred to as heavy timber construction

B. Presents a heavy fire load
   1. Good fire resistance due to bulk
      a) Difficult to ignite
      b) Withstand flame better than exposed steel
      c) Lack of void spaces
   2. Requires large quantities of water
      a) Due to large surface area
      b) Fires beyond incipient phase may be beyond the capabilities of manual fire fighting

C. Structural elements
   1. Exterior and interior walls and their associated structural members made of noncombustible or limited combustible materials
      a) May be any approved by code
   2. Other interior structural members are made of solid or laminated wood with no concealed spaces
      a) Wood dimensions large enough to be considered heavy timber
      b) Dimensions vary depending on code
   3. Permanent partitions and members of the structural frame must be at least 1-hour

D. Primary fire hazard is the massive amount of combustible contents present
   1. Both in structural timbers and contents
   2. Remain stable for long periods, but give off tremendous heat
      a) Exposure protection problems
### Exterior walls
1. 4-hour with interior bearing walls - 1-hour

**VI. TYPE V CONSTRUCTION**

A. Typically used in single-family residences
B. Often referred to as wood frame construction
   1. Walls, floors, and roofs are wood or other combustible material
      a) More prone to extension than noncombustible construction
      b) Smaller dimensions than those used in heavy timber construction
C. Fire hazard is the unlimited potential for fire extension within the building of origin and to nearby structures
D. Subcategories
   1. Type V-1-hour
      a) May be written as V-1-Hour
      b) 1-hour throughout
   2. Type V-nonrated
      a) May be written as V-N
      b) Any approved material

**Examples**
1. Single family homes
2. Small apartments
3. Strip malls

### VII. EFFECTS OF FIRE ON COMMON BUILDING MATERIALS

#### A. Wood

1. Newer construction
   a) Often contains composite building materials that may be highly combustible and produce significant toxic gases
      1) Wood fibers
      2) Plastics
      3) Other substances joined by glue or resin binders
         - Plywood
         - Particle board
         - Fiberboard
         - Paneling

2. Size of the wood
   a) Smaller the wood size, more likely to lose structural integrity
   b) Can be protected by drywall or gypsum to increase their resistance to fire

3. Moisture content
   a) Affects the rate of burn
   b) Higher moisture content, slower burn rate

4. Water used during fire suppression
   a) Does not have a substantial negative effect on structural strength of wood
   b) Stops the charring process
### B. Masonry

1. **Materials**
   
a) **Brick and stone**
   
   1) Usually veneer walls
   
   2) Attached to the outside of some load-bearing frame structure
   
   b) **Concrete block**
   
   1) May be load-bearing walls

2. **Commonly used for fire wall assemblies**

3. **Minimally affected by fire and exposure to high temperatures**
   
a) **Brick**
   
   1) Rarely show signs of integrity loss or serious deterioration
   
   b) **Stone**
   
   1) May spall or lose small portions of their surface
   
   2) Mortar may be subject to more deterioration
   
   c) **Concrete block**
   
   1) May crack
   
   2) Usually retains strength and structural stability

4. **Rapid cooling from water used to extinguish a fire may cause masonry to crack and spall**

### C. Cast iron

1. **Rarely used in modern construction**
   
a) **Commonly used as an exterior surface covering**

2. **Holds up well to fire and intense heat**
3. May crack or shatter when rapidly cooled with water
4. Bolts that hold the cast iron to the building can fail
   a) Large, heavy sections of metal will fall

D. Steel
1. Primary material for modern building construction
2. Elongates when heated
   a) Up to 4 inches for a 50-foot beam
   b) Can push out load-bearing walls
      1) Causing collapse
3. If ends restrained, the steel buckles and fails in the middle
4. Failure can be anticipated when temperature reaches 1,000°F
   a) Variables
      1) Size
      2) Load
      3) Composition
      4) Geometry
5. Water can cool the steel and reduce the risk of collapse

E. Reinforced concrete
1. Concrete internally fortified with steel reinforcement bars or mesh
   a) Compressive strength of concrete
   b) Tensile strength of steel
2. Does not perform well under fire conditions
   a) Loses strength
   b) Spalls
c) The bond between the concrete and the steel reinforcement can fail

F. Gypsum
1. Inorganic product used to construct plaster and plasterboard
2. Has a high water content
   a) Excellent heat resistant and fire-resistive properties
   b) Evaporation requires high heat
3. Used to provide insulation to steel and wood structural members

G. Glass
1. Used in sheet form for doors and windows
   a) Not typically used for structural support
2. Heated glass may crack and shatter when water is applied

H. Fiberglass
1. Used for insulation
2. Glass component is not a significant fuel
3. Material used to bind the fiberglass may be combustible and difficult to extinguish

VIII. DANGEROUS BUILDING CONDITIONS
A. Fire loading
1. Maximum heat that can be produced if all the combustible materials in a given area burn
2. Arrangement of materials affects fire development and severity
3. One of the most critical hazards in commercial and storage facilities
   a) Fire may override capabilities of a sprinkler system
   b) Access problems for fire fighters
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</thead>
<tbody>
<tr>
<td>B.  Combustible furnishings and finishes</td>
<td></td>
</tr>
<tr>
<td>1.  Contribute to fire spread and smoke production</td>
<td></td>
</tr>
<tr>
<td>2.  Major factor in loss of lives</td>
<td></td>
</tr>
</tbody>
</table>
C. Roof coverings
   1. Final outside layer placed on top of a roof assembly
   2. Common materials
      a) Wood
      b) Composite shingles
      c) Tile
      d) Slate
      e) Tin
      f) Asphalt and tar paper
   3. Combustibility
      a) Can cause conflagrations from flaming embers traveling from roof to roof
      b) Wood shake shingles can significantly contribute to fire spread
         1) Even when treated with a fire retardant
         2) Particular problem in wildland/urban interface situations
         3) Must use aggressive exposure protection tactics

D. Wooden floors and ceilings
   1. Contribute to fire loading
   2. Prolonged exposure increases the chances of collapse

E. Large, open spaces
   1. Contribute to fire spread
   2. Found in warehouses, churches, large atriums, common attics or cocklofts, and theaters
   3. Proper ventilation is essential
F. Building collapse
   1. Can seriously injure or kill fire fighters
   2. Construction type and age factors into potential for collapse
      a) Lightweight or truss construction will give way to fire much quicker than a heavy timber building
      b) Older buildings exposed to weather and/or poorly maintained are more likely to collapse than newer buildings
   3. Results from the damage to the structural system
      a) The time this takes varies due to
         1) Fire severity
         2) Type of construction
         3) Presence of heavy equipment or materials on upper floors
         4) General condition
   4. Indications of collapse
      a) Cracks or separations in walls, floors, ceilings, and roof structures
      b) Structural instability
         1) Presence of tie rods and stars that hold the building together
      c) Loose bricks, blocks, or stones falling from the building
      d) Deteriorated mortar
      e) Distorted structural members
      f) Fire beneath floors that support extreme weight
      g) Prolonged fire exposure
      h) Unusual creaks and cracking noises
i) Structural members pulling away from walls
j) Excessive weight of building contents

IX. FORCES ON A BUILDING

A. Loading

1. Dead load
   a) Characteristics
      1) Fixed in location
      2) Accurately known
   b) Weight of any permanent part of a building
      1) Roofs
      2) Floor slabs or decks
      3) Interior walls
      4) Stair systems
      5) Exterior walls
      6) Columns
   c) Any permanent equipment
      1) Heating plants
      2) Elevator hoists
      3) Pumps

2. Live load
   a) Not fixed or permanent
      1) Building contents
      2) Occupants
      3) Weight of snow or rain

3. Uniformly distributed loads
   a) Applied constantly over a large area
### 4. Concentrated load
- a) Applied at one point or over a small area
- b) Produce high localized forces

### 5. Static load
- a) Steady or applied gradually
  - 1) Dead load
  - 2) Snow load
  - 3) Many live loads

### 6. Dynamic load
- a) Involve motion
  - 1) Wind
  - 2) Moving vehicles
  - 3) Earthquakes
  - 4) Vibrations
  - 5) Falling objects
- b) Capable of delivering energy to a structure in addition to the weight of an object
  - 1) Failure of trusses or columns

### 7. Impact load
- a) In motion when applied
- b) Examples
  - 1) Hose stream
  - 2) Demolition ball

### B. Directional loads
1. Axial load
   - a) Applied to the center of the cross-section of a member and perpendicular to that cross-section
   - b) Can be either tensile or compressive
### Eccentric Load

- **a)** Perpendicular to the cross-section of the structural member
  - 1) Does not pass through the center of the cross-section
- **b)** Can be either tensile or compressive
- **c)** Creates stresses that vary across the cross-section

### Torsional Load

- **a)** Offset from the center of the cross-section of the member and at an angle to or in the same plane as the cross-section
- **b)** Produces a twisting effect that creates shear stresses in a material

### External Loads

#### Compression Load
- **a)** A force that tends to push materials together

#### Tension Load
- **a)** A force that pulls materials apart

#### Shear
- **a)** A force that tends to break material by causing its molecules to slide past each other

### Basic Construction Styles

#### Conventional Construction

- **1.** Size = strength
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>2. Mass = strength</td>
<td></td>
</tr>
<tr>
<td>3. Structural parts and members are usually not interdependent (rafter-joist)</td>
<td></td>
</tr>
</tbody>
</table>

B. Lightweight construction
1. Less than average size and weight
   a) 2"x4" or 2"x3"
2. Compression and tension = strength
3. Framing members are interdependent on one another
   a) When one fails, it causes significant stress on others

What is lightweight construction?
SUMMARY:
A basic understanding of the types of buildings, floors, and walls gives you an advantage on the fireground when combined with your fire behavior knowledge. You will be able to predict where the fire will go and the tactics you will use to extinguish them.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: BUILDING COMPONENTS

TIME FRAME: 2:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9, 3-3.11, 4-3.2, and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of building components by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Building Construction Related to the Fire Service, IFSTA, Second Edition, Chapters 6-13

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Building Construction Related to the Fire Service, IFSTA, Second Edition

PREPARATION:

You must first understand a building's components before you can understand how the building will behave under fire conditions. Fire fighters from any size community can be faced with difficult situations when structural fires occur because of how a building's components affect the course of a fire.
### I. FOUNDATION

**A. Transfers the structural load of a building to the ground**

1. Must support the dead load of the building and the live load of its contents
2. Type of foundation depends on the type of building and soil conditions at the site

**B. Shallow foundations**

1. Transfer the weight of the building to the soil at the base of the building
2. Use footings to transmit the load
   - Wall footing
     1) Continuous strip of concrete that supports a wall
   - Column footing
     1) Square pad of concrete that supports a column
   - Grillage footing
     1) Layers of beams placed at right angles to each other
        - Usually encased in concrete
     2) Distribute the load of the column over the area of the footing

**C. Deep foundations**

1. Penetrate the layers of soil directly under a building to reach soil at a greater depth that can support the weight of the building

---

**What is the purpose of a foundation?**

**What is a "shallow" foundation?**

**What is a "deep" foundation?**
2. Use piles or piers to transmit the load  
   a) Piles  
      1) Driven into the ground  
      2) Develop their load-carrying ability either through friction with the surrounding soil or by being driven into contact with rock or a load-bearing soil layer  
      3) Can be timber, steel, or precast concrete  
   b) Piers  
      1) Constructed by drilling or digging a shaft and then filling it with concrete

D. Foundation walls  
   1. Needed for a basement

E. Shoring and underpinning  
   1. Strengthen and stabilize an existing foundation

II. FLOORS

A. Concrete floors  
   1. Common in fire-resistive construction  
   2. Can be either poured-in-place or precast  
   3. Can be ordinary reinforced, prestressed, or post tensioned  
   4. Design depends on the structural system of the basic building  
      a) Cast-in-place floor would not be mixed with precast columns  
   5. Structurally self-supporting

What is the most common material for a floor?
B. Steel-supported floors
   1. Open web joists (bar joists) or trusses
      a) Can support precast concrete panels or wood decking
   2. Steel beams
      a) Used to support precast concrete slabs
   3. Light-gage steel joists
      a) Used to support metal deck or wood panel flooring systems

C. Wood-supported floors
   1. Fundamental combustibility
      a) Can be weakened and ultimately destroyed in the course of a fire
      b) Typically have combustible voids through which fire can travel
   2. Often covered by concrete or other materials
      a) Sudden failure has killed many fire fighters
         1) 12 in New York in 1966
         2) 4 in Seattle in 1995
   3. Most substantial found in Type IV construction
      a) Concealed spaces not permitted
   4. In ordinary masonry and wood-frame construction, wood floors are supported by joists

D. Floor coverings
   1. Structural floor system usually covered with a finished floor material
      a) Carpet
b) Tile

c) Oak blocks

2. Make it difficult to detect the exact type of floor system

3. Flammability

a) Was considered insignificant in overall fire safety

1) It was assumed anything located at floor level would be at the coolest part of the room

2) Floor coverings would be the last part of a room to become involved

b) Codes currently contain requirements limiting the flammability of floor coverings

4. Raised access flooring

a) Commonly found in spaces containing computer equipment

b) Used to route wiring and cables

c) Plastic insulation around communication wiring can provide fuel to an electrical fire

III. FLOOR COMPONENTS

A. Wood

What does a girder post do?

1. Girder post or column

a) Provides link and support from pier to girder beneath

2. Girder

a) Full dimension supporting member that runs parallel to ground from pier to pier
3. Laminated beams or "glulams"
   a) Pieces of wood glued together and formed into thick beams
   b) Lengths of 100 feet can be supported

4. Box beams
   a) Composite beams with vertical plywood webs
   b) High strength to weight ratio

5. Plywood beams
   a) "I" beam cross-section
   b) Box beam cross-section
   c) Fabricated using nails, bolts, glue, etc.

6. Trusses
   a) Manufactured off-site
   b) May consist of wood and steel components

7. Floor joists
   a) Attached parallel to ground
   b) Perpendicular to floor support components
   c) Commonly attached with metal joist hangers

B. Steel
   1. Girder
   2. Beams
   3. Trusses
   4. Joists
IV. CEILINGS

A. Ceiling materials
   1. Plaster
      a) Fire-resistive cementitious material
      b) Sets and hardens to form a finished surface
   2. Gypsum board
      a) Popular ceiling material
      b) Less labor intensive than plaster
      c) Can be attached directly to the underside of a floor
      d) Can be suspended several inches beneath the floor
   3. Mineral tiles
      a) Commonly used in a suspended ceiling
      b) Tiles are lightweight
      c) Contain perforations for acoustics

B. Interstitial ceiling spaces
   1. Buildings that require extensive mechanical equipment above the ceiling
      a) Hospitals
      b) Laboratories
   2. Amount of combustibles is usually low
   3. Fire sprinklers may be installed
V. WALL DESIGNS AND CONSTRUCTION FEATURES

A. Nonload-bearing walls
   1. A wall that only supports its own weight

B. Load-bearing wall
   1. A wall that supports a vertical load in addition to its own weight

   a) Much more likely to jeopardize firefighters if it collapses

C. Curtain wall
   1. An exterior wall supported by the structural frame of the building

D. Enclosure wall
   1. An interior wall that creates a vertical opening for a stairway, elevator, duct space, etc.
      a) Connects two or more floors
   2. May encourage/facilitate vertical fire extension

E. Fire partition
   1. An interior wall that restricts the spread of fire, but does not qualify as a fire wall

F. Fire wall
   1. A wall of sufficient durability and stability to withstand the effect of the most severe anticipated fire
      a) Openings within the walls must be protected

What is a nonload-bearing wall?

What is the major hazard during a fire?

What is a fire wall?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G. Parapet wall</strong></td>
<td>Where might you see a parapet wall?</td>
</tr>
<tr>
<td>1. A portion of an exterior fire or party wall which extends above the roofline</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>H. Partition wall</strong></th>
<th>What is a party wall?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. An interior wall not more than one story in height that separates two areas in the same building</td>
<td></td>
</tr>
<tr>
<td>a) Is not intended to serve as a fire barrier</td>
<td></td>
</tr>
</tbody>
</table>

| **I. Party wall** | |
|-------------------| |
| 1. A common wall separating two occupancies | |

| **J. Cavity wall** | |
|-------------------| |
| 1. A wall of two parallel vertical brick walls with an airspace between them | |
| a) Connected by metal ties | |

| **K. Faced wall** | |
|-------------------| |
| 1. A wall of two different masonry materials bonded together as a single wall | |
| a) A facing vertical wall | |
| b) A backup vertical wall | |

| **L. Hollow wall** | |
|--------------------| |
| 1. A wall consisting of two parallel vertical brick walls with an air space between them | |
| a) No ties to hold the walls together | |

| **M. Sandwich wall** | |
|----------------------| |
| 1. A nonbearing wall whose outer face encloses an insulating core material | |
## Exterior wall

1. Wood frame construction
   a) Balloon frame
      1) Studs run from mudsill to the ceiling in unbroken fashion
      2) Apparent in two-story occupancies
   b) Platform frame
      1) Supports weight of structural component
         - Roof
         - Higher floors
      2) Supports own weight

2. Non-load-bearing
   a) Supports its own weight only
   b) Used to partition occupancy

3. Fire walls
   a) Divides occupancy into finite areas to restrict fire spread

## VI. DOORS

### A. Types by operation

1. Swinging
   a) Rotates around a vertical axis
   b) Single or double leaf
   c) Single acting
      1) Swings in one direction
   d) Double acting
      1) Swings in two directions

How are doors categorized?
2. Sliding
   a) Suspended from an overhead track
   b) Floor guides provided
   c) Designs
      1) Surface sliding
      2) Pocket sliding
      3) Bypass sliding

3. Folding
   a) Hung from an overhead track
   b) Bifolding or multifolding

4. Vertical
   a) Opens in a vertical plane
   b) Often found in industrial occupancies
   c) Can be single leaf or have two or more sections

5. Revolving
   a) Constructed with two or more sections or wings in a circular frame
   b) Designed to minimize the flow of air through a door opening
   c) Can present problems for fire fighters
      1) Does not allow for movement of hoseline or equipment into the building
   d) Most have a collapsing mechanism
      1) Allows the wings to go into a "book-fold" position
B. Styles and construction

1. Wood panel
2. Flush (slab)
3. Glass
4. Metal

VII. FIRE DOORS

A. Classifications

1. Must have some degree of fire resistance similar to the fire-resistive walls

2. Ratings
   a) 4-hour
   b) 3-hour
   c) 1½-hour
   d) 1-hour
   e) ¾-hour
   f) ½-hour
   g) ¾-hour (20 minute)

3. Building codes determine the classification

B. Testing

1. In accordance to the procedures in NFPA Standard #252, "Standard Methods of Fire Tests of Door Assemblies"
   a) Also identified as American Society for Testing and Materials (ASTM) E-152

2. Not as rigid as those required for fire-resistive walls

Who or what determines the fire-resistant rating for fire doors?
3. Fire door must remain in place during the test
   a) Some warping is permitted
   b) Intermittent passage of flames is permitted after first 30 minutes of the test
4. Must remain in place when subjected to a hose stream immediately following the fire test

C. Frames and hardware
   1. To be effective, fire door must remain closed and attached to the fire-rated wall

D. Construction and operation
   1. Rolling steel
      a) Constructed of interlocking steel slats
      b) Other operating components
         1) Releasing device
         2) Governor
         3) Counterbalance mechanism
         4) Wall guides
      c) Closes under the force of gravity when a fusible link melts
         1) Motor-driven doors are available
      d) May be dangerous to fire fighters who may not be able to see the door through heavy smoke
   2. Horizontal sliding
      a) Can be constructed from a variety of materials
         1) Commonly constructed of a metal-covered, wood-core door
      b) Slides into position along a track either by gravity or a counterweight after a fusible link melts
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>3. Swinging</td>
<td></td>
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<tr>
<td>a) Used in stairwell enclosures and corridors</td>
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<tr>
<td>b) Can be constructed of a variety of materials</td>
<td></td>
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<tr>
<td>c) Slides into position by a counterweight after a fusible link melts</td>
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<tr>
<td>4. Special type</td>
<td></td>
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<tr>
<td>a) Freight and passenger elevators</td>
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<tr>
<td>b) Service counter openings</td>
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<tr>
<td>c) Security (bullet-resisting) doors</td>
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<tr>
<td>d) Dumbwaiters</td>
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<tr>
<td>e) Chute openings</td>
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<tr>
<td>5. Glazing</td>
<td></td>
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<tr>
<td>a) Must be fire rated</td>
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<tr>
<td>b) Restrictions on the allowable area of glass are determined by doors fire-resistance rating</td>
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<tr>
<td>6. Louvers</td>
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<tr>
<td>a) Permit ventilation while the door is closed</td>
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<tr>
<td>b) Must close in the event of fire</td>
<td></td>
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<tr>
<td>1) Usually by means of a fusible link</td>
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<tr>
<td>7. Closing devices</td>
<td></td>
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<tr>
<td>a) Can be either automatic or self-closing</td>
<td></td>
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<tr>
<td>b) Automatic</td>
<td></td>
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<tr>
<td>1) Normally held open and closes automatically when operating device is activated</td>
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<tr>
<td>c) Self-closing</td>
<td></td>
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<tr>
<td>1) Normally closed and will return to a closed position if it is opened and released</td>
<td></td>
</tr>
</tbody>
</table>
d) Door closers
   1) Used with sliding or swinging fire doors
   2) Uses a hold-open device or can be self-closing

e) Door holders
   1) Used with rolling, sliding, or swinging fire doors
   2) Used with a suitable door closer
   3) Electromagnetic door holder is used in conjunction with a smoke detector

f) Door operators
   1) Used with sliding fire doors mounted on a level or incline track
   2) Operates using an electronic operator to open and close the door
   3) Fusible link disconnects the door from the electric operator

VIII. WINDOW ASSEMBLIES
   A. Components
      1. Frame
         a) Sill
            1) Lowest horizontal member
            2) Supports the weight of the hardware and sash
         b) Sash
            1) Framed unit that may be included within a window frame
            2) May be fixed or openable
         c) Side jamb
         d) Head jamb
2. One or more sashes
3. All necessary hardware to make a complete unit

B. Types

1. Fixed
   a) Consists of a frame and a glazed stationary sash
   b) Can be used alone or in combination with movable windows
   c) Example
      1) Large show windows in mercantile occupancies

2. Movable
   a) Double-hung
      1) Has two sashes
      2) Can move past each other in a vertical plane
      3) Used in residential occupancies
   b) Single-hung
      1) One movable sash
   c) Casement
      1) Side-hinged sash
      2) Swings outward
   d) Horizontal sliding
      1) Two or more sashes
      2) At least one moves horizontally
   e) Awning
      1) One or more top-hinged sashes
      2) Swings outward
f) Jalousie
   1) Similar to an awning window
   2) Large number of narrow overlapping glass sections

g) Projecting
   1) Swings outward
   2) Slides upward and downward in grooves
   3) Operated by a push bar

h) Pivoting
   1) Sash that pivots horizontally or vertically about a central axis
   2) Part swings inward; part swings outward

C. Security
   1. Common method is attaching metal bars or screens to the exterior of the window frame
      a) May be fastened to the building
      b) Embedded in masonry
      c) Mounted on hinges and locked

D. Access panels
   1. Used in windowless walls
   2. Intended to be breachable points that can be opened to facilitate ventilation or penetration of hose streams
   3. Must be identifiable from the outside

E. Fire windows
   1. Used where it is necessary to block the communication of fire through a window opening
      a) Windows located in the facing walls of closely spaced buildings
b) Windows adjacent to fire escapes or exterior stairs
   1) Wired glass is required in windows close to exterior stairs
2. Constructed with steel frames
3. Alternatives to fire windows can be used
   a) Exterior sprinkler systems
   b) Steel shutters

IX. INTERIOR FINISH

A. Combustible interior finishes

1. Can spread fire rapidly over the surface
2. Degree of fire spread is called the "surface burning characteristics" of the material
3. Influencing the speed of flame spread
   a) Composition of the material
   b) Ventilation
   c) Shape of the space in which the materials is installed
   d) Whether the material is applied to the ceiling or wall

B. Flame-spread ratings

1. Steiner Tunnel Test is the most commonly used method for evaluating the surface-burning characteristics of materials
   a) Developed by A. J. Steiner in the late 1940s
   b) Produces a numerical evaluation of the flammability of interior materials
2. Classifications
   a) Building codes establish 3 classifications using a letter designation
   b) Intent is to restrict materials in vertical exits or exit corridors to those with low-flame spreads
   c) Class A
      1) Flame spread 0-25
      2) Required in vertical exits of most occupancies
   d) Class B
      1) Flame spread 26-75
      2) Required in corridors that provide exit access
   e) Class C
      1) Flame spread 76-200
      2) Maximum flame-spread rating

3. Smoke-developed rating
   a) Measure of the relative visual obscurity created by smoke from a tested material
   b) Also identified through the tunnel test

4. Significance
   a) It is not an absolute measure of the spread of fire
      1) Field applications and test conditions create a differing behavior
   b) May not produce an accurate correlation with the actual behavior of a material in a fire
      1) Due to effect of room shape, room dimensions, and fuel load
5. Fire-retardant coatings
   a) Can reduce flame-spread ratings of some interior finishes
   b) Types
      1) Intumescent paints
      2) Mastics
      3) Gas-forming paints
      4) Cementitious and miner-fiber coatings
   c) Valid treatments, but may be misused
   d) Only affect the coated surface
      1) Do not affect the untreated back side

X. BUILDING SERVICES AND SUBSYSTEMS
   A. Elevators
      1. Design, construction, and operation are stringently controlled and monitored by all levels of government
      2. Important means of egress during emergencies
         a) Americans with Disabilities Act of 1992
      3. Types
         a) Hydraulic
         b) Electric
      4. Safety devices
         a) Terminal switch
            1) Electric switch designed to stop the car
b) Buffers
   1) Large springs or hydraulic cylinders and pistons that act as shock absorbers should the terminal switch fail
   2) Cannot safely stop a free-falling car

c) Speed-reducing switch
   1) AKA speed governor
   2) Slows the drive motor if it begins to exceed a safe speed

d) Over-speed switch
   1) Connected to the speed governor
   2) Activated if the speed-reducing switch fails to slow the car sufficiently

e) Car safeties
   1) Tapered sets of steel jaws that wedge against the guide rails and bring the elevator to a stop
   2) Designed to stop a free-falling car

5. Cars
   a) Generally required to be built of noncombustible materials
      1) Except for decorative trim panels

6. Hoistways
   a) A vertical shaft in which the elevator car travels
      1) Includes the elevator pit
   b) Types
      1) Single
         • Contains only one elevator car
7. Elevator doors
   a) Single-slide doors
      1) One panel
      2) Slides horizontally to one side of the doorway opening
      3) Function slowly
   b) Two-speed doors
      1) Two panels
         • Located one behind the other
      2) Slide horizontally in the same direction
   c) Center opening doors
      1) Most common
      2) Two panels
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</thead>
<tbody>
<tr>
<td>3) Slide horizontally and meet in the middle</td>
<td></td>
</tr>
<tr>
<td>d) Vertical bi-part doors</td>
<td></td>
</tr>
<tr>
<td>1) Freight elevator doors</td>
<td></td>
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<tr>
<td>2) Two panels</td>
<td></td>
</tr>
<tr>
<td>3) Move vertically and meet in the middle</td>
<td></td>
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<tr>
<td>• One comes down from the top</td>
<td></td>
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<tr>
<td>• Other comes up from the bottom</td>
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<tr>
<td>e) Access panels</td>
<td></td>
</tr>
<tr>
<td>1) Emergency exit for an elevator car</td>
<td></td>
</tr>
<tr>
<td>2) Top exit</td>
<td></td>
</tr>
<tr>
<td>• On all electric traction elevators</td>
<td></td>
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<tr>
<td>• Open outward</td>
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<tr>
<td>3) Side exit</td>
<td></td>
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<tr>
<td>• In multiple hoistways</td>
<td></td>
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<tr>
<td>• Allow passengers to be transferred laterally from one car to another</td>
<td></td>
</tr>
<tr>
<td>f) Hoistway doors</td>
<td></td>
</tr>
<tr>
<td>1) Rated assemblies that work in conjunction with elevator car doors</td>
<td></td>
</tr>
<tr>
<td>2) Dependent on the car doors for their power</td>
<td></td>
</tr>
<tr>
<td>• Exception is the freight elevator</td>
<td></td>
</tr>
<tr>
<td>3) Locks</td>
<td></td>
</tr>
<tr>
<td>• Prevent the doors from opening when an elevator car is not at the landing</td>
<td></td>
</tr>
</tbody>
</table>
8. Emergency use
   a) Phase I operations
      1) Automatic recall of elevators in the case of fire
      2) Can be caused by the activation of smoke detectors, sprinkler water flow, or nearly any other fire alarm device
      3) Can be activated manually by the keyed switch in the terminal floor lobby
   b) Phase II operations
      1) Permit fire fighters to use the elevators after they arrive on scene
      2) Overrides the recall feature
   c) Safety considerations
      1) Do not use the elevator to travel to the fire floor
         - Stay below the fire floor
      2) Maintain the ability to communicate by radio or other means at all times
      3) Know the visual signal on the elevator control panel that indicates an impending elevator problem
      4) Be aware that the power may fail at any time
      5) Never use a fire or heat-damaged elevator
      6) Never use an elevator that has been exposed to water
      7) Become familiar with the emergency procedures required to operate elevators by training on actual systems
B. Moving stairs (escalators)
   1. Electrically powered steps that move continuously in one direction
   
      How fast do escalators travel?
      
   2. Speeds of either 90 or 120 feet per minute
   3. Vertical openings created by escalators may be protected in the same manner as other vertical openings
      a) Alternative could be use of a sprinkler draft curtain
   4. Escalators should be stopped when used in emergency situations

C. Stairs
   1. Basic components
      a) Handrail
      b) Baluster
      c) Newel post
      d) Nosing
      e) Stringer (carriage)
      f) Run (tread)
      g) Riser
      h) Building codes specific the exact acceptable dimensions
   2. Types of stairs
      a) Straight run stairs
         1) Extend a straight line for their entire length

      What are straight run stairs?
b) Return stairs
   1) Have an intermediate landing between floors and then reverse direction
   2) Common in modern construction

What are return stairs?

What are scissor stairs?

c) Scissor stairs
   1) Two separate sets of stairs
   2) Constructed in a common shaft

d) Circular stairs
   1) Grand stairs or convenience stairs
   2) Serve only two levels

e) Folding stairs
   1) Provide access to an attic space
      - Without a permanent access stair

f) Spiral stairs
   1) Allow stairs to be placed in a very small space
   2) Series of steps spiraling around a single column

3. As part of the means of egress
a) Protected stairs
   1) Critical part of the life safety system of a building
   2) Enclosed with fire-resistive construction
      - Noncombustible or limited combustible materials
b) Exterior stairs
   1) May be open or enclosed
   2) Must comply with requirements similar to those of interior enclosed stairs

c) Fire escapes
   1) Open metal stairs and landings
   2) Attached to the outside of the building
   3) Not permitted in new construction for decades

d) Unprotected stairs
   1) Access or convenience stairs
   2) Not protected from fire and smoke
   3) May serve as a path for fire and smoke
   4) Will not protect anyone using them from exposure to the products of combustion

D. Utility chases and vertical shafts
   1. Pipe chases
      a) Utility chase that contains the piping needed for building services
         1) Hot and cold potable water
         2) Drain lines
         3) Steam and hot water for heating
         4) Sprinkler risers
      b) Can spread fire and smoke if not properly protected
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Building codes specify shaft enclosure protection</td>
<td></td>
</tr>
<tr>
<td>1) Noncombustible or fire-resistive construction</td>
<td></td>
</tr>
<tr>
<td>2) Access openings must also be rated</td>
<td></td>
</tr>
<tr>
<td>2. Refuse chutes</td>
<td></td>
</tr>
<tr>
<td>a) Provides for the removal of trash and garbage from upper floors of a building</td>
<td></td>
</tr>
<tr>
<td>b) Large vertical chute that extends the length of the building</td>
<td></td>
</tr>
<tr>
<td>1) Openings on every floor</td>
<td></td>
</tr>
<tr>
<td>c) Required to be constructed of noncombustible material with rated doors</td>
<td></td>
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<tr>
<td>d) Sprinklers may be required at the top and bottom</td>
<td></td>
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<tr>
<td>3. Linen chutes</td>
<td></td>
</tr>
<tr>
<td>a) Provide for the removal of soiled linens from upper floors of a building</td>
<td></td>
</tr>
<tr>
<td>b) Similar in construction as a refuse chute</td>
<td></td>
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<tr>
<td>E. HVAC systems</td>
<td></td>
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<tr>
<td>1. Components</td>
<td></td>
</tr>
<tr>
<td>a) Outside air intakes</td>
<td></td>
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<tr>
<td>b) Fans</td>
<td></td>
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<td>c) Air filtration</td>
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<td>d) Air heating and cooling equipment</td>
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<tr>
<td>e) Air ducts</td>
<td></td>
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<tr>
<td>2. Smoke and fire spread</td>
<td></td>
</tr>
<tr>
<td>a) Can quickly transport products of combustion to uninvolved areas</td>
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<tr>
<td>b) Smoke or fire dampers protect duct penetration</td>
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<tr>
<td>XI. ROOFS</td>
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<td>----------</td>
<td></td>
</tr>
<tr>
<td>A. Architectural styles</td>
<td></td>
</tr>
<tr>
<td>B. Supporting systems</td>
<td></td>
</tr>
<tr>
<td>C. Roof decks</td>
<td></td>
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<tr>
<td>D. Roof coverings</td>
<td></td>
</tr>
<tr>
<td>E. Fire ratings of roof coverings</td>
<td></td>
</tr>
<tr>
<td>F. Roof openings</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** This topic is covered in detail in Unit C - Topic 4, "Basic Roof Construction And Safety."
**SUMMARY:**

The components of a building are many and complex. Even a simple, one-room structure uses multiple components and will be affected by fire in a variety of ways depending on those components. Your safety when fighting fire in a building is affected greatly by how the building was made.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Building Construction Related to the Fire Service*, IFSTA, Second Edition, Chapters 6-13 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PURPOSE OF FIRE RESISTIVE RATINGS FOR WALLS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.9, 3-3.11, 4-3.2, and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the purpose of fire resistive ratings for walls by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Building Construction Related to the Fire Service, IFSTA, Second Edition, Chapter 9

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Building Construction Related to the Fire Service, IFSTA, Second Edition
- California Building Code, CBSC, 1994 Edition
- Fire Inspection and Code Enforcement, IFSTA, Sixth Edition

PREPARATION: The relationship between rated building construction and such things as building size, exposure potential, and internal vertical and horizontal fire spread is extremely important. As fire fighters, you need to recognize fire-resistive construction and use it to your advantage during a fire.
I. FIRE RESISTIVE DEFINED

A. Rating assigned to a material or an assembly after standardized testing by an independent testing organization

B. The ability of a structural assembly to maintain its load-bearing capability under fire conditions

C. The ability of a wall, partition, or ceiling to act as a barrier to the fire

II. FIRE RESISTIVE TESTING

A. Primary means used to determine a fire-resistant rating

1. Mathematical equations have been developed to predict behavior of a material at high temperatures

B. Material or assembly is subjected to the heat of a fire in a test furnace

   a) Also identified as ASTM E-119

2. Furnace temperatures are regulated to conform to an established time-temperature curve

3. Test is continued until either the specimen fails or the specified fire endurance for which the specimen is being tested is reached

C. Fire-resistive ratings are expressed in standard intervals

1. ½ -hour (20 minute)
2. ½ -hour (30 minute)
3. ¾ -hour (45 minute)
4. 1-hour

What does "fire resistive" mean?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. 2-hour</td>
<td></td>
</tr>
<tr>
<td>6. 3-hour</td>
<td></td>
</tr>
<tr>
<td>7. 4-hour</td>
<td></td>
</tr>
<tr>
<td>D. Testing is accomplished by laboratories</td>
<td></td>
</tr>
<tr>
<td>1. Underwriters Laboratories, Inc.</td>
<td></td>
</tr>
<tr>
<td>a) Best known</td>
<td></td>
</tr>
<tr>
<td>b) Annually publishes the Fire Resistance</td>
<td></td>
</tr>
<tr>
<td>Directory</td>
<td></td>
</tr>
<tr>
<td>2. National Institute of Standards and Technology</td>
<td></td>
</tr>
<tr>
<td>3. Factory Mutual Research Corporation</td>
<td></td>
</tr>
</tbody>
</table>

### III. FIRE WALLS (AREA SEPARATION WALLS)

A. Important ally to the fire fighter

B. Characteristics
- 1. Limit the maximum spread of fire
  - a) Constructed to provide an absolute barrier to a fire under conditions of a total burnout on either side
- 2. Subdivide a building into smaller areas
  - a) A fire in one portion of a building is limited to that area only

C. Are not popular with designers
- 1. Increase structural costs
- 2. May interfere with movement of material through a factory or warehouse
- 3. May be architecturally unattractive

D. Exceptions
- 1. Building codes may not require fire walls if a building has an automatic sprinkler system and meets other criteria for height and construction type
E. Construction
1. Must be either freestanding or tied
2. Freestanding fire walls
   a) Self-supporting
   b) Independent of the building frame
   c) Usually found in wood-frame or masonry construction
   d) Must resist a lateral load of at least 5 psi
3. Tied fire walls
   a) Erected at a column line in steel-frame or concrete-frame construction
4. Typically constructed of masonry
5. Usually have a fire-resistant rating of 4 hours
6. No combustible structural members can penetrate
7. Must extend beyond walls and roofs to prevent radiant heat from igniting adjacent surfaces

F. Openings
1. Must be protected by either automatic or self-closing fire doors

IV. PARTY WALLS
A. Characteristics
1. A wall between two buildings and is common to both
2. Common in older masonry construction
3. Almost always are load-bearing walls
4. Frequently function as fire walls and extend through a building
   a) From the basement to the roof
   b) With a parapet
5. Common for owners to breach for a variety of reasons
   a) Breach may not be apparent from the exterior

V. FIRE PARTITIONS
   A. Interior walls that do not qualify as fire walls
   B. Characteristics
      1. Subdivide a floor or area of a building
         a) "Compartmentalized"
         b) Usually erected from the floor to the underside of the floor above
      2. Used as corridor walls and occupancy separations
      3. Can contain the fire and block its spread
   C. Construction
      1. Wide variety of materials
         a) Lath and plaster
         b) Gypsum wallboard
         c) Concrete block
         d) Combination
         e) Depends on the required fire resistance and construction type

VI. ENCLOSURE AND SHAFT WALLS
   A. Characteristics
      1. Enclose vertical openings
         a) Stairwells
         b) Elevator shafts
         c) Pipe chases
      2. Block the vertical spread of fire
      3. Protect means of egress
B. Construction
   1. Similar to partition walls
      a) Difference is in their function
   2. Fire-resistive rating of 1-hour or 2-hour
      a) Depends on building height
   3. Usually nonload-bearing
   4. Common construction materials can be used
C. Openings
   1. Adequate protection is important
   2. Combustion products rise vertically through stairwells and shafts

VII. CURTAIN WALLS
A. Nonload-bearing exterior wall functions only to enclose a building
   1. Structural frame is used for a building's main structural support
B. Came into existence with the development of the steel-framed skyscraper
C. Characteristics
   1. Separate the interior environment from the exterior environment
      a) Must resist wind, rain, and snow
   2. Control heat loss, noise transmission, and solar radiation
D. Construction
   1. Common materials
      a) Combination of glass and steel, stainless steel, or aluminum
   2. Other materials
      a) Lightweight concrete
      b) Plastic
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Fiberglass</td>
<td></td>
</tr>
<tr>
<td>d) Metal panels with core materials</td>
<td></td>
</tr>
</tbody>
</table>

3. Fire resistance
   a) May have none
   b) Depends on the separation distance between buildings and the building occupancy

4. Vertical communication of fire
   a) Gap is created between the edge of the floor and the curtain wall
      1) May be several inches wide
   b) Fire stopping must be provided
      1) To maintain fire-resistive barrier

VIII. MOVABLE PARTITIONS

A. Characteristics
   1. Subdivide the interior of a building to suit different needs
   2. Never load bearing
   3. Extend from floor to ceiling
      a) Usually mounted on an overhead track
         1) Power or hand operated
   4. Usually not fire resistive
   5. Construction
      a) Several materials
         1) Wood
         2) Vinyl
         3) Metal
SUMMARY:

Rated building construction bears an important relationship to building size, exposure, and resistance to internal fire spread. Knowledge of the key elements of building construction is necessary to an understanding of this relationship. During fire conditions fire rated walls and assemblies will help determine your strategy and tactics to put out a fire.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Building Construction Related to the Fire Service, IFSTA, Second Edition, Chapter 9 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: BASIC ROOF CONSTRUCTION AND SAFETY CONSIDERATIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.11, 4-3.2, and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of basic roof construction and safety considerations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Building Construction for the Fire Service, IFSTA, Second Edition, Chapter 10

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Building Construction for the Fire Service, IFSTA, Second Edition
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Roof construction and design is essential for both interior fire fighting operations and roof ventilation. All fire personnel must be able to recognize the dangers associated with a roof if they will be operating at any time under or above the roof. This information will add to your ability to make sound decisions about the safety and stability of a roof you may one day encounter while fighting fire.
## I. ARCHITECTURAL STYLES

### A. From a fire fighting standpoint, roofs can be classified into three categories

### B. Flat

1. Characteristics
   - a) Easiest for fire fighters to work on
   - b) For drainage, many flat roofs are provided with a slight slope
     1) Typically from front to rear

2. Found on all types of buildings
   - a) Large area warehouses
   - b) Factories
   - c) Shopping centers
   - d) Schools

### C. Pitched

1. Characteristics
   - a) Designed to shed water and snow
   - b) Have inclined surfaces
   - c) Major hazard is the steepness and lack of secure footing

2. Common types
   - a) Shed
     1) Simplest
     2) Slopes in one direction

Where can flat roofs be found?

What is a major hazard of a pitched roof?

What are some common types?
### PRESENTATION

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| b) Gable | 1) Two inclined surfaces  
2) Meet at their high side  
• Form a ridge |
| c) Hip | 1) Slopes in four directions  
2) Degree of slope similar to gable |
| d) Gambrel | 1) Slopes in two directions  
2) Break in the slope on each side  
3) Residential construction  
• Space created under the roof can be used as an attic or living space |
| e) Mansard | 1) Break in the slope on all four sides  
2) Can be constructed with a flat deck  
3) Projected beyond the building wall  
• Creates a concealed space where fire can communicate  
4) Can collapse in large sections |
| f) Butterfly | 1) Two shed roofs that meet at their low eaves |
| g) Monitor | 1) Provide better light and ventilation  
2) Vertical side is normally glass |

Where do you find gambrel roofs?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>h) Sawtooth</td>
<td></td>
</tr>
<tr>
<td>1) Found in industrial buildings</td>
<td></td>
</tr>
<tr>
<td>2) Maximizes natural light and ventilation</td>
<td></td>
</tr>
<tr>
<td>3) Inclined faces should face north</td>
<td></td>
</tr>
<tr>
<td>● Glare of the sun can be avoided</td>
<td></td>
</tr>
</tbody>
</table>

D. Curved

1. Characteristics

a) Take their form from the structural system used to support them

   1) Arches
   2) Bowstring trusses

b) Dome can be used

   1) Arch rotated 360°
   2) Produces structural forces similar to an arch

2. Types

a) Lamella arch

   1) Constructed from short pieces of wood
      ● Known as lamellas
   2) Lamellas are bolted together in a diagonal pattern
   3) Arch results from the beveling of the ends of the individual pieces of wood

b) Geodesic dome

   1) Created using spherical triangulation
   2) Constructed from wood, steel, and concrete
E. Dormer  
1. Frequently provided in buildings with pitched roofs  
2. Means of increasing the usability of an attic space  
   a) By increasing light and ventilation

II. ROOF SUPPORTING SYSTEMS

A. Flat roof supports
   1. Simplest is ordinary wood joists supported at either end by a masonry wall  
      a) Function as beams to support the roof deck

B. Rafters
   1. Inclined joists used to support some types of pitched roofs  
      a) Shed  
      b) Gable  
      c) Hip  
      d) Gambrel  
      e) Mansard

C. Trusses
   1. Characteristics  
      a) Very common  
      b) Use less material and are lighter than a comparable beam or joist of an equal span
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Reduced mass and interdependence of components make them vulnerable for</td>
<td>What are some hazards associated with trusses?</td>
</tr>
<tr>
<td>early failure under fire conditions</td>
<td></td>
</tr>
<tr>
<td>d) Often create a concealed attic space</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Hazards</td>
<td></td>
</tr>
<tr>
<td>a) Lightweight metal and wood trusses</td>
<td></td>
</tr>
<tr>
<td>1) Will fail after 5-10 minutes of fire exposure</td>
<td></td>
</tr>
<tr>
<td>b) Steel trusses</td>
<td></td>
</tr>
<tr>
<td>1) 1,000°F is the critical temperature</td>
<td></td>
</tr>
<tr>
<td>c) Gusset plates in wood trusses will fail early when exposed to heat</td>
<td></td>
</tr>
<tr>
<td>d) If one member fails, the entire truss is likely to fail</td>
<td></td>
</tr>
<tr>
<td>e) Once an entire truss fails, the truss next to it is likely to fail</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Types</td>
<td>Where could you find a bowstring truss?</td>
</tr>
<tr>
<td>a) Bowstring</td>
<td></td>
</tr>
<tr>
<td>1) Found in every community</td>
<td></td>
</tr>
<tr>
<td>2) Used in buildings that have large open spaces</td>
<td></td>
</tr>
<tr>
<td>• Car dealerships</td>
<td></td>
</tr>
<tr>
<td>• Bowling alleys</td>
<td></td>
</tr>
<tr>
<td>• Factories</td>
<td></td>
</tr>
<tr>
<td>• Supermarkets</td>
<td></td>
</tr>
<tr>
<td>TABLE: ROOF DECKS</td>
<td></td>
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<tr>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td><strong>A.</strong> Portion of the roof that the roof covering is applied</td>
<td></td>
</tr>
<tr>
<td><strong>B.</strong> Loads on the roof are transmitted through the deck to the roof supporting members</td>
<td></td>
</tr>
<tr>
<td><strong>C.</strong> Construction materials</td>
<td></td>
</tr>
<tr>
<td>1. <strong>Plywood</strong></td>
<td></td>
</tr>
<tr>
<td>a) May be ½ inch thick</td>
<td></td>
</tr>
<tr>
<td>b) Supports 24 inches on center</td>
<td></td>
</tr>
</tbody>
</table>

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**III. ROOF DECKS**

What is a roof deck?
2. Wood planks
   a) Minimum 1 inch nominal thickness
3. Corrugated steel
4. Precast gypsum or concrete planks
5. Poured gypsum
6. Poured concrete
7. Cement planks containing wood fiber

IV. ROOF COVERINGS
   A. Provide the water-resistant barrier for the roof system

   B. Type depends on
      1. Roof structure
      2. Slope of the roof
      3. Climate
      4. Desired appearance
      5. Maintenance requirements
      6. Durability
      7. Required wind and fire resistance

   C. Flat roof covering
      1. Characteristics
         a) Can be one or more layers
         b) Can use a combination of materials
         c) Usually require a more complex roof covering assembly because of slow drainage
<table>
<thead>
<tr>
<th><strong>PRESENTATION</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Components</td>
<td></td>
</tr>
<tr>
<td>a) Vapor barrier</td>
<td></td>
</tr>
<tr>
<td>1) Designed to reduce the diffusion of interior moisture into the insulation layer</td>
<td></td>
</tr>
<tr>
<td>b) Thermal insulation</td>
<td></td>
</tr>
<tr>
<td>1) Reduces the heat loss through the roof</td>
<td></td>
</tr>
<tr>
<td>c) Membrane</td>
<td></td>
</tr>
<tr>
<td>1) The actual waterproof material that keeps out rain and snow</td>
<td></td>
</tr>
<tr>
<td>2) Built-up</td>
<td></td>
</tr>
<tr>
<td>• Use several overlapping layers</td>
<td></td>
</tr>
<tr>
<td>3) Elastomeric-plastomeric</td>
<td></td>
</tr>
<tr>
<td>• Sheet materials that are applied in a single layer</td>
<td></td>
</tr>
<tr>
<td>4) Fluid applied</td>
<td></td>
</tr>
<tr>
<td>• Applied as a liquid</td>
<td></td>
</tr>
<tr>
<td>• Permitted to cure in place</td>
<td></td>
</tr>
<tr>
<td>d) Drainage layer</td>
<td></td>
</tr>
<tr>
<td>1) Permits the free movement of rain water to the roof drains</td>
<td></td>
</tr>
<tr>
<td>e) Wear course</td>
<td></td>
</tr>
<tr>
<td>1) Protects the roof from mechanical abrasion</td>
<td></td>
</tr>
</tbody>
</table>

What is the function of the vapor barrier?

What is the function of the membrane?

What is the function of the wear course?
D. Pitched roof coverings

1. Characteristics
   a) Function differently than those used on flat roofs
   b) Coverings must always be secured to the roof deck or roof support

   1) Due to the constant gravitational pull

2. Wood shingles and shakes
   a) Shingles
      1) Thin, tapered slabs of wood sawn from a tree trunk
   b) Shakes
      1) Split from the wood by machine or hand and are thicker than shingles

3. Asphalt shingles
   a) Asphalt-impregnated felt made from rag, paper, or wood fiber

4. Slate, clay, and concrete tiles
   a) Hard rock that splits along one plane

5. Application
   a) Usually attached with corrosion resistant nails

6. Fire performance
   a) Wood shingles and shake pose a serious fire potential
      1) Easily ignited by burning brands
      2) Can be pressure-impregnated with fire-retardant chemical

Why must the covering be secured?

How are asphalt shingles made?
### Fire Fighter I

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To reduce combustibility</td>
<td>What is the fire performance for asphalt shingles?</td>
</tr>
<tr>
<td>• Meet building code requirements</td>
<td></td>
</tr>
</tbody>
</table>

b) Asphalt shingles
1) Fundamentally combustible
2) Drip and run under fire conditions
3) Produce a heavy black smoke

c) Clay tiles, slate, and cement tiles
1) Noncombustible
2) Excellent resistance to flying brands landing on tiles
   • Can fly under tiles and burn roof deck

3) Hazards to fire fighters
   • Loose tiles can fall
   • Surface can be extremely slippery
   • Brittle and may have sharp edges

E. Metal roof coverings
1. Materials
   a) Galvanized iron or steel
   b) Copper
   c) Zinc
   d) Aluminum
   e) Lead
### FIRE RATINGS OF ROOF COVERINGS

#### A. Building codes impose restrictions on the combustibility of roofs
1. On certain buildings or occupancies
2. Particular locations within a community

#### B. Evaluated by test procedures contained in NFPA Standard #256, "Standard Methods of Fire Tests of Roof Coverings"
1. Also identified as ASTM, E-108
2. Very comprehensive
3. Simulates several fire exposure conditions
4. Does not test based on a fire starting within the building
   - Only a fire starting outside the building

#### C. Test procedures
1. Intermittent flame exposure
2. Spread of flame
3. Burning brand
4. Flying brand
5. Rain
6. Weathering

D. Classifications of roof coverings

1. Based on the severity of the fire that the material can withstand
2. Class A roof coverings
   a) Effective against severe fire exposure
   b) Are the most fire resistive
   c) Do not communicate or carry fire
   d) Afford high degree of fire protection to the roof deck
   e) Do not slip from position
   f) Possess no flying brand hazard
   g) Do not require frequent repair to maintain fire-resistive properties
   h) Examples
      1) Concrete
      2) Metal
      3) Slate

3. Class B roof covering
   a) Effective against moderate fire exposure
   b) Not readily flammable

What is the classification rating based on?
Is Class A the most or least resistive to fire?
What are some examples of Class A roof coverings?
What degree of fire exposure is Class B effective against?
c) Does not readily communicate or carry fire
d) Afford moderate degree of fire protection to the roof deck
e) Does not slip from position
f) Possesses no flying brand hazard
g) Requires repairs to maintain fire retardant properties

h) Examples
   1) Asbestos shingles
   2) Composition shingle roofs

What are some examples?

What degree of fire exposure is Class C effective against?

4. Class C roof coverings
   a) Effective against light fire exposure
   b) Not readily flammable
c) Do not readily communicate or carry fire
d) Afford slight protection to roof decks
e) Possess no flying brand protection
f) Require repair or renewal to maintain fire retardant properties
g) Example
   1) Nonrated or treated shake shingles

VI. ROOF OPENINGS
   A. Normally provided for purposes other than fire protection
      1. Can be used for roof access and ventilation
### B. Penthouses

1. Small structures erected on the main roof
   a) Also known as bulkheads

2. Functions
   a) Stairway enclosure
   b) Elevator machinery enclosure
   c) Mechanical equipment
   d) Additional living space

3. Not always accessible from the inside of the building

### C. Roof hatches

1. Provide access to the roof from inside the building
   a) Usually placed over a stairway

2. Usually locked

3. Using roof hatches for ventilation may make the stairway unusable

### D. Skylights

1. Provide natural lighting to the interior of a building

2. Provide rapid means of ventilation

3. Can be provided with operable glass panes

4. Required to have wired or tempered glass
   a) Can also be plastic domes

5. Do not step on skylights
   a) Can fall through
E. Smoke and heat vents
   1. Permits the release of smoke and heat from a fire
   2. Provides faster interior attack by fire fighters
   3. Typically found in roofs of industrial or warehouse buildings

VII. ROOF COLLAPSE AND ROOF SAFETY

A. Ladder the roof in at least two places
B. Look and sound the roof before getting off ladder
C. Do a visual check

   1. Look for sags in the roof, or bubbling tar
   2. Check large equipment sagging
   3. See if pipes are growing
   4. Check attic vents for fire or pressurized smoke

D. Determine if ventilation is safe
E. Get off the ladder to walk and sound roof on large structural members

F. Look for fire walls, skylights, roof hatches, etc.
G. Do your job and get off the roof as soon as possible
H. Leave on main structural supports, sounding all the way back

How many ladders should be placed to the roof?

What are the dangers you are looking for on a roof?

What types of building features can help roof operations?
SUMMARY:

Fire fighters must remain safe and stay clear of danger when on the fire ground. Knowing the dangers of specific roof styles and what they do during fire conditions can keep you and your crews safe.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Building Construction for the Fire Service, IFSTA, Second Edition, Chapter 10 in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

TOPIC: INDICATIONS OF POTENTIAL BUILDING COLLAPSE

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9, 3-3.11, 4-3.2, and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

  Condition: A written test

  Behavior: The student will confirm a knowledge of the indications of potential building collapse by completing the written test

  Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 3

MATERIALS NEEDED:

  • Writing board with markers/erasers
  • Appropriate audiovisual equipment
  • Appropriate audiovisual materials

REFERENCES:

  • Building Construction for Fire Suppression Forces, NFA, Section C-21
  • Essentials of Fire Fighting, IFSTA, Fourth Edition
  • Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: During the progress of fire, the integrity and strengths of the construction materials is greatly diminished. It is imperative that fire fighters know the indicators which may warn of potential building collapse. This knowledge could save you and your fellow fire fighters' lives.
I. INDICATORS OF COLLAPSE

A. A key assumption is what you previously know about a building may well be your only warning of collapse

B. General indicators
   1. Sagging floors, roofs
   2. Bulging or leaning walls
   3. Burning of a side wall for a long period
   4. Large volume of fire coming through windows or breaking through roof

C. Immediate indicators of collapse
   1. Continued or heavy fire
   2. Smoke showing through walls
      a) May precede backdraft explosion
   3. Cracking noises

D. Steel construction
   1. Distortion
   2. Roughened appearances

   3. Damage occurs at 1,000°F
      a) A 50-foot beam may elongate by as much as 4 inches when heated from room temperature to 1,000°F
### PRESENTATION

#### E. Concrete

1. Flaking or fragmented brick
   - a) Expect little or no support from walls
   - b) Brick may also crack
2. Concrete block
   - a) Typically cracks along mortar lines
3. Reinforced concrete walls
   - a) Reinforced whether vertically or horizontally
   - b) If visible reinforcing rods are found, the wall will not continue to function
   - c) Shear walls are an integral part of structural support system in steel frame construction

4. Damage occurs after prolonged exposure of 450°F

### APPLICATION

At what temperature does concrete begin to fail?

What is an indication of weakness in walls?

### F. Indications of weakness in walls

1. Patches
2. Pargeting
   - a) Plastering over a masonry wall
3. Wall out of alignment
4. Pipe chase
   - a) Either inside or outside is a plane of weakness
SUMMARY:

All structural materials, whether classified combustible or noncombustible, are adversely affected when exposed to elevated temperatures during a fire. In many cases, damage may be compounded by excessive expansion and instability in unit design. For life safety, a firefighter must realize these effects of construction materials before collapse.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: TYPES OF HEAT MEASUREMENT

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

   Condition: A written test
   Behavior: The student will confirm a knowledge of the types of heat measurement by completing the written test
   Standard: With a minimum 80% accuracy according to the information contained in the Fire Protection Handbook, NFPA, Eighteenth Edition, Section 1, Chapter 4

MATERIALS NEEDED: • Writing board with markers/erasers
                    • Appropriate audiovisual equipment
                    • Appropriate audiovisual materials
                    • Sample sprinkler heads


PREPARATION: The temperature of a material is the condition that determines whether it will transfer heat to or from other materials. It is important that we understand heat measurement so we can prevent fires, protect property, and develop heat resistive material for our protection.
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. TYPES OF HEAT MEASUREMENT</strong></td>
<td>What are the two types of heat measurement?</td>
</tr>
<tr>
<td>A. Specific heat is the amount of heat a substance absorbs as its temperature increases</td>
<td></td>
</tr>
<tr>
<td>B. Latent heat is absorbed as a substance is converted from a solid to a liquid or from a liquid to a gas</td>
<td></td>
</tr>
<tr>
<td><strong>II. TYPES OF TEMPERATURE MEASUREMENT</strong></td>
<td>What are the four types of temperature units?</td>
</tr>
<tr>
<td>A. Celsius</td>
<td></td>
</tr>
<tr>
<td>1. A Celsius (centigrade) degree (°C) is 1/100th the difference between the temperature of melting ice and boiling water (at one atmosphere pressure)</td>
<td></td>
</tr>
<tr>
<td>a) 0°C is the melting point of ice</td>
<td></td>
</tr>
<tr>
<td>b) 100°C is the boiling point of water</td>
<td></td>
</tr>
<tr>
<td>B. Kelvin</td>
<td></td>
</tr>
<tr>
<td>1. A Kelvin degree (°K) is the same measurement as the Celsius degree</td>
<td></td>
</tr>
<tr>
<td>a) Zero on the Kelvin scale is -459.67°F</td>
<td></td>
</tr>
<tr>
<td>b) Absolute lowest achievable temperature</td>
<td></td>
</tr>
<tr>
<td>C. Fahrenheit</td>
<td></td>
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<tr>
<td>1. A Fahrenheit degree (°F) is 1/180th the difference between the temperature of melting ice and boiling water (at one atmosphere pressure)</td>
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<tr>
<td>a) 32°F is the melting point of ice</td>
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</tr>
<tr>
<td>b) 212°F is the boiling point of water</td>
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</tbody>
</table>
D. Rankine
   1. A Rankine degree (°R) is the same size as the Fahrenheit degree
      a) On the Rankine scale, zero is -459.67°F, so the Rankine also provides an absolute temperature

III. HEAT UNITS
A. Joule
   1. The energy (or work) expanded when unit force (1 newton) moves a body through unit distance (1 inch)

B. Watt
   1. Measure of power or rate of energy release
   2. Watt is equal to one joule per second
   3. Rate of heat release from a fire can be expressed in kilowatts or megawatts

C. Calorie
   1. The amount of heat required to raise the temperature of one gram of water one degree Celsius

D. British Thermal Unit
   1. The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit

IV. TEMPERATURE MEASUREMENT
A. Devices depend upon physical change
   1. Expansion of a solid, liquid, or gas
   2. Change of state
      a) Solid to liquid
   3. Energy change
      a) Changes in electrical potential energy
         1) Voltage
### Types Of Heat Measurement Page 4

#### PRESENTATION

<table>
<thead>
<tr>
<th>Changes in thermal radiant emission and/or spectral distribution</th>
</tr>
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</table>

#### B. Thermometers

1. **Liquid expansion**
   
a) Consists of a tube (partially filled with a liquid) which measures expansion and contraction of the liquid with changes in temperature

b) Tube calibrated to read the level of liquid in degrees of a temperature scale

2. **Bimetallic**
   
a) Contains strips of two metals (laminated) with different coefficients of expansion

b) As the temperature changes, the two metals expand or contract to different extents, causing the strip to deflect

c) Solid fusion makes use of the meeting or fusion point of a solid to indicate whether or not a hot object is above or below the melting point of the solid

3. **Solid fusion**
   
a) The eutectic metal in a sprinkler link melts in a fire environment which activates the sprinkler

#### C. Thermocouple

1. One end has a pair of wires of different metals connected to each other (the sensing end)

2. The other end is connected to a voltmeter

#### APPLICATION

What is the most common temperature measurement tool?

What other type of thermometers can be used?
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<tr>
<td>3. When the sensing ends are at a different temperature from the voltmeter end, a voltage is set up</td>
<td></td>
</tr>
<tr>
<td>4. The magnitude depends upon the temperature difference between the two ends</td>
<td></td>
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</table>

D. Pyrometer

1. Measures the intensity of radiation from a hot object

What is a pyrometer?
SUMMARY:

Essentially, ignition is a matter of increasing temperature by adding heat, whereas physical fire extinguishment usually is accomplished through reduction of temperatures by removing the heat. By understanding temperature and the measurement of heat, you will be better able to combat fire with the proper heat removing substance. The four types of temperature units are Celsius, Kelvin, Fahrenheit, and Rankine.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Protection Handbook, NFPA, Eighteenth Edition, Section 1, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SOURCES OF HEAT ENERGY

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.10 and 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the sources of heat energy by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: To be an effective fire fighter, there must be an understanding of the chemical and physical characteristics of combustion. Heat sources play an extensive and important role in starting and extending fires. It is necessary to understand these heat sources if a fire fighter is to properly combat fires.
### I. HEAT ENERGY

**A.** Measurement of molecular movement in a substance

**B.** When heat comes in contact with a fuel, the energy supports the combustion reaction

**C.** States of matter

1. **Solid**
   - a) Low molecular vibration
   - b) Pyrolysis
     - 1) Decomposition creates an ignitable mixture

2. **Liquid**
   - a) Temperature increases, molecules spread farther apart
   - b) Vaporization
     - 1) Vapors mix with air creating ignitable mixture

3. **Gaseous**
   - a) Molecular action so rapid that the molecules leave the container

### II. SOURCES OF HEAT ENERGY

**A.** There are four sources of heat energy

1. Chemical
2. Electrical
3. Mechanical
4. Nuclear

---

**What is "heat energy?"

**What are the three states of matter?**

**What are the sources of heat energy?**
### B. Chemical
1. Heat of combustion
2. Spontaneous heating
   - a) Oily rags
3. Heat of decomposition
   - a) Hay barns
   - b) Mulch piles
4. Heat of solution

**What are some ways spontaneous combustion can occur?**

**What are the types of electrical heat energy?**

### C. Electrical
1. Resistance heating
2. Dielectric heating
3. Induction heating
4. Leakage current heating
5. Heat from arcing
6. Static electricity heating
7. Lightening

**What are some types of mechanical heat energy?**

### D. Mechanical
1. Heat of friction
2. Heat of compression
### E. Nuclear heat energy

1. Release of large quantities of energy from the nucleus of the atom

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<th>a) Fission</th>
<th>1) Splitting of atoms</th>
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</thead>
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<tr>
<td>b) Fusion</td>
<td>1) Combining of two atoms</td>
</tr>
</tbody>
</table>

**What is "nuclear heat energy?"**

**What are the two methods by which energy is released from an atom?**
SUMMARY:

The process of combustion follows the basic laws of the natural sciences. Heat is a form of energy. It is a measurement of molecular motion in a substance. There are four common sources of heat energy: chemical, electrical, mechanical, and nuclear.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: THEORY AND FUNDAMENTALS OF HEAT TRANSFER

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

-condition: A written test

-behavior: The student will confirm a knowledge of the theory and fundamentals of heat transfer by completing the written test

-standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION:

Fires start, spread, and are then controlled due to a basic principle of fire physics, the transmission of heat. A complete understanding of this principle is required for effective fire control operations and fire fighter safety.
I. HEAT TRANSFER

A. Law of heat flow
   1. Hot to cold
   2. Objects will be same temperature if in contact

B. Methods of heat transfer

   1. Conduction
      a) Point-to-point transmission of heat energy
      b) Conductivity of substances
      c) Examples
         1) Nails
         2) Steel beams
         3) Metal pipe

   2. Convection
      a) Movement of heat through air or liquid
      b) Heated air rises
      c) Cool air sinks
      d) Primary cause of vertical and horizontal spread
      e) Examples
         1) Vertical rise from floor to floor
         2) Between walls
### Radiation

a) Transmission of energy as an electromagnetic waves

1) Travel through air until striking object
   - Light waves
   - Radio waves

2) Heat object to ignition temperature

b) Major cause of fire spread

c) Example

1) Radiation from fire to exposures

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How is heat transferred by radiation?
SUMMARY:

Heat is transferred in three and only three ways. It may be conducted through a substance, convected by a substance, or radiated from one substance to another. An example of conduction is a spoon in a hot bowl of soup. The handle becomes hot by the heat being conducted up the spoon.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: TERMS RELATED TO THE FUNDAMENTALS OF COMBUSTION

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.10 and 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the terms related to the fundamentals of combustion by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Orientation and Terminology, IFSTA, Third Edition

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Orientation and Terminology, IFSTA, Third Edition

PREPARATION: Fire fighters must have a basic understanding of the terms of combustion. Knowledge of these terms will aid the fire fighter in their decision-making process regarding safety, extinguishments, and fire control techniques.
## I. DEFINITIONS

**A. British Thermal Unit (BTU)**
1. Amount of heat energy required to raise the temperature of one pound of water one degree Fahrenheit

**B. Calorie**
1. Amount of heat needed to raise the temperature of one gram of water one degree Centigrade

**C. Combustion**
1. Self-sustaining oxidation of a fuel, which produces heat and light

**D. Fire**
1. Rapid oxidation of combustible materials accompanied by a release of energy in the form of heat and light

**E. Fire point**
1. Temperature at which a liquid fuel produces sufficient vapors to support combustion once the fuel is ignited
2. Usually a few degrees above the flash point
3. Also called the burning point

**F. Flame**
1. Burning gas or vapor of a fire that is visible as light of various colors

**G. Flammable limit**
1. Percentage of a substance in the air that will burn once it is ignited

What is "combustion?"

What is "fire point?"

What is "flammable limit?"
2. Most substances have an upper (too rich to burn) and lower (too lean) flammable limit

What are some other names for this?

3. Also known as
   a) Explosive limit
   b) Flammable range

What is "flash point?"

H. Flash point
   1. Minimum temperature at which a liquid gives off enough vapors to form an ignitable mixture with air near the vapors surface

I. Heat
   1. Form of energy that is proportional to molecular movement
   2. To signify its intensity, it is measured in degrees of temperature

What is "ignition temperature?"

J. Ignition temperature
   1. Minimum temperature to which a fuel in air must be heated in order to start self-sustained combustion independent of the heat source

K. Lower explosive limit (LEL)
   1. Lowest percentage of fuel/oxygen mixture required to support combustion
   2. Any mixture with a lower percentage would be considered "too lean"

L. Oxidation
   1. Chemical reaction in which oxygen combines with other substances
   2. Fire, explosions, and rusting are examples of oxidation
<table>
<thead>
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<tbody>
<tr>
<td>M. Oxidizer</td>
<td></td>
</tr>
<tr>
<td>1. Substance that yields oxygen readily and may stimulate the combustion of organic and inorganic matter</td>
<td></td>
</tr>
<tr>
<td>N. Permissible exposure limits (PEL)</td>
<td></td>
</tr>
<tr>
<td>O. Pyrolysis</td>
<td></td>
</tr>
<tr>
<td>1. Chemical decomposition caused by heat that generally results in the lowered ignition temperature of the materials</td>
<td></td>
</tr>
<tr>
<td>P. Smoke</td>
<td></td>
</tr>
<tr>
<td>1. Visible products of combustion, which vary in color and density depending on the types of material burning and the amount of oxygen present</td>
<td></td>
</tr>
<tr>
<td>Q. Upper explosive limit (UEL)</td>
<td></td>
</tr>
<tr>
<td>1. Maximum concentration of vapor or gas in air that will allow combustion to occur</td>
<td></td>
</tr>
<tr>
<td>2. Concentrations above this are called &quot;too rich&quot; to burn</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Fire fighter safety requires that we understand how fires start, spread, and how to safely control and extinguish fires. With a basic understanding of terms of combustion, the fire fighter now has a foundation to build upon.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Orientation and Terminology, IFSTA, Third Edition in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: ELEMENTS OF THE COMBUSTION PROCESS
TIME FRAME: 0:30
LEVEL OF INSTRUCTION: Level I
AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:
Condition: A written test
Behavior: The student will confirm a knowledge of the elements of the combustion process by completing the written test
Standard: With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Combustion is a form of rapid oxidation. In order for fire fighters to fulfill their responsibilities, they must be able to identify the elements that are needed for this process to exist.
I. CHARACTERISTICS OF FIRE BEHAVIOR

A. Fuels

1. Solids
   a) Definite size and shape
   b) Surface area in relation to mass
   c) Increase in surface area to mass, decreases amount of heat required to cause ignition

2. Liquids
   a) Assume shape of container
   b) Specific gravity
      1) Water has a specific gravity of one
   c) Solubility in water
   d) Volatility
   e) Vaporization
      1) Increase in surface area to volume, increases rate of vaporization

3. Gases
   a) Assumes shape of space
   b) Vapor density

1) Air has a vapor density of one
<table>
<thead>
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<tr>
<td><strong>B. Oxidizers</strong></td>
<td>What is the normal percentage of oxygen in air?</td>
</tr>
<tr>
<td>1. Oxygen</td>
<td></td>
</tr>
<tr>
<td>a) Normal is 21%</td>
<td></td>
</tr>
<tr>
<td>b) Minimum to allow free burning is 16%</td>
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<tr>
<td>2. Flammable range</td>
<td></td>
</tr>
<tr>
<td>a) Varies with the fuel and the ambient temperature</td>
<td></td>
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<tr>
<td>3. Oxidizing agent</td>
<td></td>
</tr>
<tr>
<td>a) Bromates</td>
<td></td>
</tr>
<tr>
<td>b) Chlorates</td>
<td></td>
</tr>
<tr>
<td><strong>C. Heat</strong></td>
<td></td>
</tr>
<tr>
<td>1. Energy component</td>
<td></td>
</tr>
<tr>
<td>2. Causes pyrolysis or vaporization of solids and liquids and produces ignitable vapors</td>
<td></td>
</tr>
<tr>
<td>3. Provides energy necessary for ignition</td>
<td></td>
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<tr>
<td>4. Causes the continuous production of ignitable vapors</td>
<td></td>
</tr>
<tr>
<td><strong>D. Self-sustained chemical reaction</strong></td>
<td></td>
</tr>
<tr>
<td>1. Flaming combustion occurs when heat energy produces continuous fuel vapors</td>
<td></td>
</tr>
<tr>
<td>a) Called a chain reaction</td>
<td></td>
</tr>
<tr>
<td>b) Each reaction adds to the next</td>
<td></td>
</tr>
<tr>
<td>2. Example</td>
<td></td>
</tr>
<tr>
<td>a) A runaway chain reaction of a nuclear bomb</td>
<td></td>
</tr>
</tbody>
</table>
II. FIRE TRIANGLE
   A. Elements needed for combustion (smoldering)
      1. Heat
      2. Oxygen (oxidizing agent)
      3. Fuel
   B. Removal of any one element extinguishes fire

III. FIRE TETRAHEDRON
   A. Elements needed for combustion
      1. Heat
      2. Oxygen
      3. Fuel
      4. Chain reaction

What is the fourth side of the fire tetrahedron?
SUMMARY:

Combustion occurs only during the presence of certain elements. It must be understood that the removal of any one of the elements will result in the extinguishment of the fire. These components are described at the fire tetrahedron. Each component must be in place for combustion to occur.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRODUCTS OF COMBUSTION

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the products of combustion by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition
• Self-Contained Breathing Apparatus, IFSTA, Second Edition

PREPARATION: As a fuel burns, the chemical composition of the material changes. These changes result in the production of gases that can be hazardous to anyone within the fire environment. An understanding of the properties of the products of combustion can help ensure the safety of those in that environment.
### I. PRODUCT OF COMBUSTION

**A. When a fuel burns there are four products of combustion**

1. Fire gases
2. Flame
3. Heat
4. Smoke

**B. Fire gases**

1. Determined by the type of material, amount of available oxygen, rate of heating, and temperature of evolved gases
2. Refer to the vaporized products of combustion
3. Particles contain carbon

4. Most common
   a) Carbon monoxide
   b) Carbon dioxide

5. There are numerous other gases released during all phases of combustion
   a) Sulfur dioxide
   b) Phosgene
   c) Nitrogen oxides
   d) Herolein
   e) Ammonia
   f) Hydrogen cyanide

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What are the two most common gases?

What are some other fire gases?
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<td>g) Hydrogen sulfate</td>
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<td>h) Hydrogen chloride</td>
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</tr>
<tr>
<td>i) Asphyxiant gases</td>
<td></td>
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<tr>
<td>j) Irritant particles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What is an asphyxiant gas?</td>
</tr>
<tr>
<td>C. Asphyxiant gases</td>
<td></td>
</tr>
<tr>
<td>1. Those products of combustion that effect the central nervous system and</td>
<td></td>
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<tr>
<td>can result in loss of consciousness or death due to oxygen depletion</td>
<td></td>
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<tr>
<td></td>
<td>What are some asphyxiant gases?</td>
</tr>
<tr>
<td>2. Examples of asphyxiant gases</td>
<td></td>
</tr>
<tr>
<td>a) Carbon monoxide</td>
<td></td>
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<tr>
<td>b) Hydrogen cyanide</td>
<td></td>
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<tr>
<td>c) Carbon dioxide</td>
<td></td>
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<tr>
<td>D. Irritant gases</td>
<td></td>
</tr>
<tr>
<td>1. Affect</td>
<td></td>
</tr>
<tr>
<td>a) Breathing</td>
<td></td>
</tr>
<tr>
<td>b) Eyes</td>
<td></td>
</tr>
<tr>
<td>c) Skin</td>
<td></td>
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<tr>
<td></td>
<td>What are some examples?</td>
</tr>
<tr>
<td>2. Examples</td>
<td></td>
</tr>
<tr>
<td>a) Halogen acids</td>
<td></td>
</tr>
<tr>
<td>b) Nitrogen oxides</td>
<td></td>
</tr>
<tr>
<td>c) Organic irritants</td>
<td></td>
</tr>
</tbody>
</table>
What is flame?

E. Flame
1. Flame is the luminous aspect of burning
2. Hotter flame
   a) Less luminous
3. Hotter flame
   a) More complete combustion
4. Not present during smoldering phase

F. Heat
1. A form of energy that is measured in degrees of temperature to signify intensity
2. Heat is the combustion product most responsible for fire spread in a building
3. Direct cause of burn injuries
4. Other heat injuries
   a) Dehydration
   b) Heat exhaustion
   c) Respiratory tract

What product is most responsible for fire spread?

What is smoke?

G. Smoke
1. A mixture of oxygen, nitrogen, carbon dioxide, carbon monoxide, and mixture of finely divided carbon particles (soot)
2. Contents of smoke varies with fuel being burned
   a) Liquid fuels give off dense, black smoke
SUMMARY:
When a material burns, it gives off products of combustion. These are gases, flame, heat, and smoke. Alone or in combination, they can cause serious injury or death to the unprotected fire fighter. Many gases are asphyxiants or irritants. It is, therefore, important that we recognize the dangers inherent in the fire environment and use the appropriate personal protective equipment and equipment in order to operate safely.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PHYSICAL PROPERTIES OF COMMON COMBUSTION GASES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the physical properties of common combustion gases by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Protection Handbook, NFPA, Eighteenth Edition, Section 1, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Common combustion gases have many physical properties that can injure fire fighters. An assertive fire fighter is capable of recognizing these properties and take steps to prevent exposure. Without this knowledge fire fighters could be seriously injured or die.
I. RELATIVE TOXICITY
   A. Ability of a substance to do harm within the body measured in parts per million (ppm)
   B. 1,000,000 = 100% in air
   C. Permissible exposure limits (PEL) determined by ppm
   D. Examples
      1. Carbon monoxide
         a) PEL 35ppm

II. WATER SOLUBILITY
   A. A liquid's ability to mix with water
   B. Water soluble liquids
      1. Alcohol
      2. Corrosives
      3. Polar solvents
   C. Nonsoluble
      1. Nonpolar solvents
      2. Petroleum based products

III. VAPOR DENSITY
   A. Weight of a gas in relation to air
      1. Air = 1
   B. Gases lighter than air
      1. Helium
      2. Ammonia
      3. Hydrogen
      4. Acetylene
5. Methane  
6. Illuminating gases  
7. Nitrogen  
8. Carbon monoxide  
9. Ethylene

What will these gases do when mixed with air?

C. Gases with a vapor density less than one will rise in air  
D. Gases heavier than air  
1. Gasoline vapor  
2. Propane

IV. FLAMMABILITY
   A. Relates to flammable limits or flammable range  
      1. Flammable explosive limit  
         a) The concentration level of a substance at which it will burn  
      2. Flammable range (FR)  
         a) Ratio of gas to air that will sustain fire if exposed to flame or spark  
         b) Example  
            1) Carbon monoxide  
                • FR 12.5%-84%

V. WARNING PROPERTIES
   A. Most products of combustion have an adverse effect on the body  
      1. Burning skin  
      2. Burning eyes  
      3. Increase respirations  
         a) Altered level of consciousness
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Acrid smells</td>
<td></td>
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<tr>
<td>c) Dizziness</td>
<td></td>
</tr>
<tr>
<td>d) Nausea</td>
<td></td>
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<tr>
<td>e) Vomiting</td>
<td></td>
</tr>
</tbody>
</table>


4. Example
   a) Carbon monoxide
   b) Odorless, colorless, tasteless
   c) Symptoms
      1) Headache
      2) Dizziness
      3) Nausea
      4) Flushed skin
      5) Altered level of consciousness
          • Euphoria
   d) You may not know you have been exposed to carbon monoxide until it is too late
SUMMARY:

It is crucial for the fire fighter to understand and recognize the common combustion gases and their adverse effects. Many toxic by-products of combustion do not have any warning signs. A fire fighter can be exposed to high levels of carbon monoxide and not be aware until it is too late. The fire fighter must also understand that not all gases and liquids weigh the same. This knowledge plays an integral part of fire fighter safety and the decision-making process.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Protection Handbook, NFPA, Eighteenth Edition, Section 1, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** PHASES OF FIRE

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.10 and 3-3.11

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the five phases of fire by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2 or Firefighter's Handbook, Delmar, 2000 Edition, Chapter 4

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition

**PREPARATION:** You and your partner have been assigned to stretch a 1½" hoseline down a hallway to extinguish a fire in a bedroom. As you crawl down the hallway, you feel the heat beating down on your legs. You look up and notice fire above your head. The paint on the walls is bubbling and steam is coming from the carpet on the floor. What is your fire doing? What are the hazards? What phase is the fire in?
I. IGNITION

A. First phase of fire development
B. Period when the four elements of the fire tetrahedron come together
   1. Heat
   2. Fuel
   3. Oxygen
   4. Chemical chain reaction
C. Two types of ignition
   1. Piloted
      a) Striking a match
   2. Nonpiloted
      a) Caused when a material reaches its ignition temperatures as a result of self-heating
         1) Spontaneous combustion
D. Conditions
   1. Oxygen content 21%
   2. Small fire
   3. Confined to the area first ignited

II. GROWTH

A. Second phase of fire development
B. Oxygen rich air drawn into the fire by the rising convection current
C. Increasing heat being generated
   1. Mushrooming and rollover occur
      a) Products of combustion reach the outer walls of the compartment
      b) Products of combustion bank from the ceiling down
   2. Thermal layering of gases
      a) Gases form in layers according to temperature
      b) Hottest gases on top, cooler on bottom

   Why is rollover significant to the fire fighter?

3. The heat from rollover radiates back down and heats uninvolved fuel sources liberating flammable gases contributing to flashover and fire fighter’s injuries

D. Smoke temperature can be up to 900°F
E. Room heat will increase proportionately to the time the fire burns
F. Fire gases being generated
   1. Water vapor (H₂O)
   2. Carbon dioxide (CO₂)
   3. Sulfur dioxide (SO₂)
   4. Carbon monoxide (CO)

III. FLASHOVER
A. Third phase of fire development
B. Transition between the growth and fully developed phase
C. Temperatures range from 900°F-1,200°F
D. Process of flashover
1. Super-heated fire gases have heated nearby unburned combustibles liberating flammable fire gases
2. When the temperature reaches the ignition point of another substance in the room, a new chain reaction combustion site occurs and additional heat is added beyond the initial source of fire
3. Flashover is not instantaneous, but occurs very rapidly

IV. FULLY DEVELOPED
A. Fourth phase of fire development
B. All combustible materials in the room are burning
C. Fire is ventilation controlled

V. DECAY
A. Fifth phase of fire development
B. Fuel/oxygen or both have been consumed
C. The fire is now controlled by
   1. Fuel
      a) Sufficient oxygen with low amount of fuel
   2. Ventilation
      a) Compartment is not vented
      b) There is plenty of fuel heated to its ignition temperature

What is the danger from an unvented fire in the decay phase?

D. Backdraft
1. Occurs during the decay phase
2. Environment is fuel-rich, oxygen-poor
SUMMARY:

Fire development is defined in five phases: ignition, growth, flashover, fully developed, and decay. Each phase presents dangers that can cause serious injury or death to fire fighters and occupants. As a fire transitions through each phase, its dangers lead to the next. During the flashover phase, fire develops so rapidly that it is a very short time for the fire to enter the fully developed phase. It is crucial for the fire fighter to identify and recognize the different phases to employ proper fire attack tactics.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS OF PYROLYSIS, ROLLOVER, FLASHOVER, AND BACKDRAFT

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics of pyrolysis, rollover, flashover, and backdraft by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Flashover and backdraft are two very important fire conditions that can lead to catastrophic sudden escalation of a fire, resulting in injury or death to firefighters and in severe to total destruction of the building and its contents. It is crucial that a firefighter recognize the signs of pending flashover and backdraft.
I. **PYROLYSIS**

A. Chemical decomposition of matter through the action of heat

B. Also known as
   1. Pyrophoric action
   2. Pyrolysis
   3. Pyrophoric carbonization

C. Process
   1. As a fuel is heated the surface reaches the boiling point of water, and water vapor is released
   2. As heating continues/increases, the drying process continues
   3. Early indications of the pyrolysis process in addition to steam is the darkening or discoloration of the surface of the fuel
   4. As pyrolysis continues combustible gases are released and a black carbon residue remains
   5. As pyrolysis continues sufficient combustible gases are evolved to produce an atmosphere rich enough to support combustion

D. Pyrophoric carbonization
   1. Development of pure carbon through the sustained temperatures below the ignition temperature
   2. Continued heating of combustible materials without reaching ignition temperature may result in total carbonization of the material
   3. Minimum temperature associated with development of pyrophoric carbon and has ability to absorb heat

What is "pyrolysis?"
4. Pyrophoric carbon may become hot enough to cause surrounding fuels to reach ignition temperature

II. ROLLOVER

A. When in a compartment, heated products of combustion are produced
B. The seat of the fire continues to heat these fire gases to their ignition temperature where they spread across the ceiling level
C. Heat from rollover radiates back down and further heats nonburning material
D. This radiant heat is a major contributor to flashover

E. Dangers of rollover
   1. Reduces chances of survivability
   2. Slows interior fire attack to the seat of the fire
   3. Increases for potential of vertical fire extension

F. Prevention
   1. Apply short bursts of water to the upper levels of the thermal layer
   2. Vertical ventilation

   a) Removes super-heated gases that contribute to the ignition temperature of combustibles

What is "rollover?"

Other than contributing to flashover, what else makes rollover dangerous?

Can you prevent rollover?

Why does ventilation reduce rollover?
G. Thermal layering of gases
   1. Forms layers of heated gases according to temperature
      a) Hottest gases tend to be in the top layer
      b) Cooler gases tend to be in the bottom layer
   2. Also known as heat stratification or thermal balance
   3. Improper water application may disrupt the thermal layering, bringing super-heated gases down to the fire fighter

III. FLASHOVER
   A. A transitional phase between the growth stage and fully developed stage of a fire
   B. Not instantaneous, but occurs very rapidly
   C. Components of flashover
      1. Sustained ignition of gaseous layers across the ceiling of an entire room or compartment (rollover if by itself)
      2. Extension of open flames from the original room out through the openings
      3. Open-flame combustion of all combustible materials in a compartment
   D. Catastrophic chain reaction
      1. When the overall temperature in a confined area reaches the ignition point of another substance in a room, a new chain reaction occurs
      2. Smoke layer ranges from 900°F-1,200°F
   E. Changes from a fire driven by burning combustibles to exposed combustible surfaces including products of combustion

What is "flashover?"
### F. Signs of flashover
1. You are not near the seat of the fire, but there is excessive heat in the smoke
2. Thick, hot smoke under pressure
3. Rollover and fingers of fire developing in the thermal layer

### G. Prevention
1. Early recognition
2. Proper ventilation
   a) Vertical
   b) Horizontal
3. Proper use of hose streams to cool super-heated gases
   a) Do not disrupt the thermal balance
   b) Straight or solid stream to limit steam production
4. Extinguish the seat of the fire

### IV. BACKDRAFT
A. A fire of explosive force caused by introduction of oxygen rich air into a super-heated, oxygen deficient atmosphere with an accumulation of fuel rich gases

B. Occurs during the decay stage when the reason for decay is lack of oxygen
C. The oxygen is consumed before the fuel is consumed

D. Signs of backdraft
1. Smoke coming from the building or compartment under pressure
   a) Backdraft has occurred inside of closets and center hallway storage facilities
2. Smoke-stained windows
3. Smoke boiling out under pressure
4. No visible flame, or very dull red flame, in the depth of the smoke
5. Tightly sealed building
6. Smoke pushing out the top of a window at high pressure and being sucked back in from the bottom of the window

E. Prevention
1. Vertical ventilation
   a) Allows super-heated gases to be released from the top of a structure and replaced with cooler gases at the bottom
   b) It is crucial that the vertical opening be made prior to the horizontal opening

What are some signs of backdraft?

Can backdraft be prevented?
SUMMARY:

Backdraft and flashover are two very significant fire conditions that can lead to fire fighter injury and deaths. It is crucial that fire fighters recognize the difference between flashover and backdraft. Although the devastating results are very similar, backdraft and flashover are very different. Flashover is the transitional phase of fire between the growth of a fire and it being fully developed. Flashover is associated with heavy fire and super-heated combustibles that reach their ignition temperature. Backdraft is associated with relatively no fire and all products of combustion and unburned fuels are already at their ignition temperature. Backdraft is a ticking time bomb awaiting an unsuspecting fire fighter to add a breath of fresh air.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: TYPES AND CAUSES OF EXPLOSIONS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the type and causes of explosions by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Protection Handbook, NFPA, Eighteenth Edition, Section 1, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

PREPARATION: An explosion is a rapid release of high-pressure gas into the environment. As a fire fighter, it is essential that you understand the types and causes of explosions. Your personal safety and the safety of your fellow fire fighters may depend on your knowledge of this subject.
# Explosion

## Types and Causes

### Physical

- **A.** Most common type of explosion
- **B.** Externally heated container
  - **a)** Boiler
  - **b)** Pressurized gas cylinder
  - **c)** Trapped steam
  - **d)** Any container that will pressurize with the application of heat
    - **1)** BLEVE
      - **B** - Boiling
      - **L** - Liquid
      - **E** - Expanding
      - **V** - Vapor
      - **E** - Explosion

### Physical/chemical

- **A.** External heat required to cause endothermic reaction
  - **a)** Endothermic = absorbs heat
- **B.** Chemical that absorbs external heat to create a chemical reaction
- **C.** Chemical reaction creates additional heat which increases gas pressure
### PRESENTATION

C. Chemical

1. Exothermic

   a) Produces own temperature increase

      1) Does not require external heat to react

   b) The higher the temperature, the faster the reaction, the more gas is produced
**SUMMARY:**

Explosions are caused in three ways: physical, physical/chemical, and chemical. The most common type of explosion is caused by physical means. A BLEVE is an example of a physical explosion.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Protection Handbook*, NFPA, Eighteenth Edition, Section 1, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:**
EXTINGUISHING AGENTS

**TIME FRAME:**
2:30

**LEVEL OF INSTRUCTION:**
Level II

**AUTHORITY:**
1997 NFPA 1001 3-3.7

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of extinguishing agents by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 2 and 5

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sample extinguishing agents

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Principles of Foam Fire Fighting, IFSTA, First Edition

**PREPARATION:**
Effective extinguishment of fire in various types of fuels requires knowledge of the proper extinguishing agent. There is no single agent available to control all types of combustion. Many fuels react violently with the application of water. It is imperative for the fire fighter to make the proper selection of extinguishing agents for the combustion involved.
# I. EXTINGUISHING AGENTS

## A. Water

1. **Extinguishment principles**
   a) Cooling a solid or liquid
   b) Cooling the flame itself
   c) Diluting oxygen

2. **Water can be used on**
   a) Class A fires
   b) Class B fires
      1) Certain instances
   c) Class D fires
      1) Very limited

3. **Physical characteristics**
   a) Freezes at 32°F or 0°C
   b) Boils at 212°F or 100°C
   c) Weighs 8.33 pounds per gallon
   d) Noncompressible
   e) High surface tension
   f) Takes shape of container
   g) Needs expellant force in most cases
   h) Expands 1700:1 when converted to steam
4. Advantages
   a) Absorbs large amounts of heat
   b) Plentiful
   c) Can be used with specialized agents

5. Disadvantages
   a) Conductor of electricity
   b) High surface tension
   c) Freezes
   d) Reacts with certain chemicals
   e) Weight

B. Carbon dioxide (CO₂)
   1. Extinguishment principles
      a) Oxygen reduction
         1) Smothering
      b) Limited cooling effects
   2. CO₂ can be used on
      a) Class A fires
         1) Limited instances
      b) Class B fires
      c) Class C fires
   3. Physical characteristics
      a) Normally a gas
      b) Liquefied under temperature and pressure

What are some of the advantages of using water?

How does carbon dioxide extinguish fires?
### Fire Extinguishing Agents

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) 1½ times heavier than air</td>
<td></td>
</tr>
<tr>
<td>d) Solid below -79°F</td>
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</tr>
</tbody>
</table>

4. Advantages
   a) High expansion ratio

   1) One pound liquid converts to 8 cubic feet free gas
   b) Readily turns from liquid to gas
   c) Provides its own pressure
   d) Nonconductor

5. Disadvantages
   a) Slightly toxic
   b) Water soluble
   c) Limited effect on Class A combustibles

C. Halogenated hydrocarbons (Halons)

1. Extinguishment principles
   a) Break chain reaction
   b) Some cooling

2. Halons can be used on
   a) Class A fires
       1) Special instances
   b) Class B fires
   c) Class C fires

   What is the extinguishing principle of Halon?
### Physical characteristics of Halon

3. Physical characteristics
   a) Liquid under pressure
   b) Turns to gas when released
   c) Heavier than air

### Advantages
4. Advantages
   a) High expansion
   b) Clean agent
   c) Nonconductor

### Disadvantages
5. Disadvantages
   a) Not effective in open space
   b) Toxic fumes when heated
   c) Expensive when recharged
   d) Will be limited in supply in the future
   e) Environmentally damaging

### Dry chemicals

D. Dry chemicals

1. Exinguishment principles
   a) Break chain reaction

2. Dry chemicals can be used on
   a) Class A fires
   b) Class B fires
   c) Class C fires

---

**What are the physical characteristics of Halon?**

**How do dry chemicals extinguish a fire?**
### 3. Physical characteristics

- **a) Several base chemicals**
  - 1) Sodium bicarbonate
    - Ordinary
  - 2) Potassium bicarbonate
    - Purple K
  - 3) Potassium chloride
    - Super K
  - 4) Urea
    - Potassium bicarbonate
    - Monnex
  - 5) Monammonium phosphate
    - Multipurpose
    - Tri-class

- **b) Additives for free-flowing and water repulsion**
- **c) Finely ground powder**
- **d) Needs expellant force**

### 4. Advantages

- **a) Many applications**
- **b) Large fire knockdown potential**
- **c) Nonconductor**
- **d) Some dry chemicals are foam compatible**
5. Disadvantages
   a) Can become packed
   b) Cannot interchange chemicals
   c) Large concentrations can cause seeing and breathing difficulties
   d) Some chemicals are corrosive
   e) Some dry chemicals form coatings

How do dry powders extinguish fire?

E. Dry powders
1. Extinguishment principles
   a) Remove oxygen
   b) Cover burning materials
2. Dry powders can be used on
   a) Metal fires
3. Physical characteristics
   a) May have a polymer added to form a crust

What are some of the advantages of dry powders?

4. Advantages
   a) Can control some types of class D fires

What are some of the disadvantages of dry powders?

5. Disadvantages
   a) Can become packed
b) Cannot interchange chemicals

F. Wetting agents (wet water)
   1. Extinguishment principles
      a) Same as water
      b) But more expensive than water
      c) Increase the extinguishing efficiency of water
         1) Decrease the surface tension
         2) Aid in penetration
         3) Decrease run-off
   2. Methods of adding to water
      a) Premix for booster tanks
      b) Proportioning equipment

What are wetting agents?

What are some uses of wetting agents?

What are the advantages of wetting agents?

What are the disadvantages of wetting agents?

3. Advantages
   a) Cuts down the amount of water

4. Disadvantages
   a) Agent can freeze
   b) Corrosive with certain materials
## II. FOAM

A. Created by mixing foam concentrate, water and air

B. Extinguishment principles
   1. Separating
      a) Barrier between fuel and fire
   2. Cooling
      a) Lowers the temperature of the fuel and adjacent
   3. Suppressing
      a) Prevents the release of flammable vapors (smothering)

C. Physical characteristics
   1. Light in density
   2. High water content
   3. Blanketing tendencies
   4. Resistance to rapid breakdown

## III. TYPES OF FOAMS

A. Class A foam

1. Class A foams can be used on
   a) Structural fire fighting
   b) Wildland fire fighting
   c) Deeply concentrated fuels

2. Physical characteristics
   a) Hydrocarbon surfactants
      1) Reduce surface tension

On what types of fires can Class A foam be used?
What are the physical characteristics of Class A foam?
### Consistency

1. Small bubbles
   - Adhere to surfaces developing long lasting foam
2. Large bubbles
   - Stays on and in the fuel, reduces fuel temperature, increases fuel moisture

### Retention

1. Stays on and in fuel
   - Reduces the temperature and increases the fuel moisture content

### Class A foam with low expansion ratio

1. Faster drainage causes quicker knockdown

### Class B foam

1. Physical characteristics
   
a) Different foams will have a variation of the following characteristics
   1. Water retention
   2. Foam life
   3. Heat resistance
   4. Application method
   5. Freeze resistance
   6. Multipurpose use
### PRESENTATION

7) Viscosity - of concentrate
8) Knockdown speed and flow finished foam
9) Fuel resistance
10) Vapor suppression
11) Alcohol tolerance
12) Quarter life

- 25% drainage time

**What does the term quarter life mean?**

**How is chemical foam made?**

### C. Chemical foam

1. Formed when an acid and alkaline salt come together in solution
2. Equipment maintenance problems due to corrosive nature
3. Mixing often results in clogging problems
4. Tends to bake hard and crack
5. Considered obsolete but may be found in some industrial installations

### D. Protein foams

1. Regular protein foams
   a) Chemically broken down natural protein solids referred to as protein solids
   b) High heat resistance
   c) Water retention capabilities
   d) High strength
   e) Nontoxic
When is it not appropriate to use protein foams?

f) Not well suited for
   1) Polar solvents
   2) Extremely cold temperatures
   3) Subsurface injection
   4) Use with dry chemical powders

g) Mixed in 3% and 6% solutions

2. Fluoroprotein foams
   a) Regular protein foams fortified with fluorinated solvents
   b) Available in 3% and 6% concentrations
   c) Excellent for subsurface injection
   d) Excellent for surface application where foam becomes agitated with flammable liquid
   e) Premixable for short periods on time
   f) Compatible with dry chemicals
   g) Must be delivered through air aspirating devises
   h) Shelf life 10 years

3. Film foaming fluoroprotein foam (FFFP)
   a) Combines the benefits of fast fire knockdown with long lasting heat resistance
   b) Available in 3% and 6% concentrations
   c) Can be stored premixed
   d) Compatible with dry chemicals
   e) Also available in an alcohol resistance formulation at 3% or 6% concentration
<table>
<thead>
<tr>
<th><strong>E. Aqueous film forming foam (AFFF)</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Most commonly used foam today</td>
<td>What is the most commonly used foam today?</td>
</tr>
<tr>
<td>2. Available in 1%, 3%, and 6%</td>
<td></td>
</tr>
<tr>
<td>3. Premixable</td>
<td></td>
</tr>
<tr>
<td>4. Suitable for subsurface injection</td>
<td></td>
</tr>
<tr>
<td>5. Good penetration capabilities</td>
<td></td>
</tr>
<tr>
<td>6. Compatible with dry chemicals</td>
<td></td>
</tr>
<tr>
<td>7. Can be used on Class A materials, if necessary</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>F. Alcohol resistance foam</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Available from manufacturers</td>
<td>What type of fuels are alcohol foams used on?</td>
</tr>
<tr>
<td>2. Used on most polar solvents</td>
<td></td>
</tr>
<tr>
<td>3. Normally used at 3% and 6% concentrations</td>
<td></td>
</tr>
<tr>
<td>4. Dual purpose</td>
<td></td>
</tr>
<tr>
<td>a) Can be used on hydrocarbon fires at 3%</td>
<td></td>
</tr>
<tr>
<td>b) Can be used on alcohol fires at 6%</td>
<td></td>
</tr>
<tr>
<td>5. Creates a membrane rather than film</td>
<td></td>
</tr>
<tr>
<td>6. Prevents solvent from attacking foam blanket</td>
<td></td>
</tr>
<tr>
<td>7. Can be used in subsurface injection</td>
<td></td>
</tr>
<tr>
<td>8. Not easily premixable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>G. High expansion foams</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Special-purpose foams that have a detergent</td>
<td>What type of foam has the lowest water content?</td>
</tr>
</tbody>
</table>
2. Have a low water content
3. Minimize water damage
4. Three basic applications
   a) Concealed spaces
      1) Such as basements
   b) Fixed extinguishing systems
      1) Industrial
   c) In Class A fire applications
5. Physical characteristics
   a) Can be stored at temperatures from 27°F-110°F
   b) Not affected by freezing or thawing
   c) Poor heat resistance due to low water content
   d) Cannot have prolonged contact with galvanized steel
6. Compressed-air foam systems (CAFS)
   a) BLM developed a high energy system in the mid 1980s
   b) Rotary air compressor used in conjunction with the main pump
      1) High energy system
   c) Compressed air is added to foam solution before its discharged
   d) Advantages
      1) Reach of fire stream is considerably longer than low energy systems
      2) Small air bubbles that are very durable
      3) Adheres to surfaces, resists heat longer than low energy systems
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Hoselines are lighter</td>
<td></td>
</tr>
<tr>
<td>e) Disadvantages</td>
<td></td>
</tr>
<tr>
<td>1) CAFS adds expense and maintenance to vehicles</td>
<td></td>
</tr>
<tr>
<td>2) Hoseline reaction force can be erratic</td>
<td></td>
</tr>
<tr>
<td>3) Additional training is required</td>
<td></td>
</tr>
</tbody>
</table>

IV. RETARDANTS

A. Any substances having a chemical or physical action that reduces the flammability of combustibles

B. Primarily used by wildland agencies
   1. USFS
   2. CDF
   3. BLM

C. Two major types being used in California
   1. Phos-check
   2. Fire-trol

D. There are different mixes to make short and long term retardants
   1. Short term retardant
      a) Without holding capabilities
      b) Example
         1) Water
         2) "Wet water" solutions
   2. Long term retardants
      a) Have a chemical retarding action on fire even after water content has evaporated

E. Pretreatment
   1. Retardant line in advance of the fire as a fire control line

Where are they used?
SUMMARY:

Fire fighting is the primary responsibility of any fire fighter on the line. Knowledge of common extinguishing agents such as water, dry chemicals, dry powders, Halons, wetting agents, and foams prepares the fire fighter to operate safely. Without a basic knowledge of these extinguishing agents, their capabilities, advantages, and limitations, a fire fighter cannot make decisions on which to use on different types of combustibles.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 2 and 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROPERTIES OF WATER AS THEY RELATE TO FIRE FIGHTING

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7 and 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the properties of water as they relate to fire fighting by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 2 and 13

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Pint of water
- Small beaker of carbon disulfide
- Small beaker of acetone
- Small beaker of gasoline

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Streams Practices, IFSTA, Seventh Edition

PREPARATION: Water is not only the most plentiful fire extinguishing agent, but also the most easily handled and because of its nature, the best extinguishing agent for Class A fires. If we are to use it safely and effectively, we need to understand some of its basic properties.
## I. CHARACTERISTICS OF WATER

### A. Can exist in three forms
1. **Liquid**
   - a) Water
   - b) 32°F-212°F
2. **Solid**
   - a) Ice
   - b) Below 32°F
3. **Gas**
   - a) Water vapor
   - b) Above 212°F

### B. Transitional temperatures
1. Freezing point is 32°F
2. Boiling point is 212°F

### C. In addition to temperature, state of water can be altered by raising or lowering atmospheric pressure

## II. HEAT TRANSFER AND ABSORPTION

### A. Law of heat flow
1. Heat tends to flow from a hot substance to a cold substance
2. Conduction, radiation, and convection

### B. Law of specific heat
1. A measure of the heat absorbing capacity of a substance

In what forms can water exist?

What is the law of heat flow?

What is the law of specific heat?
2. Water has excellent specific heat characteristics

C. Law of latent heat of vaporization
   1. Quantity of heat absorbed when a substance changes from a liquid to a vapor
   2. Water vaporizes at a relatively low temperature, 212°F
      a) Absorbs a large quantity of heat

III. ADVANTAGES AND DISADVANTAGES OF USING WATER

A. Advantages
   1. Smothering agent
      a) Will float on heavy liquids such as carbon disulfide
   
   NOTE: Demonstration: pour water in beaker with carbon disulfide.
   2. Diluting agent
      a) With miscible flammable liquids, such as acetone
   
   NOTE: Demonstration: pour water in beaker with acetone.
   3. Excellent heat absorption qualities
   4. Good liquid to vapor expansion ratio
      a) Smothers fire
   5. Readily available
   6. Nontoxic
### B. Disadvantages

1. High surface tension
2. Reactivity with certain materials
3. Relatively high freezing temperature
4. Low viscosity
5. Conductivity
6. Most flammable liquids float on water

**NOTE:** Demonstration: pour water in beaker with gasoline.

### IV. COMMON INDUSTRIAL MATERIALS THAT REACT WITH WATER AND THEIR REACTIONS

<table>
<thead>
<tr>
<th>Material</th>
<th>Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium carbide</td>
<td>Acetylene gas</td>
</tr>
<tr>
<td>Charcoal</td>
<td>Spontaneous heating</td>
</tr>
<tr>
<td>Liquefied chlorine cylinders</td>
<td>Hydrochloric acid</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Hydrogen gas, Oxygen gas</td>
</tr>
<tr>
<td>Quicklime</td>
<td>Sodium hydroxide (Lye)</td>
</tr>
<tr>
<td>Sodium</td>
<td>Causes violent reaction</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>Violent exothermic reaction</td>
</tr>
</tbody>
</table>
SUMMARY:

Water exists in three states: liquid, solid, and gas. It has the ability to extinguish fire in several ways as a smothering agent and a diluting agent, with excellent heat absorption properties. Although there are disadvantages to its use as an extinguishing agent, such as high surface tension, reactivity with some chemicals, and electrical conductivity, it is still widely used due to its easy availability.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 2 and 13 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: GENERAL SAFETY PRECAUTIONS FOR ALL EMERGENCY SITUATIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the general safety precautions for all emergency situations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Fighter Occupational Safety, IFSTA, First Edition, Chapter 1

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:
• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Fighter Occupational Safety, IFSTA, First Edition
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: Fire fighters take on their responsibilities knowing that the job is inherently dangerous. Fire fighting will never be made completely safe, but it is time to make an extra effort to begin controlling the hazards wherever possible. The best available protection against injury is information used to reduce risk.
I. ATTITUDE
A. Safety is each fire fighter's responsibility

B. Safe attitude must be maintained at all times
   1. In station
   2. During training
   3. At emergency scenes
   4. En route/returning

C. Wear all appropriate personal protective equipment (PPE) provided

NOTE: Discuss current injury/death rates using current NFPA or IAFF data.

II. EN ROUTE/RETURiNING TO STATION
A. Properly dressed prior to engine moving
B. Mount and dismount apparatus with care
C. Wear seat belts at all times
D. Never leave engine without order to do so

III. TOXIC ATMOSPHERES
A. Structure fires
B. Vehicle fires
C. Dump fires
D. Hazardous material incidents
E. In confined spaces
F. In station garages
   1. Due to idling engines
   2. Provide adequate ventilation

When should you think about safety?

Under what circumstances will you don a SCBA?
IV. ON-SCENE HAZARDS

A. Building collapse
   1. Floors
   2. Ceilings
   3. Walls
   4. Glass

B. Electrical hazards

C. Tripping/falling/puncture hazards
   1. Provide adequate lighting
   2. Tape off hazard zones

D. Vehicle incidents
   1. Vehicle instability
   2. Traffic control
   3. Supplemental restraint systems (air bags)
   4. Leaking/spilled fluids

E. From public
   1. Establish enforceable boundaries when needed
   2. Domestic animals (pets)

F. From equipment failure/misuse
   1. Training
   2. Inspection and maintenance programs

G. On-scene accountability
   1. Personnel accountability systems
   2. Rapid intervention crews

What are some types of on-scene hazards?

What are some hazards associated with vehicle incidents?
## V. PHYSICAL HAZARDS

### A. Back injuries
1. Proper lifting techniques
2. Lift within personal limits
3. Use tools properly
4. Physical conditioning

### B. Heat stress
1. Can reduce mental acuity
2. Watch for symptoms of heat exhaustion/stroke
3. Hydrate adequately before, during, and after emergency
4. Physical conditioning

### C. Cold stress
1. Can reduce mental acuity
2. Reduces manipulative capabilities

### D. Spread of contagious diseases
1. Hands
   a) Latex gloves
2. Eyes
   a) Eye protection

What type of physical hazards can you think of?

What can be done to decrease the risk of heat stress?

What are some methods of transmission and the means to protect against them?
### Inhalation
- a) Airborne pathogen mask

### Surface absorption
- a) Proper washing techniques

### Fatigue
1. Physical conditioning

### Hearing
1. Wear all appropriate PPE provided

What can be done to reduce the risks of fatigue?
SUMMARY:

Fire fighting is a dangerous profession. Fire fighters must develop an attitude towards safety that promotes the use of all available safety gear and procedures. This will increase their awareness of potential dangers.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Fighter Occupational Safety, IFSTA, First Edition, Chapter 1 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PERSONAL PROTECTIVE EQUIPMENT FOR THE FIRE SERVICE

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-1.1.2 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the appropriate personal protective equipment for the fire service by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Appropriate personal protective equipment

REFERENCES:
- Fire Fighter Occupational Safety, IFSTA, First Edition

PREPARATION: The environment in which you perform your duties demands that you have the best personal protective equipment (PPE) available. This can aid in reducing injuries and deaths if the proper equipment is worn during fire fighting operations. It is important that you understand the relationship between life-threatening situations and the use of your PPE to meet your safety needs. It is called personal protective equipment for a reason. Wear it. Use it. Let's reduce injuries and disabilities in the fire service. The heat, toxic gases, and debris are reasons to wear PPE. We work in the most dangerous occupation in the country and using PPE is one way we are trying to reduce our injuries and deaths.
## I. NEED FOR PERSONAL PROTECTIVE EQUIPMENT

### A. Types of injuries on-scene
1. Inhalation/absorption
2. Puncture/injections
3. Sprains/strains
4. Broken bones
5. Crushing injuries
6. Internal trauma
7. Burns

### B. Sensitive areas
1. Respiratory system
   a) Inhalation of toxic fumes
   b) Absorption into the blood stream
2. Eyes
   a) Absorb 100% of fumes exposed to

## II. STRUCTURAL FIRE FIGHTING PPE

### A. Helmets

1. Conventional design
   a) Function to shed water
   b) Little protection from heat and cold

What types of injuries do fire fighters receive at the emergency scene?

What parts of our bodies are most sensitive to exposures?

What are the two types of helmet designs?
### PRESENTATION

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Absorption design</td>
</tr>
<tr>
<td>c)</td>
<td>Large rear overhang became a problem when using SCBA</td>
</tr>
<tr>
<td>a)</td>
<td>Have an energy absorbing liner</td>
</tr>
<tr>
<td>b)</td>
<td>Came from the transportation and sports fields</td>
</tr>
<tr>
<td>c)</td>
<td>Based on the assumption that time duration of impact is short</td>
</tr>
<tr>
<td>d)</td>
<td>Higher pressures can be absorbed without concussive effects</td>
</tr>
<tr>
<td>e)</td>
<td>Two criteria are important</td>
</tr>
<tr>
<td>1)</td>
<td>Shell must be quite hard</td>
</tr>
<tr>
<td>2)</td>
<td>Liner must fit well to the skull and be capable of absorbing energy</td>
</tr>
</tbody>
</table>

### APPLICATION

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do helmets absorb energy?</td>
</tr>
<tr>
<td>Who sets the standards for helmets?</td>
</tr>
</tbody>
</table>

### 3. Helmet requirements

<table>
<thead>
<tr>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Acceptance level of any helmet will depend on comfort to wearer and group acceptance in terms of symbolic tradition</td>
</tr>
<tr>
<td>b) Must meet the latest standards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) American National Standard Institute (ANSI)</td>
</tr>
<tr>
<td>2) NFPA Standard #1971</td>
</tr>
<tr>
<td>3) ANSI 289.1 list requirements for Type D</td>
</tr>
<tr>
<td>4) ANSI specifies limits of flammability and water absorbency and the requirements of brim strength</td>
</tr>
<tr>
<td>5) Reflective visibility must reflect current NFPA standard</td>
</tr>
</tbody>
</table>
4. Construction material for helmets
   a) Plastics
      1) Temperature range is an important consideration since some plastics will melt at much lower temperatures than those encountered by fire fighters
   b) Fiberglass
   c) Leather
   d) Kevlar

5. Proper fit
   a) Repair or replace poor fitting helmets
   b) Will reduce its ability to resist transmission of force

6. Inspection
   a) Inspect the suspension system
      1) Check for deterioration of system
      2) Replace as needed
   b) Inspect inner and outer shell
      1) For cracks
      2) Separation
      3) Replace as needed
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Inspect the face shield or goggles</td>
<td>What should a face shield be inspected for?</td>
</tr>
<tr>
<td>1) Ensure they are clean</td>
<td></td>
</tr>
<tr>
<td>2) Excessive scratches obscure vision</td>
<td></td>
</tr>
<tr>
<td>3) Goggle ventilation should be in place to prevent fogging</td>
<td></td>
</tr>
</tbody>
</table>

What procedures are used to maintain helmets?

7. Maintenance
   a) Remove dirt and all foreign objects
   b) Remove chemicals, oils, and petroleum
      1) May cause softening of shell
      2) Reduces its impact protection
      3) Reduces dielectric protection

B. Turnout coats and pants
   1. Designed for specific range of exposure
   2. Clothing is fire resistant, not fireproof
      a) Use safe practices and common sense
   3. Standards set by NFPA Standard #1971
   4. Research indicates that multiple layers of lightweight materials with air sandwiches between them provide near optimum protection
   5. Outer shell considerations
      a) Flame resistant
      b) Limited restriction of motion
      c) Cleaning effectiveness
      d) Permeability
6. Materials used today
   a) Nomex
   b) PBI
   c) Kevlar
   d) Some aluminized fabrics

7. Vapor barrier
   a) Prevents or inhibits the transfer of water, corrosive liquids, steam, or hot vapor
   b) Flame resistant
   c) Should be light
   d) Usually neoprene, rubberized, or Goretex
   e) Must allow air flow for thermal insulation
   f) Should not stiffen when subjected to freezing conditions

8. Inner or insulating liners
   a) For thermal protection and padding
   b) Should not be removed
      1) Summer and winter types
   c) Lightweight materials
      1) Flannel
      2) Wool
      3) Cotton
      4) Nylon quilt

What materials are used to construct turnouts?

What materials are used in insulating liners?
9. **General design features**
   a) **Collar**
      1) Should protect the neck and throat
      2) Should be water repellant

   b) **Closures**
      1) Snap and D-ring
      2) Velcro™
      3) Zippers
      4) Must provide protection against steam and water

   c) **Trim and color**
      1) Come in many colors
      2) Lighter color doesn't absorb as much heat
      3) Visibility must be considered
      4) Trimmed in white reflective type trim per NFPA Standard

10. **Maintenance**
    a) Cleaned after every exposure
    b) Wash separate from other type of clothing
    c) Machine wash, warm water
    d) No starch or bleach
    e) Tumble dry, low heat
    f) In accordance with manufacturer's recommendations and directions
C. Turnout boots
   1. Must meet current ANSI standards
   2. Puncture resistant
   3. Fitted as closely as possible
   4. Inspection and maintenance
      a) Check for cracks, splits, or punctures
      b) Worn heels should be replaced
      c) Oil, grease, and debris should be cleaned off
         1) May cause deterioration of rubber

D. Gloves
   1. Made from NFPA recommended materials
   2. Special care gloves for specialized hazards and exposures should be used
   3. Gloves can be cut
      a) Exposure to cuts, bruises, puncture wounds

   4. Disadvantages
      a) Less manual dexterity
      b) Difficult to get proper fit
      c) Limited protection with use and age as well as extreme hot or cold
      d) Exposure to chemicals and contact will absorb the material
         1) Causes deterioration and increased exposure of the hands and fingers
      e) Inadequate wrist protection

What are the disadvantages of structural gloves?
### III. WILDLAND FIRE FIGHTING PPE

#### A. Helmet
1. Lightweight
2. Small brim
3. Adjustable headband for proper fit
4. Inspect and clean after each use
   - a) Soap and water
   - b) Do not clean with solvents

#### B. Eye protection
1. Goggles are preferred eye protection
2. Prevents injuries and irritation from smoke and fire brands, as well as penetration injuries
3. Disadvantages
   - a) Excessive scratches can obscure vision
   - b) Inadequate ventilation causes fogging
   - c) Can melt if exposed to high heat
4. Sunglasses are not recommended

#### C. Ear and neck protection
1. Designed to protect the neck, ears, and in some designs the lower face area
2. Usually a part of or attached to the rear and side of the helmet
3. Wraparound or as fold down ear and neck flaps
4. Inspect and clean periodically and after each fire exposure

---

Should sunglasses be worn in lieu of goggles or a shield?
D. Protective coat

1. Wildland fire fighting Nomex-type coats are usually a thin single layer
   a) Provide for enhanced body heat loss
   b) Offer minimal insulation

2. Cotton undergarments are important for reducing radiant heat exposure
3. Sleeves must be fastened
4. All closures used (button, zipper, Velcro™, snap)
5. Inspect and clean periodically and after each fire exposure according to manufacturer's specifications
   a) Replace if torn, ripped, or threadbare
6. Storage
   a) Exposure to high heat and/or sunlight for extended periods of time degrade material

E. Protective pants

1. Wildland fire fighting Nomex-type pants are usually a thin single layer
   a) Provide for enhanced body heat loss
   b) Offer minimal fire exposure protection
2. Cotton and other undergarments are important for reducing radiant heat exposure
3. All closures used (button, zipper, Velcro™, snap)
4. Inspect and clean periodically and after each fire exposure according to manufacturer's specifications
   a) Replace if torn, ripped, or threadbare

What types of gloves are approved?

F. Gloves
   1. Wildland fire fighting gloves provide better handling characteristics than structure protection gloves
   2. Must fit properly
   3. Can limit manual dexterity
   4. Use and age limits life of material
   5. Gloves can be damaged
   6. Must have adequate wrist protection

What special hazards are present in wildland fire fighting?

G. Foot and ankle protection
   1. Demands offer additional hazards not present in structure fire fighting
      a) Uneven terrain, rocks
      b) Animals, snakes
   2. An above-the-ankle type work boot with lace up capability should be worn
      a) Minimum of 8-inch rise
   3. Steel toe and steel sole
      a) For puncture protection
   4. Lug type sole or equivalent for traction in all types of terrain
   5. Boots to be kept clean and polished or oiled after each use
SUMMARY:

Fire fighter personnel should be aware of the type of personal protective equipment needed for different exposures and have the equipment readily available. Knowledge of the needs for personal protective equipment will assure that fire fighters are adequately protected.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: REASONS WHY PERSONAL PROTECTIVE EQUIPMENT CAN FAIL

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the limitations of personal protective equipment including how it can fail under fire conditions by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Fire Fighter Occupation Safety, IFSTA, First Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sample personal protective equipment

REFERENCES:
- Fire Fighter Occupation Safety, IFSTA, First Edition

PREPARATION:
As a wearer of personal protective equipment, it is imperative that fire fighters recognize the shortcomings and limitations of this gear. Fire fighters must understand that no specific item in any category (helmet, boots, turnout coats) can defend against all attacks to the body. Overconfidence in the degree of protection afforded by a piece of equipment may cause the fire fighter to take unnecessary risks, which could result in injuries. It is critical for fire fighters to know and understand the designs, needs, and limitations of personal protective equipment for both wildland and structure fire fighting.
I. SAFEGUARDING AGAINST HAZARDS
   A. Eliminate the hazard
      1. Not possible in all situations
   B. Intercept the hazard
      1. Erect fences
      2. Establish guards
      3. Construct fire walls, etc.
   C. Defensive wall against the hazard
      1. Last resort against the hazard
      2. If the wall fails, the human body is the immediate target

NOTE: Defensive wall concept applies to personal protective equipment.

II. SHORTCOMINGS AND LIMITATIONS OF PERSONAL PROTECTIVE EQUIPMENT
   A. It is the goal of the fire department to minimize hazards and protect its personnel from injuries through the education of its fire fighters

   B. Overconfidence in the degree of protection afforded by a piece of equipment may cause the fire fighter to take unnecessary risks which could result in injuries

   C. Today's technological working environment may be beyond some fire fighter's comprehension because of limited experience and/or education
      1. These limitations may cause fire fighters to underestimate the degree of risk in a fire situation
2. The result is that some emergencies may be attacked that are beyond the capability of personnel, equipment, and known techniques

D. Overconfidence and unnecessary risk
   1. Create an environment for injury
   2. Fire fighters must recognize the degree of hazard, even with proper use of personal protective equipment

E. Limitations
   1. Inadequate knowledge
   2. Improper attitude
   3. Insufficient training
   4. Improper maintenance
      a) Failure to repair compromised clothing
   5. Misuse or improper use of personal protective equipment
      a) May make a fire fighter vulnerable to injuries
      b) Failure to use

What are some of the limitations concerning personal protective equipment?
SUMMARY:

Because of the multiple types of situations and exposures fire fighters encounter, it is very difficult to provide a type of personal protective equipment that will meet all needs. It is therefore, imperative that the fire fighter fully understands that shortcomings and limitations do exist.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Fighter Occupation Safety, IFSTA, First Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF PERSONAL ALARM DEVICES

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** CCR Title 8, Section 3401 and SBFS

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the characteristics and functions of personal alarm devices by completing the written test

*Standard:* With a minimum 80% accuracy according to the information contained in the specific manufacturer's operational manual

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Various samples of alarm devices

**REFERENCES:**
- Specific manufacturer's operational manual

**PREPARATION:** Fire fighting is a job in which any number of conditions can trap or render a fire fighter unconscious. The personal alarm device has been developed to automatically sound an alarm that will summon help. It is essential that each fire fighter know how these devices operate. The proper use of this device can have a dramatic impact on fire fighters long-range careers.
NOTE: Refer to specific manufacturer's operational manual.

I. ALARM DEVICE

A. Uses
   1. Whenever entering a structure during fire fighting, salvage, or overhaul operations

B. Design and operation
   1. Specifications
      a) Waterproof
      b) Shockproof
      c) Explosion proof

   2. Designed to attach to either the SCBA straps or to the exterior of clothing
      a) Accessible to the fire fighter
      b) Each device is attached differently
         1) In accordance with manufacturer's recommendations and directions

   3. Manual and automatic operation
      a) Automatic activation
         1) A lack of motion for 20-40 seconds will cause the unit to sound an alarm
         2) If motion is detected within the 20-40 seconds, unit will automatically reset
      b) Manual activation
         1) Different, depending on the manufacturer

Where is it worn?

Does anyone know how an alarm device works?
4. Once the unit activates, the unit's audible alarm should sound continuously until it is turned to the off position.

5. Clearing the alarm can be done by turning the unit to the off position.

C. Testing and maintenance should be in accordance with manufacturer's recommendations and directions.

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Once the unit activates, the unit's audible alarm should sound continuously until it is turned to the off position.</td>
<td></td>
</tr>
<tr>
<td>5. Clearing the alarm can be done by turning the unit to the off position.</td>
<td></td>
</tr>
</tbody>
</table>

How do you test and maintain the device?
SUMMARY:

The use of a personal alarm device can be a lifesaving factor. Each wearer must thoroughly know the operations of a personal alarm device for their personal safety. In addition, the user should be familiar with all aspects of this unit confirming the reliability of the key safety components and any operational limitations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read the specific manufacturer's operational manual in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** HOW TO DON STRUCTURAL FIRE FIGHTING PPE WITHIN ONE MINUTE, DOFF, AND PREPARE FOR REUSE

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-1.1.2

**BEHAVIORAL OBJECTIVE:**

*Condition:* A set of structural fire fighting personal protective equipment

*Behavior:* The student will don the PPE within one minute, then doff the PPE, and prepare for reuse

*Standard:* Completing all operations within ________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- One set of structural fire fighting personal protective equipment

**REFERENCES:**

- Essentials of Fire Fighting, IFSTA, Fourth Edition

**PREPARATION:** Appropriate personal protective equipment is issued to each fire fighter and its use is mandatory. Your personal safety and your value as a crewmember depends on your use of PPE.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Step into boots</td>
<td>1a. One foot at a time</td>
</tr>
<tr>
<td>2. Pull up pants</td>
<td>2a. Grasping waistband on either side</td>
</tr>
<tr>
<td></td>
<td>b. Pulling straight up</td>
</tr>
<tr>
<td>3. Connect pant fasteners</td>
<td>3a. All closures</td>
</tr>
<tr>
<td>4. Pull up suspenders</td>
<td>4a. Over shoulders</td>
</tr>
<tr>
<td></td>
<td>b. No twists</td>
</tr>
<tr>
<td></td>
<td>c. Adjusting length as needed</td>
</tr>
<tr>
<td>5. Put on fire resistive hood</td>
<td>5a. Pulling over head</td>
</tr>
<tr>
<td></td>
<td>b. Covering head, neck, and ears</td>
</tr>
<tr>
<td>6. Put on coat</td>
<td>6a. One arm at a time</td>
</tr>
<tr>
<td></td>
<td>b. Neck of fire resistive hood inside the coat</td>
</tr>
<tr>
<td>7. Connect coat fasteners</td>
<td>7a. All internal closures</td>
</tr>
<tr>
<td></td>
<td>b. All external closures</td>
</tr>
<tr>
<td>8. Put on helmet</td>
<td>8a. Adjusting for proper fit</td>
</tr>
<tr>
<td>9. Lower helmet shroud</td>
<td>9a. Edges down covering ears and neck</td>
</tr>
<tr>
<td></td>
<td>b. Draped outside of coat collar</td>
</tr>
<tr>
<td>10. Secure helmet chin strap</td>
<td>10a. Snug under chin</td>
</tr>
<tr>
<td></td>
<td>b. Covering back of the neck</td>
</tr>
<tr>
<td>12. Lower helmet face shield/goggles</td>
<td>12a. Pulling downward</td>
</tr>
<tr>
<td></td>
<td>b. Properly positioned</td>
</tr>
<tr>
<td>13. Put on gloves</td>
<td>13a. One hand at a time</td>
</tr>
<tr>
<td></td>
<td>b. Wristlets fully extended under coat sleeve</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>14. Doff PPE</td>
<td>14a. In the order that it was donned</td>
</tr>
<tr>
<td>15. Prepare PPE for reuse</td>
<td>15a. Gloves are not inside out</td>
</tr>
<tr>
<td></td>
<td>b. Helmet chin strap is loose and</td>
</tr>
<tr>
<td></td>
<td>shield/goggles are in the up position</td>
</tr>
<tr>
<td></td>
<td>c. Coat sleeves are not inside out</td>
</tr>
<tr>
<td></td>
<td>d. Liners are not twisted</td>
</tr>
<tr>
<td></td>
<td>e. Pants folded down around boots</td>
</tr>
<tr>
<td></td>
<td>f. Suspenders are not tangled</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: TRAFFIC CONTROL CONSIDERATIONS AND PROCEDURES

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.16

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic procedures used for traffic control at the scene of an emergency by completing the written test.

Standard: With a minimum 80% accuracy according to the information contained in Vehicle Rescue, Harvey Grant, 1996 Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Vehicle Rescue, Harvey Grant, 1996 Edition

PREPARATION: Life safety is the number one priority at any emergency. To protect the scene, victims, our equipment, and ourselves, traffic control is a necessary and important skill. You must be aware of the hazards posed by traffic and know basic procedures to mitigate those hazards.
### I. UNCONTROLLED TRAFFIC CONSEQUENCES

<table>
<thead>
<tr>
<th>A.</th>
<th>Damaged hoseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>Damaged apparatus</td>
</tr>
<tr>
<td>C.</td>
<td>Other accidents</td>
</tr>
<tr>
<td>D.</td>
<td>Blocked access/egress</td>
</tr>
<tr>
<td>E.</td>
<td>Interference with evolutions</td>
</tr>
<tr>
<td>F.</td>
<td>Blowing debris and dirt, etc.</td>
</tr>
<tr>
<td>G.</td>
<td>Injured or killed fire fighter</td>
</tr>
</tbody>
</table>

### II. TRAFFIC CONTROL PROCEDURES

<table>
<thead>
<tr>
<th>A.</th>
<th>Traffic laws</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>California Vehicle Code, Chapter 4, Division 2</td>
</tr>
<tr>
<td>2.</td>
<td>California Vehicle Code, Chapter 3, Division 2</td>
</tr>
<tr>
<td>3.</td>
<td>Local codes and ordinances</td>
</tr>
<tr>
<td>B.</td>
<td>Law enforcement often handles traffic control</td>
</tr>
<tr>
<td>1.</td>
<td>Fire fighters may assume traffic control responsibilities before law enforcement arrives to ensure scene safety</td>
</tr>
<tr>
<td>C.</td>
<td>Traffic may be slowed, diverted, or stopped</td>
</tr>
</tbody>
</table>

What are some of the consequences caused by uncontrolled traffic at an emergency scene?

What methods of traffic control are available to us?
5. Hand signals
6. Emergency vehicles
7. Traffic paddles
8. Flashlights

NOTE: Answers will be department specific.

E. Communication is a necessity
   1. Maintain visual or radio contact with person managing opposing traffic

F. Incident zone
   1. Includes all areas within a 50-foot radius of the actual incident
   2. May increase in size due to power lines, spills

G. Farthest warning device
   1. Should be, at a minimum, equal to the stopping distance for the road’s posted speed and condition
   2. Increase distance for downhill traffic
   3. Increase distance during inclement weather
   4. Increase distance when crests obstruct view
   5. If first warning device is too far from scene, drivers may disregard warning or become confused

What methods/tools are available on your engine?

What will affect a driver's stopping distance?

6. Driver's stopping distance may also be affected by
   a) Speed
   b) Vehicle size
### III. BARRICADES

#### A. Spacing
1. 10-30 feet apart
2. Closer together near incident zone

#### B. Safety considerations
1. Always watch oncoming traffic

   a) Drivers may be drunk, confused, or watching accident, etc.
2. Be prepared to take evasive action

### IV. CONES

#### A. Used for temporary control

#### B. Spacing should decrease near incident zone, over crests, and on corners

#### C. Safety considerations
1. Always watch oncoming traffic
2. Be prepared to take evasive action

### V. FLARES

#### A. Used for temporary control

#### B. Spacing should decrease near incident zone, over crests, and on corners

#### C. Burn time
1. Will be marked on flare

---

Why might oncoming vehicles run you down?

How long will a road flare burn?
FIRE FIGHTER I

PRESENTATION

a) 15 minute
b) 30 minute

2. Flares may be joined to increase burn time
3. Check periodically to ensure that all flares are burning

D. Dangerous situations
   1. Stabilize flares with rocks if placed on a hill or grade
   2. Place away from vegetation along roadway

VI. HAND-HELD SIGNS

A. Maintain visual or radio contact with people managing opposing traffic
B. Safety considerations
   1. Wear helmet
   2. Wear bright protective clothing and/or vest
   3. Always watch oncoming traffic
   4. Be prepared to take evasive action

VII. HAND/ARM SIGNALS

A. Stopping traffic
   1. Look at the driver and make eye contact
   2. Raise your arm/hand shoulder
      a) Maintain eye contact
   3. Point your index finger at the driver
   4. Raise the palm of your hand towards the driver
### What types of arm/hand signals are used to start traffic?

**B. Starting traffic**

1. Look at the driver and make eye contact
2. Stand with your side towards the traffic
3. Raise your arm/hand shoulder high
   - Maintain eye contact
4. Point your index finger at the driver
5. Move the palm of your hand toward the direction of travel
   - Maintain eye contact

### What arm/hand signals are used to direct right-hand turns?

**C. Directing right-hand turns**

1. Look at the driver and make eye contact
2. Raise your right arm/hand shoulder high
   - Maintain eye contact
3. Point your index finger at the driver
4. Swing your right arm in the direction the driver is suppose to travel
5. Continue this arm motion until the driver begins to turn
   - Maintain eye contact

### What arm/hand signals are used to direct left-hand turns?

**D. Directing left-hand turns**

1. Stop on-coming traffic in the lane that the driver has to cross
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. While maintaining the stop signal, look at the driver that needs to turn and make eye contact.</td>
<td></td>
</tr>
<tr>
<td>3. Raise your left arm/hand shoulder high</td>
<td></td>
</tr>
<tr>
<td>a) Maintain eye contact</td>
<td></td>
</tr>
<tr>
<td>4. Point your index finger at the driver</td>
<td></td>
</tr>
<tr>
<td>5. Swing your left arm in the direction the driver is suppose to travel</td>
<td></td>
</tr>
<tr>
<td>6. Continue this arm motion until the driver begins to turn</td>
<td></td>
</tr>
<tr>
<td>a) Maintain eye contact</td>
<td></td>
</tr>
<tr>
<td><strong>E. Safety considerations</strong></td>
<td></td>
</tr>
<tr>
<td>1. Wear helmet</td>
<td></td>
</tr>
<tr>
<td>2. Wear bright protective clothing and/or vest</td>
<td></td>
</tr>
<tr>
<td>3. Be prepared to take evasive action</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

You should have the knowledge required to control traffic at the scene of an emergency. These skills are essential in keeping the scene safe for victims and fellow fire fighters.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Vehicle Rescue, Harvey Grant, 1996 Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS FOR ENERGIZED ELECTRICAL EQUIPMENT

TIME FRAME: 0:45

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of safety considerations for energized electrical equipment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 7 and 14

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Department Occupational Safety, IFSTA, Second Edition

PREPARATION: Fire fighters face a variety of hazards in all emergency responses. The most dangerous hazards are those that can't be seen, such as electricity. It is essential that all fire fighters have a basic understanding of the principles of electricity and the associated hazards in order to avoid injury or death.
# I. ELEMENTS OF ELECTRICITY

## A. Potential energy
1. Measured in volts
2. The potential to do work

## B. Current
1. Measured in amperes (amps)
2. The flow of electrons

## C. Electricity follows path through conductors
1. Best conductors are metals
2. Wood and plastic objects may conduct electricity, but are affected by
   a) Moisture content
   b) Dirty surfaces
3. Water is a conductor
   a) Depends on its purity
      1) Dirty water is a better conductor
   b) Hose streams will conduct
      1) Solid streams are better conductors
      2) Fog stream least likely

## D. Electrical shock
1. Occurs when there is enough voltage to overcome the body's resistance

What units do we use to measure current?

What determines how well water will conduct electricity?
II. STRUCTURAL ELECTRICAL HAZARDS

A. Residential buildings

1. Most circuits are 110 volts

II. STRUCTURAL ELECTRICAL HAZARDS

A. Residential buildings

1. Most circuits are 110 volts
2. Some circuits are 220 volts  
   a) Ovens, stoves, dryers

B. Commercial buildings  
   1. May have multiple service connections  
   2. Some industrial buildings have high voltage service  

   How can we shut-off power to a building?

C. Disconnecting power to structures  
   1. At main panel  
      a) Shut-off breakers  
      b) Remove fuses  
      c) Main electrical disconnect switch  
   2. At subpanel  
      a) To isolate specific areas  
   3. DO NOT  
      a) Cut service drop wires  
      b) Pull meter  
      c) Operate any switches in the presence of combustible vapors or gases

III. EXTERIOR ELECTRICAL HAZARDS  
A. Wires down  
   1. Establish a danger zone of one span in all directions  
   2. Be aware of objects that wires have contacted  
   3. Treat all wires as energized high-voltage lines  
      a) Phone and TV cables may be energized by being in contact with electrical wires  
   4. Consider possibility of other wires down in the area
### PRESENTATION

5. Wait for electrical utility personnel to declare wires as de-energized

   a) Circuit breakers automatically reset
   b) Power feeds may come from different directions

6. Puddles or pools of water with wires in them should be considered as energized

7. Be suspicious of vegetation fires near power lines with no obvious cause

### APPLICATION

If the power is out, why can’t we be sure that the wires are dead?

B. Fires on power poles

1. Do not attempt to extinguish if confined to utility equipment
2. Extinguish secondary fires
3. Extinguish, if possibility of collapse exists

   a) With nonconducting agent
   b) If necessary, use water fog
      1) Allow it to rain down on fire

C. Wires on objects

1. Vehicles
   a) Avoid contact until de-energized
   b) Have occupants remain in vehicle

   1) If occupants need to leave, have them jump clear with both feet

   How should the fire be extinguished?

   What is the safest method to leave the vehicle if necessary?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>2. Fences and guardrails</td>
<td></td>
</tr>
<tr>
<td>a) Consider entire fence to be energized</td>
<td></td>
</tr>
<tr>
<td>1) Can extend for miles</td>
<td></td>
</tr>
<tr>
<td>D. Aboveground transformers</td>
<td></td>
</tr>
<tr>
<td>1. If they have shifted, consider them energized</td>
<td></td>
</tr>
<tr>
<td>a) Objects in contact with them are energized as well</td>
<td></td>
</tr>
<tr>
<td>E. Underground transformers</td>
<td></td>
</tr>
<tr>
<td>1. Wait for utility personnel to de-energize</td>
<td></td>
</tr>
<tr>
<td>2. Be cautious of metal objects in area</td>
<td></td>
</tr>
<tr>
<td>a) Utility hole covers</td>
<td></td>
</tr>
<tr>
<td>b) Transformers</td>
<td></td>
</tr>
</tbody>
</table>

IV. GENERAL PRECAUTIONS

A. Disconnect electrical service to fire buildings
B. Be aware of backup power sources

1. Generators
2. Batteries

3. Can come on once main power is shut down
   a) Automatic switching circuits
4. Can feed power back through distribution system in widespread outages

C. Call electrical utility company to restore power or seal the meter

What kinds of backup power sources are found in buildings?

How do these backup sources pose a danger to fire personnel?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. When there is a risk of contacting an energized object during building search, use the back of your hand</td>
<td>Why is contacting an energized object with the back of the hand less dangerous?</td>
</tr>
<tr>
<td>a) Prevents grasping object with muscle contraction</td>
<td></td>
</tr>
<tr>
<td>E. Be aware of items energized by downed or exposed wires</td>
<td>What distance does Cal/OSHA require us to maintain between ladders and energized wires?</td>
</tr>
<tr>
<td>1. Plumbing</td>
<td></td>
</tr>
<tr>
<td>2. Telephone or TV cable wires</td>
<td></td>
</tr>
<tr>
<td>3. Roof gutters</td>
<td></td>
</tr>
<tr>
<td>F. Be aware of low hanging wires when working on roof or with ladders</td>
<td></td>
</tr>
<tr>
<td>G. Avoid spotting apparatus under wires, which may come down</td>
<td></td>
</tr>
<tr>
<td>H. When in doubt, consider the wire energized and call for electrical utility personnel</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Electricity can cause injury or death with no warning. In responding to emergencies, fire fighters regularly face electrical hazards. All personnel should be constantly vigilant for these hazards and take steps to avoid them. All wires should be considered energized until proven otherwise. Electrical utility personnel should be called whenever electrical hazards need to be controlled.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 7 and 14 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROCEDURES FOR RESPONDING ON APPARATUS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of procedures for responding on apparatus to an emergency scene by completing the written test


MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Department Occupational Safety, IFSTA, Second Edition
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: Many accidents occur to firefighters while in transit to and from emergencies. The use of safety features, such as a seat belt, is your responsibility. Serious death or injury can occur from your improper practices.
I. **HAZARDS ASSOCIATED WITH RIDING ON APPARATUS**
   A. Loose gear
   B. Wet floorboards
   C. Mounting and dismounting
   D. Proper footing
   E. Improper handhold
   F. PPE worn properly

II. **APPARATUS SAFETY FEATURES**
   A. Seat belts
   B. Safety bars
   C. Hearing protection

III. **UNSAFE/PROHIBITED PRACTICES**
   A. No standing on tailboards or sideboards while apparatus is in motion
   B. Disabling apparatus provided safety equipment
      1. Seat belts
      2. Safety bars, etc.
SUMMARY:

All personnel should be constantly aware of hazards associated with responding on apparatus. Serious injury or death can result from improper use of standard apparatus safety devices and the improper storage of gear and equipment.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: HOW TO MOUNT AND DISMOUNT A FIRE APPARATUS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.2

BEHAVIORAL OBJECTIVE:

Condition: A fire apparatus and appropriate personal protective equipment

Behavior: The student will mount and dismount a fire apparatus

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Fire apparatus
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Department Occupational Safety, IFSTA, Second Edition

PREPARATION:
Many accidents occur in transit to and from emergencies. Many injuries are a result of improper techniques while getting on or off the apparatus. Serious injury or even death can occur from improper practices.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Face apparatus</td>
<td>1a. In appropriate PPE&lt;br&gt;b. NEVER attempt to don PPE in or on the apparatus</td>
</tr>
<tr>
<td>2. Grasp the grab rail</td>
<td>2a. With the appropriate hand&lt;br&gt;b. Ensuring there is nothing in your way</td>
</tr>
<tr>
<td>3. Step onto the apparatus</td>
<td>3a. Always facing forward&lt;br&gt;b. Secure footing</td>
</tr>
<tr>
<td>4. Sit down</td>
<td>4a. In assigned seat</td>
</tr>
<tr>
<td>5. Secure all safety restraints</td>
<td>5a. Properly</td>
</tr>
<tr>
<td>6. Remain seated</td>
<td>6a. DO NOT attempt to don a SCBA while the apparatus is in motion</td>
</tr>
<tr>
<td>7. Stand up</td>
<td>7a. After apparatus has come to a complete stop and <strong>you are instructed to dismount</strong></td>
</tr>
<tr>
<td>8. Grasp the grab rail</td>
<td>8a. With the appropriate hand&lt;br&gt;b. Ensuring there is nothing in your way</td>
</tr>
<tr>
<td>9. Step off the apparatus</td>
<td>9a. Always facing forward&lt;br&gt;b. Secure footing</td>
</tr>
<tr>
<td>10. Report to Company Officer</td>
<td>10a. To await instructions</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** FIRE FIGHTER INJURIES AND FATALITIES

**TIME FRAME:** 2:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9 and CCR Title 8, Section 5144

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the situations that result in fire fighter injury and death by completing the written test

*Standard:* With a minimum 80% accuracy according to the information contained in the Fire Fighter Rescue & Survival, Hoff and Kolomay, 1999 Edition

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- Fire Fighter Rescue & Survival, Hoff and Kolomay, 1999 Edition
- "Working Fire" video, Vol. 95-12 and 97-5

**PREPARATION:**

What structural fire fighting conditions are injuring and killing today's fire fighters? Can common denominators be found? This lesson will look at actual incidents from fire situations that injured or killed our own. Based on the information presented in the videos and lecture, what can you do today to prevent these situations from happening tomorrow? May the lessons learned protect you and your fellow fire fighters.
I. INTRODUCTION

A. Fire injuries and fatalities are not meant to be critical of any department's or individual's actions

B. These incidents are offered for instructional purposes only with respect and gratitude to the departments involved for the purpose of educating fire fighters for their safety

NOTE: Maintain and present the latest documented incidents that are pertinent to this topic.

II. SAN FRANCISCO, MARCH 9, 1995, 0059 HOURS

A. Situation
   1. Single-family dwelling built on a ridge
      a) 2 stories exist below the entry level
      b) "Cliff hanger" house
   2. First-in engine company prepared for a room and contents fire and began initial attack

B. Fire conditions
   1. Fire started at an outlet in exterior wall of a room, one story below grade
   2. Fire traveled in concealed space in addition to the involved room
   3. Outside winds in the canyon were gusting to 50 mph

C. Initial fire attack
   1. First hoseline into/through the attached garage to attack the fire
   2. Additional hoselines to protect exposures

D. Changing fire conditions
   1. The fire vented through the exterior windows
Picture yourself fanning the coals in the backyard BBQ. How quickly does that change the fire's intensity?

2. The high winds forced oxygen into the fire creating a bellows effect and dramatically increasing the fire's intensity

3. Interior conditions rapidly degraded, making interior fire fighting impossible

4. Interior crews decided to exit the structure to a more tenable point of fire attack

E. The unexpected happens

1. At some point after the interior crew entered the garage, the door closed behind them

2. Exterior personnel did not immediately recognize the hazard

3. The attack crew is now trapped

F. Rescue efforts

1. A fire fighter on the exterior hears banging on the garage door and assumes it is another fire fighter in the area that was trying to enter the closed door

2. Fire fighter realizes the banging is from the inside and calls for help

3. Three fire fighters unable to lift the door
   a) The door is breached with axes and finally, a chain saw

4. Panic sets in

5. One fire fighter is removed

6. Additional fire fighters arrive at garage door
   a) Six fire fighters lift door open

7. Two additional fire fighters found at door
NOTE: Show video "Working Fire," video, Volume 95-12, approximately 14 minutes.

Without finding any fault, discuss potential issues that contribute to and contribute against fire fighter safety.

G. Some discussion points to cover
   1. Fire fighter accountability
   2. Common distress signals
   3. Common evacuation command
   4. Safety Officer
   5. Rapid intervention crew
   6. Essential tools

III. LOS ANGELES, JULY 30, 1995, 0321 HOURS
A. Situation
   1. Vacant commercial building
B. Initial fire attack
   1. Initial attack was defensive with master streams from the street
   2. Once the main body of the fire was knocked down, crews entered the building to continue extinguishment
   3. IC ordered all personnel to remain outside of the structure
C. The unexpected happens
   1. Structure collapse shortly after IC orders people out
   2. Time of collapse approximately 19 minutes after arrival on scene
   3. Seven fire fighters trapped in rubble

NOTE: Show video "Working Fire," video, Volume 95-12, approximately 11 minutes.
NOTE: Without finding any fault, discuss potential issues that contribute to and contribute against fire fighter safety.

D. Some discussion points to cover
   1. Fire fighter accountability
   2. Common distress signals
   3. Common evacuation terms
   4. Safety Officer
   5. Rapid intervention crew
   6. Essential tools

IV. STOCKTON, FEBRUARY 6, 1997, 0412 HOURS
   A. Situation
      1. Single-family dwelling
         a) Attached dance studio
         b) Second-story master bedroom and deck
      2. Dispatch stated, "Occupants likely inside"
   B. Initial fire attack
      1. Heavy fire conditions on arrival, exposures threatened
      2. First arriving crews were not aware structure was two stories
      3. Two handlines extended through the front door to attack the fire
   C. The unexpected happens
      1. Twenty-three minutes after arrival, one interior crew reports a wall collapse with people trapped
         a) Exterior crew reports collapse at back of building
      2. Three fire fighters trapped under collapsed second floor

Without finding any fault, discuss potential issues that contribute to and contribute against fire fighter safety.

D. Some discussion points to cover
   1. Fire fighter accountability
   2. Common distress signals
   3. Common evacuations term
   4. Safety Officer
   5. Rapid intervention crew
   6. Essential tools
**SUMMARY:**

Sincere thanks must be given to the fire departments that shared the information presented. Learning from their experiences is the only hope for preventing such tragic losses in the future. These were real people and dedicated fire fighters. The focus of this course is the prevention of these situations, self-rescue, and the rescue of fire fighters that cannot help themselves.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROCEEDURES FOR USING RAPID INTERVENTION CREWS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the procedures for using rapid intervention crews by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Cal/OSHA Section 5144(g) (3) & (4)
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- NFPA Standard #1500, NFPA, 1997 Edition

PREPARATION: Cal/OSHA issued a revised standard and adopted the federal regulation regarding respiratory protection. The regulations now require that interior structural fire fighting procedures provide for at least two fire fighters inside the structure. Training is mandated by this regulation. This lesson will introduce the practice and establishment of a rapid intervention crew (RIC). RIC is an important function at any incident and each fire fighter must fully understand its importance to carry out the assignment properly.
I. TERMINOLOGY

A. IDLH environment
   1. Immediately dangerous to life and health

B. Known rescue
   1. Immediate action required to prevent human loss of life or serious injury

C. Incipient fire
   1. The initial or beginning stage of a fire

D. Entry team
   1. Two or more fire fighters who enter a structure fire's IDLH environment

E. Rapid intervention crew
   1. Two or more fire fighters who enter into an IDLH environment to rescue entry team firefighters
   2. Other names used for rapid intervention crew
      a) Rapid intervention company
      b) Rapid intervention team
      c) Rapid attack team
      d) Safety team

II. TWO-IN/TWO-OUT POLICY

A. An IDLH environment in a structure requirements
   1. A minimum of two fire fighters for entry
   2. A minimum of two fire fighters outside for backup
      a) Except during initial size-up by IC and incipient stage of fire

What is IDLH?

What term for rapid intervention crew does your department use?
B. Incipient fire stage
   1. Controlled/extinguished by
      a) Portable fire extinguisher(s)
      b) Class II standpipe
      c) Small hoseline system
      d) Not requiring personal protective equipment

C. Known rescue
   1. Deviation from 2-in/2-out policy allowed
      a) To prevent human loss of life or injury
   2. Procedure
      a) Dispatch notified of intent to enter structure
      b) Investigation conducted to determine cause
      c) Written report of incident submitted to Fire Chief

D. Entry crewmembers
   1. Must maintain contact with each other by
      a) Voice, physical touch, visual, or tag line
      b) Secondary method is radio communication

Describe an example of incipient fire stage.

Does a RIC have to be in place to conduct a rescue?
### III. RIC RESPONSIBILITIES

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Mental mission</strong></td>
<td><strong>How can you be prepared as a RIC?</strong></td>
</tr>
<tr>
<td>1. Develop a plan</td>
<td><strong>When does size-up begin for rapid intervention?</strong></td>
</tr>
<tr>
<td>2. Be prepared for the unexpected</td>
<td></td>
</tr>
<tr>
<td><strong>B. Size-up</strong></td>
<td><strong>Whom does RIC report to on arrival?</strong></td>
</tr>
<tr>
<td>1. Starts en route</td>
<td></td>
</tr>
<tr>
<td>2. Type of building</td>
<td></td>
</tr>
<tr>
<td>3. Type of occupancy</td>
<td></td>
</tr>
<tr>
<td>4. Extent of fire</td>
<td></td>
</tr>
<tr>
<td>5. Monitor radio channel(s)</td>
<td></td>
</tr>
<tr>
<td><strong>C. Upon arrival</strong></td>
<td><strong>What tools and equipment are needed for rescue?</strong></td>
</tr>
<tr>
<td>1. Report to IC or operations</td>
<td></td>
</tr>
<tr>
<td>2. Obtain incident briefing</td>
<td></td>
</tr>
<tr>
<td>3. Receive assignment</td>
<td></td>
</tr>
<tr>
<td>4. Report to Division/Group Supervisor</td>
<td></td>
</tr>
<tr>
<td><strong>D. Minimum tools and equipment needed</strong></td>
<td></td>
</tr>
<tr>
<td>1. Appropriate personal protective equipment including SCBA</td>
<td></td>
</tr>
<tr>
<td>2. Forcible entry tools</td>
<td></td>
</tr>
<tr>
<td>3. Personal alarm safety system (PASS) device</td>
<td></td>
</tr>
<tr>
<td>4. Rope bag</td>
<td></td>
</tr>
</tbody>
</table>
E. Incident scene assessment

1. Size-up
   a) All sides of building/structure

2. Location
   a) Fire
   b) Entry crew

3. Identify entry and exit points
   a) Interior attack crew

4. Identify alternate entrances and exits

5. Identify additional ladder placement, if appropriate

6. Identify weak areas of structure caused by water or fire

F. Action plan

1. Rapid intervention crew
   a) Must account for all members of entry team
   
   b) Be prepared to rescue entry team
   
   c) One member assigned and dedicated to tracking entry team
      1) Radio
      2) Visual
      3) Voice

Who keeps track of the entry team?
### PRESENTATION

2. Other functions of RIC
   a) One or more members of RIC can function in another capacity
      1) Only if abandoning their critical task doesn't jeopardize the safety and health of any fire fighter working at the incident

### APPLICATION

Can RIC members function in another position?

How many RICs are required at an incident?

What are the actions of the first-in engine company?

### IV. FIRST-IN COMPANY ACTION BEFORE SET-UP OF RIC

A. Size-up fire
   1. Four sides of building

B. Pull attack lines

C. Make exterior attack, if applicable

D. Establish a continuous water supply

E. Protect exposures

F. Ventilate or prepare to ventilate
SUMMARY:
Cal/OSHA mandates that when an IDLH environment exists in a structure, there will be a buddy system of 2-in/2-out. The entry team must maintain contact with each other by voice, visual, physical touch, or tag line. A standby crew must be in place in case there is a need to rescue loss, trapped, or injured fire fighters. This regulation is to prevent loss of life.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
TOPIC: PERFORMING AN ASSESSMENT ON A DOWNED FIRE FIGHTER

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of a downed fire fighter assessment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Firefighter Incident Safety and Accountability Guidelines ICS-910, FIRESCOPE

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Firefighter Incident Safety and Accountability Guidelines ICS-910, FIRESCOPE
- Firefighter Rescue & Survival, Hoff and Kolomay, 1999 Edition

PREPARATION: Many fire fighters each year become incapacitated during fire fighting operations in structures. It is your job, as a rapid intervention crew, to access and perform a basic assessment on a fellow fire fighter that has become a victim. Your quick access and proper assessment is the foundation to a successful rescue.
How do you locate the downed fire fighter?

I. LOCATING A DOWNED FIRE FIGHTER
   A. Follow tag line
   B. Follow hoseline
   C. Respond to last reported position
   D. Follow search pattern
   E. Listen for personal alarm device

What do you do once you have found the downed fire fighter?

II. ASSESSING DOWNED FIRE FIGHTER
   A. Locate and turn off personal alarm device
      1. Reduces noise level for communications
      2. Reduces anxiety
   B. Radio report (communications)
      1. Give a detailed, descriptive report to get attention and assistance

What information should you relay in your radio report?

a) "Emergency traffic"
   1) This should get the attention of all on-scene personnel followed by radio silence

b) Detailed location
   1) Floor
   2) Area
   3) Stairwell

c) How many victims down

d) Advise IC who is down, if known
1. **Why fire fighter is down**
   - 1) Medical condition
   - 2) Collapse
   - 3) Flashover

2. **Actions necessary for rescue**
   - 1) Equipment needs
   - 2) Personnel needs
   - 3) Where you are taking the victim out

3. **Hazards to rescuers**
   - 1) Building collapse
   - 2) Fire
   - 3) Electrical

---

2. **Determine level of consciousness**
   - a) Shake and shout
   - b) Use caution not to panic victim

3. **Reposition victim**
   - a) If found in the prone position, face down, roll fire fighter over to gain access

4. **Check for air supply**
   - a) Break seal of mask and check positive pressure
     1) Blow by
   - b) Check if victim is breathing
   - c) If there is air
     1) Check gauge to see how much is remaining

---

*How do you check for responsiveness?*

*How would you check if the downed fire fighter is getting air?*
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>d) If there is no air</td>
<td></td>
</tr>
<tr>
<td>1) Try bypass</td>
<td></td>
</tr>
<tr>
<td>2) Leave facepiece on victim</td>
<td></td>
</tr>
<tr>
<td>3) Change out SCBA if one was brought in</td>
<td></td>
</tr>
<tr>
<td>4) Detach facepiece valve and remove victim</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

In order to be prepared for rescuing a downed fire fighter from a structure, you must understand the fundamentals of an assessment. When you have a plan and practice it, you will be able to efficiently and expeditiously assess the downed fire fighter. This will enable you to properly communicate all essential information to make the rescue a success.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read your Firefighter Incident Safety and Accountability Guidelines ICS-910, FIRESCOPE in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PERSONNEL ACCOUNTABILITY REPORTS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of personnel accountability reports (PARS) by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 1 and Firefighter's Handbook, Delmar, 2000 Edition, Chapter 23

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Occupational Safety and Health in the Emergency Services, Delmar, First Edition

PREPARATION: During emergencies, personnel must be accounted for at all times. Various methods are employed by the fire service today for tracking personnel on an incident. Fire fighters need a working knowledge of these accountability systems and the importance of accounting for all persons on the fireground.
I. ACCOUNTABILITY

A. Accounts for the exact location of an individual at any given time during an incident
B. Ensures that all individuals are checked into the system when they arrive at an incident
C. Provides for points of entry into the hazard zone
D. Extremely helpful on large incidents with multiagency response

II. SYSTEM REQUIREMENTS

A. IC and/or Accountability Officer
   1. Checks at regular intervals
   2. Before, during, and after searches
   3. Before, during, and after incident is controlled
   4. When there is a change in tactics
      a) Offensive/defensive
   5. Report of missing personnel

6. Significant events
   a) Flashover
   b) Backdraft
   c) Collapse

Who is responsible for accountability?

What are examples of significant events?
### III. SYSTEM TYPES

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Tag</strong></td>
<td></td>
</tr>
<tr>
<td>1. Personnel are equipped with personal identification tags</td>
<td></td>
</tr>
<tr>
<td>2. Personnel leave tags with the IC and/or Accountability Officer before entering the emergency scene</td>
<td></td>
</tr>
<tr>
<td>a) Entering a structure or confined space</td>
<td></td>
</tr>
</tbody>
</table>

| **B. T-cards** |             |
| 1. Engine companies are equipped with personnel T-cards |             |
| 2. Personnel leave T-cards with the IC and/or Accountability Officer before entering the emergency scene |             |
| a) Requires engine company officer to track individuals on his or her engine |             |

| **C. Computer bar codes** |             |
| 1. Personnel are equipped with a bar code attached to their safety gear |             |
| 2. Personnel are scanned as they enter an incident |             |
| 3. Codes are transmitted to the IC and/or Accountability Officer |             |
| a) Not all agencies are equipped with this method |             |

What type of system does your department use?
**SUMMARY:**

Every fire fighter should learn their department's standard operating procedures (SOP) regarding personnel accountability systems. They are a strict requirement and require participation by everyone at all levels and at all incidents.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: CONDITIONS REQUIRING RESPIRATORY PROTECTION

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of conditions requiring respiratory protection by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Self-Contained Breathing Apparatus, IFSTA, Second Edition

PREPARATION: The respiratory tract and lungs are some of the most vulnerable parts of the body. Fire fighters often encounter conditions that put them at risk of injuring their respiratory system. Failure to recognize these conditions and take appropriate action can result in serious injury or death. All fire fighters must understand of the need for using respiratory protection.
I. FOUR COMMON RESPIRATORY HAZARDS FOUND AT EMERGENCY SCENES

A. Oxygen deficiency
B. Elevated temperatures
C. Smoke or unburned products of combustion
D. Toxic atmospheres

E. Can be found separately or in combination with each other
   1. Confined space
      a) Oxygen deficiency
   2. Hazardous materials release
      a) Toxic atmosphere
   3. Fires
      a) Generally all four are present

F. Legal requirements
   1. California Code of Regulations Title 8, Section 5144 (Cal/OSHA)
## II. OXYGEN DEFICIENCY

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A.</strong> Normal oxygen level in air</td>
<td>What is the normal concentration of oxygen in air?</td>
</tr>
<tr>
<td>1. 21%</td>
<td></td>
</tr>
<tr>
<td><strong>B.</strong> Cal/OSHA definition of oxygen deficient</td>
<td></td>
</tr>
<tr>
<td>1. 19.5%</td>
<td></td>
</tr>
<tr>
<td><strong>C.</strong> Some impairment of muscular coordination and increased respiratory rate</td>
<td>At what level of oxygen will a person become unconsciousness?</td>
</tr>
<tr>
<td>1. 17%</td>
<td></td>
</tr>
<tr>
<td><strong>D.</strong> Dizziness, headache, rapid fatigue</td>
<td>What are some mental effects of an oxygen deficient atmosphere?</td>
</tr>
<tr>
<td>1. 12%</td>
<td></td>
</tr>
<tr>
<td><strong>E.</strong> Unconsciousness</td>
<td></td>
</tr>
<tr>
<td>1. 9%</td>
<td></td>
</tr>
<tr>
<td><strong>F.</strong> Death within a few minutes</td>
<td></td>
</tr>
<tr>
<td>1. 6%</td>
<td></td>
</tr>
<tr>
<td><strong>G.</strong> Physical effects of oxygen deficient environments</td>
<td></td>
</tr>
<tr>
<td>1. Fatigue</td>
<td></td>
</tr>
<tr>
<td>2. Increased heart and respiratory rates</td>
<td></td>
</tr>
<tr>
<td>3. Dizziness</td>
<td></td>
</tr>
<tr>
<td>4. Nausea and vomiting</td>
<td></td>
</tr>
<tr>
<td><strong>H.</strong> Mental effects</td>
<td></td>
</tr>
<tr>
<td>1. Panic</td>
<td></td>
</tr>
</tbody>
</table>
## PRESENTATION

2. Inability to reason  
3. Unconsciousness

### III. INHALING HEATED GASES

A. Decrease in blood pressure causes failure of the circulatory system  
B. Tissue damage to respiratory tract and lungs  
C. Accumulation of fluid in the lungs (pulmonary edema)  
D. May result in death

### IV. SMOKE

A. The suspension of small unburned particles  
   1. Carbon  
   2. Tar  
   3. Dust  
B. An irritant to the respiratory system  
C. May result in  
   1. Pulmonary edema  
   2. Death

### V. TOXIC ATMOSPHERES

A. Fires give off a variety of gases based on several factors  
   1. Nature of the combustible  
   2. Rate of heating

### APPLICATION

What are some results of inhaling heated gases?  
What is smoke?  
What are some factors that determine what gases are given off in a fire?
3. Temperature
4. Oxygen level

What is IDLH?

B. IDLH
1. Immediately dangerous to life and health
2. National Institute for Occupational Health and Safety (NIOSH) definition of IDLH condition
   a) One that "poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment"

What is ppm?

C. Ppm
1. Parts per million
2. Number of molecules of contaminant found in 1,000,000 molecules of air
   a) 1 ppm is equivalent to ratio of 1¢ to $10,000

D. Toxic atmospheres associated with fires


1. Carbon dioxide (CO₂)
   a) Colorless and odorless
   b) Product of complete combustion
   c) IDLH
      1) 40,000 ppm

What produces carbon dioxide?
2. Carbon monoxide (CO)

a) Colorless and odorless
b) Combines with blood 218 times easier than oxygen
c) Product of incomplete combustion
d) Most common cause of fire-related deaths
e) IDLH
   1) 1,200 ppm

3. Hydrogen chloride (HCl)
a) Slightly yellow with pungent odor
b) Product of burning plastics
   1) Polyvinyl chloride (PVC)
c) IDLH
   1) 50 ppm

4. Hydrogen cyanide (HCN)
a) Colorless with odor of bitter almonds
b) Product of burning wool, nylon, polyurethane, foam, or rubber
c) IDLH
   1) 50 ppm
5. Nitrogen dioxide (NO₂)
   a) Reddish-brown with acrid odor
   b) Product of grain storage and burning cellulose nitrate (film)
   c) IDLH
      1) 20 ppm

6. Phosgene (COCl₂)
   a) Colorless with odor of musty hay
   b) Product of burning refrigerants such as Freon
   c) IDLH
      1) 2 ppm

E. Physical effects of exposure
   1. Eye irritation
   2. Reduced vision
   3. Cough
   4. Headache
   5. Pulmonary edema
   6. Asphyxiation

F. Mental effects of exposure
   1. Inability to reason
   2. Irrational behavior
3. Confusion
4. Unconsciousness

G. Toxic atmospheres are found at nonfire incidents
1. Normal by-products from some manufacturing processes
2. Hazardous materials releases
3. Confined spaces

H. Cumulative effects of exposure
1. Lung damage
   a) Emphysema
   b) Bronchitis
2. Cardiac complications
   a) Heart attack
   b) Dysrhythmia
3. Cancer
4. Death

What are some cumulative effects of exposure to toxic atmospheres?
SUMMARY:

Fire fighters encounter four common respiratory hazards at emergency scenes: oxygen deficiency, elevated temperatures, smoke, and toxic atmospheres. Each of these can have both physical and mental effects on the fire fighter if proper respiratory protection precautions are not taken. Exposure to respiratory hazards can have long-term cumulative effects on fire fighters.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: TYPES OF SELF-CONTAINED BREATHING APPARATUS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the types of self-contained breathing apparatus by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Self-Contained Breathing Apparatus, IFSTA, Second Edition

PREPARATION: There are several types of self-contained breathing apparatus that have been used by the fire service. Some types are no longer acceptable or legal for use. It is important that the firefighter can identify the different types of SCBA and their uses.
### OPEN-CIRCUIT

A. Exhaled air is exhausted to the atmosphere

B. Types

1. Demand
   a) Air supply is delivered to mask by negative pressure created during inhalation
   b) Not legal for fire service use

2. Supplied air respirators
   a) Often called airline equipment
   b) Similar to a SCBA

<table>
<thead>
<tr>
<th>What is the primary difference?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Air supply cylinder is remote from user</td>
</tr>
<tr>
<td>2) Hose connecting regulator to the cylinder may be up to 200 feet long</td>
</tr>
<tr>
<td>c) Often used with a small capacity air cylinder</td>
</tr>
<tr>
<td>1) Carried by user</td>
</tr>
<tr>
<td>2) For emergency escape purposes</td>
</tr>
<tr>
<td>d) Can be a standard SCBA modified to be used with air supply hose</td>
</tr>
</tbody>
</table>

What are some applications for a supplied air respirator?

e) Uses
   1) Hazardous materials incidents
   2) Confined space rescues
   3) Generally not used for fire fighting
      - Except for fire fighters in aerial baskets
### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Positive pressure</td>
</tr>
<tr>
<td>a)</td>
<td>Used almost universally in the fire service</td>
</tr>
<tr>
<td>b)</td>
<td>Slight positive pressure is maintained in the mask</td>
</tr>
</tbody>
</table>

#### Why would we want to have positive pressure in the mask?

1) Prevents contaminated air from entering the mask if the seal between the mask and the user's face is broken

### CLOSED-CIRCUIT

A. Exhaled air is recirculated in the system
   1. O$_2$ is added
   2. CO$_2$ is removed

B. Fire service requirements
   1. Must be rated for 30 minutes minimum
   2. Must be positive pressure

C. Compressed oxygen units
   1. Carry small supply of O$_2$
   2. CO$_2$ removed by scrubbers

D. Chemical generator units
   1. O$_2$ is produced by a chemical process within the SCBA
   2. Used by military and industry for specialized applications
   3. Use by the fire service is not recommended

#### How does a closed-circuit breathing apparatus work?
SUMMARY:

Open circuit, positive pressure self-contained breathing apparatus are most commonly used by the fire service. Fire fighters may encounter closed-circuit units in rare occasions.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SCBA COMPONENTS AND ACCESSORIES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the SCBA components and accessories by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Self-Contained Breathing Apparatus*, IFSTA, Second Edition, Chapter 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- SCBA including air cylinder and facepiece

REFERENCES:
- *Essentials of Fire Fighting*, IFSTA, Fourth Edition

PREPARATION:
Fire fighters must have confidence in their safety equipment. In order to develop this confidence with the self-contained breathing apparatus, you must know the basic components and their functions.

The accessories for a self-contained breathing apparatus improve communication, reduce facepiece fogging, aid vision, and increase user safety and are all-important to the fire fighter.
I. FOUR BASIC COMPONENTS
   A. Backpack assembly
   B. Air cylinder
   C. Regulator assembly
   D. Facepiece assembly

   NOTE: Refer to manufacturer's users manual for specifications.

What is the purpose of the backpack assembly?

II. BACKPACK ASSEMBLY
   A. Holds unit in place on fire fighter's back
   B. Manufactured of metal and/or high temperature resistant materials
      1. Should not fail when burned
   C. Adjustable harness straps
      1. All straps should be secured
      2. Adjust straps to carry most of the weight on the hips

III. AIR CYLINDER
   A. Construction
      1. Steel
         a) Generally no longer used
      2. Aluminum
      3. Fiberglass wrapped
         a) Aluminum liner shell
         b) Hoop-wrapped
         c) Full-wrapped
      4. Kevlar/carbon composite
B. Cylinder capacities

1. Cylinder pressure gauge
2. High pressure
   a) 4,500 psi
3. Low pressure
   a) 2,216 psi
   b) 3,000 psi for carbon fiber cylinders

4. Rated duration
   a) 30 minutes
      1) 45 cubic feet
   b) 45 minutes
      1) 65 cubic feet
   c) 60 minutes
      1) 88 cubic feet

C. Cylinder service life

1. Hydrostatic test
   a) Ensures cylinder is capable of withstanding filling to rated capacity
2. Steel and aluminum cylinders
   a) Must pass hydrostatic test every 5 years
   b) Unlimited service life
3. Fiberglass wrapped and composite cylinders
   a) Must pass hydrostatic test every 3 years
   b) Maximum service life of 15 years
4. Air quality
   a) Grade D per Compressed Gas Association pamphlet G-7.1-1989
   b) Source must be tested every 3 months

**IV. REGULATOR**

A. Reduces cylinder pressure
B. Two stages
   1. Second stage may be mounted on facepiece
C. Bypass valve
D. Low pressure warning device
   1. Activated at 450–550 psi

**V. FACEPIECE ASSEMBLY**

A. Lens
B. Exhalation valve
   1. Maintains positive pressure in mask
C. Head harness

**VI. ACCESSORIES**

A. Accessories that reduce facepiece fogging
   1. Nose cups
   2. Antifogging compounds
      a) Some may damage lens
B. Accessories that improve communications
   1. Speaking diaphragms
### SCBA Components And Accessories

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Mask mounted amplifiers</td>
<td></td>
</tr>
<tr>
<td>3. Radio interfaces</td>
<td></td>
</tr>
<tr>
<td>C. Accessories that aid vision</td>
<td></td>
</tr>
<tr>
<td>1. Facepiece lens mount</td>
<td>How can vision be corrected when using breathing apparatus?</td>
</tr>
<tr>
<td>a) Avoid standard eyeglasses</td>
<td></td>
</tr>
<tr>
<td>b) Avoid contact lenses</td>
<td></td>
</tr>
<tr>
<td>D. Accessories that increase user safety</td>
<td></td>
</tr>
<tr>
<td>1. Built-in personal alarm device</td>
<td></td>
</tr>
<tr>
<td>a) Activated when air supply is turned on</td>
<td></td>
</tr>
<tr>
<td>2. Air supply gauges/monitors in mask</td>
<td></td>
</tr>
<tr>
<td>3. Buddy breathing hose connections</td>
<td></td>
</tr>
<tr>
<td>a) Allow connection of other users to same SCBA</td>
<td></td>
</tr>
<tr>
<td>b) For emergency use only</td>
<td></td>
</tr>
<tr>
<td>4. Emergency air fill connection</td>
<td></td>
</tr>
<tr>
<td>a) Allows refilling of cylinder from another SCBA</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

A self-contained breathing apparatus consists of four basic components: backpack assembly, air cylinder, regulator assembly, and facepiece assembly. SCBA accessories will enhance the use of the basic components and assist the SCBA to function better. All of these components contribute to the proper operation of the SCBA. You must understand these functions in order to develop proficiency and confidence in the use of the SCBA.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Self-Contained Breathing Apparatus*, IFSTA, Second Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FACTORS AFFECTING AIR SUPPLY DURATION OF SCBA

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of factors which reduce the air supply duration of SCBA and actions which can be taken to minimize the effects of these factors by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Self-Contained Breathing Apparatus, IFSTA, Second Edition

PREPARATION: The factors affecting air supply duration should always be considered when using a SCBA. The duration of a SCBA is greatly dependent upon the ability of the user to understand these factors and take appropriate actions to minimize their impact. Maximizing the air supply duration could be critical when performing a self-rescue or rescuing another person.
I. AIR SUPPLY DURATION
   A. NIOSH and the Mine Safety and Health Administration (MSHA) require the following manufacturer’s statement
      1. "The user should not expect to obtain exactly 30-minute service life from this apparatus for each use"
   
   B. Averages
      1. Low pressure cylinder
         a) One minute per 100 psi
      2. High pressure cylinder
         a) One minute per 200 psi
   
   C. Duration could be cut in half depending on how strenuous the work

II. FACTORS THAT REDUCE AIR SUPPLY DURATION
   
   A. Equipment malfunction
      1. Improper maintenance
         a) Leaks
            1) Stripped threads
            2) Bad or missing O-rings
            3) Poor connections
         b) Unskilled maintenance personnel
      2. Outdated equipment
      3. Deterioration or damage to components
         a) Causes
## 1) Misuse
- Dropping/impacting SCBA
- Underwater use

## 2) Mechanical/chemical
- Exposure to excessive heat
- Exposure to chemicals

## 4. Inadequate filling of cylinders

### B. Physical fitness of fire fighter

1. Aerobic capacity
   a) Cardiovascular endurance
   b) Higher capacity enhances oxygen use
   c) Allows quicker recovery
   d) Increases length of breathing time

2. Muscular endurance
   a) Ability of a muscle to work over a prolonged period of time
   b) High endurance requires less oxygen to yield same amount of work
### PRESENTATION

#### 3. Muscular strength
- **a)** Ability of a muscle to exert maximum exertion in a short period of time
  - How does strength affect consumption?
- **b)** Provides for immediate strength needs and aids in recovery time

#### 4. Flexibility
- **a)** Degree to which a person's body can move through a full range of motion
  - How does flexibility affect consumption?
- **b)** A high degree of flexibility allows the firefighter to work in confined spaces with less exertion, which results in reduced air consumption

### APPLICATION

- What is muscular strength?
- What is flexibility?
- What are physiological responses?
- What are some environmental factors that may affect air supply duration?

#### C. Physiological responses

1. A body's response to the environment

2. Temperature extremes
- **a)** Heat
  - 1) Causes rapid fatigue
- **b)** Cold
  - 1) Body uses energy and oxygen to maintain body temperature
### III. MAXIMIZING AIR SUPPLY DURATION

**A. Equipment maintenance**

1. Check SCBA regularly for proper operation
2. Remove nonfunctional equipment from service
3. Clean and maintain SCBA after each use
## B. Physical fitness

1. Maintain regular fitness program
   a) Aerobic
   b) Strength
   c) Flexibility
2. Maintain healthy lifestyle habits
   a) No smoking
   b) Healthy diet

## C. Psychological fitness

1. Regular training with SCBA
   a) Increases confidence in equipment and skills
2. Reducing emotional responses
   a) Breathing techniques
   b) Relaxation techniques
   c) Meditation/biofeedback

What kind of training should be included in a program?

How can a fire fighter decrease the effects of psychological response?
**SUMMARY:**

Numerous factors affect the air supply duration of a self-contained breathing apparatus. These include equipment related, physical fitness of the fire fighter, physiological considerations, and psychological responses. For many of these factors, the fire fighter can take proactive steps to reduce the negative effects. In order to maximize their effectiveness on the fireground, fire fighters should work to increase their air supply duration.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

FIRE FIGHTER I

**TOPIC:** SAFE USE OF SCBA

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.1 and CCR Title 8, Section 5144

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of safe use of SCBA by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4 or Firefighter's Handbook, Delmar, 2000 Edition, Chapter 7

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Self-Contained Breathing Apparatus, IFSTA, Second Edition

**PREPARATION:**

Even the best quality safety equipment will not provide adequate protection when it is not used correctly and safely. There are many considerations for the correct use of a SCBA. Fire fighters should be aware of these considerations in order to work safely.
# BASIC SAFETY CONSIDERATIONS

A. Fire agencies must develop a SCBA program
   1. Required by California Code of Regulations Title 8, Section 5144
   2. Fire fighters should be certified as being physically fit for using SCBA
   3. Fire fighters should be fit tested for the mask they use
   4. A fireground accountability system must be established

<table>
<thead>
<tr>
<th>When should SCBAs be worn?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Track fire fighters working in an IDLH environment</td>
</tr>
<tr>
<td>b) Always check in</td>
</tr>
<tr>
<td>1) Prior to entering hostile environment</td>
</tr>
<tr>
<td>2) After exiting hostile environment</td>
</tr>
</tbody>
</table>

B. Wear a breathing apparatus any time the possibility of a hazardous environment exists
   1. Be suspicious in questionable circumstances
   2. Continue to wear SCBA during overhaul
      a) Use air monitoring when possible to confirm that environment is safe

C. Check for proper functioning of equipment prior to entering a hostile environment
   1. Adjustment of straps
   2. Facepiece seal
   3. Adequate air supply
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Always work in crews of two or more</td>
<td>What is the minimum number of fire fighters that should work together in a hazardous environment?</td>
</tr>
<tr>
<td>1. Do not separate into less than crews of two, even in emergency situations</td>
<td></td>
</tr>
<tr>
<td>2. Maintain contact between crewmembers</td>
<td></td>
</tr>
<tr>
<td>a) Verbal</td>
<td></td>
</tr>
<tr>
<td>b) Visual</td>
<td></td>
</tr>
<tr>
<td>c) Physical</td>
<td></td>
</tr>
<tr>
<td>1) Use a short rope or tool</td>
<td></td>
</tr>
<tr>
<td>E. PASS devices should always be activated prior to entering the IDLH environment</td>
<td></td>
</tr>
<tr>
<td>F. When a crew is working inside an IDLH environment a rescue crew of at least two fire fighters should be available outside</td>
<td></td>
</tr>
<tr>
<td>1. Two-in/two-out</td>
<td></td>
</tr>
<tr>
<td>2. RIC</td>
<td></td>
</tr>
<tr>
<td>G. Policies for rehabilitation of fire fighters during operations requiring SCBA use should be established</td>
<td></td>
</tr>
<tr>
<td>1. Provides for rest and hydration</td>
<td></td>
</tr>
<tr>
<td>2. EMS personnel should monitor vital signs</td>
<td></td>
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<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>H. Fire fighters should be aware of their individual air consumption rates</td>
<td></td>
</tr>
<tr>
<td>1. Can be established by tests with simulated fire fighting activities</td>
<td></td>
</tr>
<tr>
<td>2. Avoid getting into a position where the time to exit the hostile environment is longer than the remaining air supply</td>
<td></td>
</tr>
</tbody>
</table>

II. WORKING IN A HOSTILE ENVIRONMENT

A. Establish a plan of activity and communicate it to all crew members
   1. Search pattern
   2. Direction to advance hoseline
   3. Emergency procedures

B. Always stay low
   1. Better visibility
   2. Less heat
   3. Less likely that a fire fighter will walk into a hole or open shaft

C. Ventilate as you advance unless it will contribute to fire spread or interfere with positive pressure ventilation
   1. Improves visibility
   2. Reduces heat

D. Maintain an awareness of your location
   1. Relative to exits
   2. What floor of building

Why should fire fighters stay low in hostile environments?

What is the advantage of ventilating while advancing?
3. Communicate this information to personnel outside
4. Make sure an exit can be reached prior to depletion of the air supply

E. Know your means of egress
   1. Contact with a wall
   2. Contact with a hoseline

   a) Male coupling is closer to apparatus
3. Use lifeline

F. Never compromise the integrity of the SCBA
   1. Do not remove the facepiece
   2. Keep all valves open

How can the direction out be determined with a hoseline?
SUMMARY:

Fire fighters need to follow safe operating procedures when working in hostile environments with SCBA. Both the equipment and the user should be fit for use. When the risk of a dangerous environment exists, do not hesitate to use a SCBA. Always work in crews of two or more and stay in contact with each other. Under no circumstances should the functional integrity of the SCBA be compromised.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:** EMERGENCY PROCEDURES WHEN USING SCBA

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of emergency procedures when using SCBA by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4 or Firefighter's Handbook, Delmar, 2000 Edition, Chapter 7

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Self-Contained Breathing Apparatus, IFSTA, Second Edition

**PREPARATION:** SCBA units can malfunction or become damaged during use. Several procedures are available for you to respond to these situations and resolve the problem or get to safety. Your ability to handle emergency situations will greatly enhance your chance of survival.
I. EMERGENCY PROCEDURES

A. STAY CALM!
   1. Allows clear thinking
   2. Panic will make the situation worse
   3. Stop and think
      a) What happened?
      b) How can it be reversed or fixed?
      c) How did I get to this point?

B. Rely on training
   1. Knowledge of SCBA operation
      a) Helps with troubleshooting
      b) Enables effective operation of SCBA in difficult situations
   2. Frequent practice with SCBA will increase confidence in unit

C. Control breathing
   1. Conserves air
   2. Helps keep you calm

D. Inform others of your situation
   1. Crewmembers
   2. Outside personnel
      a) Advise if they need to initiate rescue
### PRESENTATION

3. Announce a "Mayday" message over the radio
   a) Follow local policy
   b) Identify self, current condition, and location

E. Immediately exit the hazardous environment
   1. All crew members together

F. Manually activate PASS device
   1. Signals distress
   2. Helps identify location

### REGULATOR FAILURE

A. Troubleshoot problem
B. Attempt to fix
C. Use bypass valve to conserve air supply
   1. Close main valve
   2. Open bypass valve during inhalation
   3. Close bypass during exhalation

### FACEPIECE FAILURE

A. Troubleshoot problem
B. Attempt to fix
C. Use bypass valve to increase airflow
   1. Keeps contaminated air from getting into facepiece
D. Use flash hood as filter
What are some actions to take in the event of low air?

<table>
<thead>
<tr>
<th>IV. LOW AIR</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Control breathing</td>
<td></td>
</tr>
<tr>
<td>B. Skip breathing</td>
<td></td>
</tr>
<tr>
<td>1. Inhale normally</td>
<td></td>
</tr>
<tr>
<td>2. Hold breath for duration of a normal exhalation</td>
<td></td>
</tr>
<tr>
<td>3. Inhale normally again</td>
<td></td>
</tr>
<tr>
<td>4. Exhale slowly</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V. LAST RESORT METHODS</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Practice these techniques during training</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emergency situations are not the time to try new techniques</td>
<td></td>
</tr>
<tr>
<td>2. Practice will increase confidence</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Buddy breathing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Two users sharing air from one cylinder</td>
<td></td>
</tr>
<tr>
<td>a) Depletes air twice as fast or faster</td>
<td></td>
</tr>
<tr>
<td>2. Use systems provided on SCBA</td>
<td></td>
</tr>
<tr>
<td>a) In accordance with manufacturer's recommendation and directions</td>
<td></td>
</tr>
<tr>
<td>3. Do not share facepieces</td>
<td></td>
</tr>
<tr>
<td>4. NIOSH and NFPA standards do not allow buddy breathing</td>
<td></td>
</tr>
<tr>
<td>5. Follow agency policy</td>
<td></td>
</tr>
</tbody>
</table>
C. Low-pressure hose breathing
   1. For total facepiece failure
   2. Works with units equipped with low-pressure hose
   3. Disconnect low-pressure hose from facepiece
      a) Some units require special tools
   4. Breath directly from low-pressure hose

D. Breathing from regulator
   1. For low-pressure hose failure
   2. Works with units equipped with low-pressure hose
   3. Disconnect low-pressure hose from regulator
      a) Some units require special tools
   4. Breath directly from low-pressure connection on regulator

VI. ENTANGLEMENT IN DEBRIS

A. Stop moving
B. Attempt to determine what caused the entanglement
C. Reverse motions that caused the entanglement
   1. Stop if problem worsens
D. Cut or remove objects causing entanglement
E. Get help from crewmembers
F. Follow emergency procedures

What are some actions to take after becoming entangled?
### VII. PASSING THROUGH NARROW OPENINGS

**A.** Attempt to widen opening or use alternate route  
**B.** Move slowly  

**C.** Change your SCBA profile  
1. Loosen harness straps  
2. Remove one shoulder strap  
3. Remove SCBA harness entirely  
   a) Pass SCBA through opening ahead of yourself  
   b) Do not remove facepiece  
4. Maintain contact with SCBA at all times  

5. Redon SCBA and secure all straps as soon as possible

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are some actions to take to pass through a narrow opening?</td>
<td>What can the fire fighter do to change their SCBA profile?</td>
</tr>
<tr>
<td>What should a fire fighter do after passing through the restricted opening?</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

While using a SCBA in emergencies, it is extremely important that you do not panic. Clear thinking and reliance on training can resolve many situations. Trapped fire fighters should call for help as soon as possible so that rescue can be initiated. Train frequently with your SCBA to be familiar with all of its operating features.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: HOW TO DON A SCBA FACEPIECE WITH A LOW-PRESSURE HOSE

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A SCBA facepiece with a low-pressure hose, an already donned SCBA, and appropriate personal protective equipment

Behavior: The student will don a SCBA facepiece with a low-pressure hose

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- SCBA facepiece with a low-pressure hose
- Donned SCBA
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4
- Self-Contained Breathing Apparatus, IFSTA, Second Edition, Chapter 8

PREPARATION: To ensure that your SCBA will properly protect you from the hazardous environment, it is essential that the facepiece be properly donned. An improperly fitting facepiece could result in your injury or death from a contaminated or oxygen-deficient atmosphere.

NOTE: Refer to the manufacturer's recommendations and directions for details on the proper donning of the units being used during training.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp harness</td>
<td>1a. Both hands</td>
</tr>
<tr>
<td></td>
<td>b. Thumbs inside straps</td>
</tr>
<tr>
<td>2. Spread apart</td>
<td></td>
</tr>
<tr>
<td>3. Position facepiece</td>
<td>3a. On face</td>
</tr>
<tr>
<td></td>
<td>b. Chin in the chin cup</td>
</tr>
<tr>
<td>4. Pull harness</td>
<td>4a. Upward motion</td>
</tr>
<tr>
<td></td>
<td>b. Over head</td>
</tr>
<tr>
<td>5. Center harness</td>
<td>5a. On rear of head</td>
</tr>
<tr>
<td>6. Tighten straps</td>
<td>6a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>7. Seal free end of low-pressure hose</td>
<td>7a. With palm of hand</td>
</tr>
<tr>
<td>8. Check facepiece seal</td>
<td>8a. Inhaling slowly</td>
</tr>
<tr>
<td></td>
<td>b. Listening for leaks</td>
</tr>
<tr>
<td>9. Repeat Operations 5-8</td>
<td>9a. Until no leaks are noted</td>
</tr>
<tr>
<td>10. Checking exhalation valve</td>
<td>10a. For proper function</td>
</tr>
<tr>
<td></td>
<td>b. Exhaling with low-pressure hose still sealed</td>
</tr>
<tr>
<td>11. Connect low-pressure hose</td>
<td>11a. To regulator</td>
</tr>
<tr>
<td>12. Activate air supply</td>
<td>12a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>13. Test for positive pressure</td>
<td>13a. Inserting fingers under edge of facepiece</td>
</tr>
<tr>
<td></td>
<td>b. Listening for airflow</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO DON A SCBA FACEPIECE WITH A FACEPIECE-MOUNTED REGULATOR

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: An SCBA facepiece with a facepiece-mounted regulator, an already donned SCBA, and appropriate personal protective equipment

Behavior: The student will don a SCBA facepiece with a facepiece-mounted regulator

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- SCBA facepiece with facepiece-mounted regulator
- Donned SCBA
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4
- Self-Contained Breathing Apparatus, IFSTA, Second Edition, Chapter 8

PREPARATION: To ensure that your SCBA will properly protect you from the hazardous environment, it is essential that the facepiece be properly donned. An improperly fitting facepiece could result in your injury or death from a contaminated or oxygen-deficient atmosphere.

NOTE: Refer to the manufacturer's recommendations and directions for details on the proper donning of the units being used during training.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp harness</td>
<td>1a. Both hands</td>
</tr>
<tr>
<td></td>
<td>b. Thumbs inside straps</td>
</tr>
<tr>
<td>2. Spread apart</td>
<td></td>
</tr>
<tr>
<td>3. Position facepiece</td>
<td>3a. On face</td>
</tr>
<tr>
<td></td>
<td>b. Chin in the chin cup</td>
</tr>
<tr>
<td>4. Pull harness</td>
<td>4a. Upward motion</td>
</tr>
<tr>
<td></td>
<td>b. Over head</td>
</tr>
<tr>
<td>5. Center harness</td>
<td>5a. On rear of head</td>
</tr>
<tr>
<td>6. Tighten straps</td>
<td>6a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>7. Connect regulator</td>
<td>7a. To facepiece</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>8. Activate air supply</td>
<td>8a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>9. Check facepiece seal</td>
<td>9a. Holding breath</td>
</tr>
<tr>
<td></td>
<td>b. Listening and feeling for leaks</td>
</tr>
<tr>
<td>10. Repeat Operations 6 - 9</td>
<td>10a. Until no leaks are noted</td>
</tr>
<tr>
<td>11. Test for positive pressure</td>
<td>11a. Inserting fingers under edge of facepiece</td>
</tr>
<tr>
<td></td>
<td>b. Listening for airflow</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DON A SCBA, OVER-THE-HEAD METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: An SCBA positioned with harness side up, valve away from student, straps extended, and appropriate personal protective equipment

Behavior: The student will don a SCBA using the over-the-head method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED: • Job breakdown
• SCBA
• Appropriate personal protective equipment

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4
• Self-Contained Breathing Apparatus, IFSTA, First Edition, Chapter 5

PREPARATION: Self-contained breathing apparatus are stored in a variety of ways. Accordingly, there are several ways to don the SCBA. In order to don the SCBA quickly and correctly, you should become competent using several methods. In this lesson, you will learn the over-the-head method.

NOTE: Refer to the manufacturer's recommendations and directions for details on the proper donning of the units being used during training.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open cylinder valve</td>
<td>1a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Completely</td>
</tr>
<tr>
<td></td>
<td>c. Low-pressure alarm should sound</td>
</tr>
<tr>
<td>2. Check gauge</td>
<td>2a. On cylinder</td>
</tr>
<tr>
<td></td>
<td>b. Full capacity</td>
</tr>
<tr>
<td>3. Grasp SCBA</td>
<td>3a. Both hands</td>
</tr>
<tr>
<td></td>
<td>b. Each side at backplate or cylinder</td>
</tr>
<tr>
<td></td>
<td>c. No straps between hands</td>
</tr>
<tr>
<td></td>
<td>d. Tank down</td>
</tr>
<tr>
<td></td>
<td>e. Valve up</td>
</tr>
<tr>
<td>4. Lift SCBA</td>
<td>4a. Overhead</td>
</tr>
<tr>
<td></td>
<td>b. Elbows close to body</td>
</tr>
<tr>
<td></td>
<td>c. Letting straps fall into place</td>
</tr>
<tr>
<td>5. Adjust SCBA</td>
<td>5a. On back</td>
</tr>
<tr>
<td></td>
<td>b. Between shoulder blades</td>
</tr>
<tr>
<td></td>
<td>c. Leaning forward</td>
</tr>
<tr>
<td>6. Secure all harnesses</td>
<td>6a. Properly to the body</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DON A SCBA, SLING/COAT METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: An SCBA positioned with harness side up, valve towards student, straps extended, and appropriate personal protective equipment

Behavior: The student will don a SCBA using the sling/coat method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- SCBA
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4

PREPARATION: Self-contained breathing apparatus are stored in a variety of ways. Accordingly, there are several ways to don the SCBA. In order to don the SCBA quickly and correctly, you should become competent using several methods. In this lesson, you will learn the sling/coat methods.

NOTE: Refer to the manufacturer's recommendations and directions for details on the proper donning of the units being used during training.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
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</thead>
<tbody>
<tr>
<td>1. Open cylinder valve</td>
<td>1a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Completely</td>
</tr>
<tr>
<td></td>
<td>c. Low-pressure alarm should sound</td>
</tr>
<tr>
<td>2. Check gauge</td>
<td>2a. On cylinder</td>
</tr>
<tr>
<td></td>
<td>b. Full capacity</td>
</tr>
<tr>
<td>3. Grasp shoulder strap</td>
<td>3a. Same side as regulator</td>
</tr>
<tr>
<td></td>
<td>b. Both hands</td>
</tr>
<tr>
<td></td>
<td>c. Hand opposite the strap, at the top</td>
</tr>
<tr>
<td>4. Guard regulator</td>
<td>4a. With free hand</td>
</tr>
<tr>
<td>5. Lift SCBA</td>
<td>5a. Fluid motion</td>
</tr>
<tr>
<td></td>
<td>b. Until strap rests on shoulder</td>
</tr>
<tr>
<td>6. Slip arm</td>
<td>6a. Between shoulder strap and backpack frame</td>
</tr>
<tr>
<td>7. Swing SCBA</td>
<td>7a. Across back</td>
</tr>
<tr>
<td>8. Slip opposite arm</td>
<td>8a. Between shoulder strap and backpack frame</td>
</tr>
<tr>
<td>9. Adjust SCBA</td>
<td>9a. On back</td>
</tr>
<tr>
<td></td>
<td>b. Leaning forward</td>
</tr>
<tr>
<td>10. Secure all harnesses</td>
<td>10a. Properly to the body</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DON A SCBA FROM A VEHICLE OR WALL MOUNT

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: An exposed vehicle or wall-mounted SCBA with harness side facing out, valve at bottom, straps extended, and appropriate personal protective equipment

Behavior: The student will don a SCBA from a vehicle or wall mount

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- One vehicle (rear, side, seat) or wall-mounted SCBA
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4

PREPARATION: Self-contained breathing apparatus are stored in a variety of ways. Accordingly, there are several ways to don the SCBA. In order to don the SCBA quickly and correctly, you should become competent using several methods. In this lesson, you will learn how to don a SCBA from a vehicle or wall mount.

NOTE: Refer to the manufacturer’s recommendations and directions for details on the proper donning of the units being used during training.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open cylinder valve</td>
<td>1a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
<tr>
<td></td>
<td>c. Low-pressure alarm should sound</td>
</tr>
<tr>
<td>2. Check gauge</td>
<td>2a. On cylinder</td>
</tr>
<tr>
<td></td>
<td>b. Full capacity</td>
</tr>
<tr>
<td>3. Take position</td>
<td>3a. With back against cylinder backplate</td>
</tr>
<tr>
<td>4. Place arms</td>
<td>4a. Through harness straps</td>
</tr>
<tr>
<td>5. Secure all harness straps</td>
<td>5a. Properly to the body</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>6. Release SCBA</td>
<td>6a. In accordance with mounting type</td>
</tr>
<tr>
<td>7. Release away from support</td>
<td>7a. Walking away from rear or side mount</td>
</tr>
<tr>
<td></td>
<td>b. Standing from seat mount</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** HOW TO REMOVE A SCBA

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

**BEHAVIORAL OBJECTIVE:**

*Condition:* A donned SCBA and appropriate personal protective equipment

*Behavior:* The student will remove a SCBA

*Standard:* Completing all operations within ________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Donned SCBA
- Appropriate personal protective equipment

**REFERENCES:**
- *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 4

**PREPARATION:** The removal of a SCBA seems like an easy operation. However, one caution must always be observed before removing the unit. The SCBA must be taken off only after you are in a safe atmosphere. If this is not accomplished, you could be seriously injured by either a contaminated or an oxygen-deficient atmosphere.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Move out of contaminated environment</td>
<td>2a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>2. Discontinue regulator airflow</td>
<td>2a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>3. Disconnect facepiece</td>
<td>3a. Low-pressure hose from regulator if so equipped</td>
</tr>
<tr>
<td></td>
<td>b. Regulator from facepiece if so equipped</td>
</tr>
<tr>
<td>4. Remove facepiece</td>
<td>4a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>5. Disconnect waist strap</td>
<td>4a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>6. Disconnect chest strap</td>
<td>5a. Releasing buckle</td>
</tr>
<tr>
<td></td>
<td>b. Fully extending strap</td>
</tr>
<tr>
<td>7. Loosen shoulder straps</td>
<td>6a. If so equipped</td>
</tr>
<tr>
<td>8. Slip off shoulder strap</td>
<td>7a. While leaning forward</td>
</tr>
<tr>
<td></td>
<td>b. Fully extending straps</td>
</tr>
<tr>
<td>9. Grasp regulator</td>
<td>8a. From either shoulder</td>
</tr>
<tr>
<td>10. Grasp harness</td>
<td>9a. With hand of free shoulder</td>
</tr>
<tr>
<td>11. Remove remaining arm</td>
<td>10a. With free hand</td>
</tr>
<tr>
<td></td>
<td>11a. Slipping from harness</td>
</tr>
<tr>
<td></td>
<td>b. Protecting regulator</td>
</tr>
<tr>
<td></td>
<td>c. Protecting cylinder valve</td>
</tr>
<tr>
<td>12. Close cylinder valve</td>
<td>11a. Slipping from harness</td>
</tr>
<tr>
<td></td>
<td>b. Protecting regulator</td>
</tr>
<tr>
<td>13. Release residual pressure</td>
<td>12a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
<tr>
<td></td>
<td>13a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td></td>
<td>b. Removing from system</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 14. Loosen all body securing straps on SCBA | 14a. In accordance with manufacturer's recommendations and directions  
| | b. Per departmental policy |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO PASS THROUGH A NARROW OPENING WHILE WEARING A SCBA

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A donned SCBA, appropriate personal protective equipment, and a suitable structure

Behavior: The student will pass through a narrow opening while wearing a SCBA

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Donned SCBA
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:

- Essentials of Firefighting, IFSTA, Fourth Edition, Chapter 4
- Self Contained Breathing Apparatus, IFSTA, Second Edition, Chapter 8

PREPARATION: Passing through narrow openings while wearing a SCBA can be difficult. In an emergency egress situation, your ability to do so could be critical. In this lesson, you will learn how to change your SCBA profile in order to pass through the narrow opening.
# How To Pass Through A Narrow Opening While Wearing A SCBA

## METHOD 1

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enter opening</td>
<td>1a. As far as possible</td>
</tr>
<tr>
<td>2. Loosen SCBA straps</td>
<td>2a. Waist strap</td>
</tr>
<tr>
<td></td>
<td>b. One shoulder strap</td>
</tr>
<tr>
<td>3. Reposition SCBA</td>
<td>3a. To the side</td>
</tr>
<tr>
<td></td>
<td>b. Opposite of loosened shoulder strap</td>
</tr>
<tr>
<td></td>
<td>c. Under arm</td>
</tr>
<tr>
<td></td>
<td>d. Along ribs</td>
</tr>
<tr>
<td></td>
<td>e. Maintaining facepiece seal</td>
</tr>
<tr>
<td>4. Continue through opening</td>
<td>4a. Until reaching other side</td>
</tr>
<tr>
<td>5. Reposition SCBA</td>
<td>5a. To normal wearing position</td>
</tr>
<tr>
<td>6. Tighten straps</td>
<td>6a. To secure SCBA</td>
</tr>
</tbody>
</table>

## METHOD 2

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove backpack</td>
<td>1a. Completely</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining facepiece seal</td>
</tr>
<tr>
<td>2. Push SCBA</td>
<td>2a. Through opening</td>
</tr>
<tr>
<td></td>
<td>b. In front of yourself</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining facepiece seal</td>
</tr>
<tr>
<td>3. Pass through opening</td>
<td>3a. Following SCBA</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining facepiece seal</td>
</tr>
<tr>
<td>4. Redon SCBA</td>
<td>4a. In accordance with standard procedures</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CHANGE A SCBA AIR CYLINDER, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A donned SCBA, a full SCBA air cylinder, and appropriate personal protective equipment

Behavior: The student will change a SCBA air cylinder using the one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

• Job breakdown
• Donned SCBA
• Full SCBA air cylinder
• Appropriate personal protective equipment

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4
• Self-Contained Breathing Apparatus, IFSTA, Second Edition, Chapter 5

PREPARATION: At the scene of an emergency, it may be necessary to replace discharged air cylinders on SCBAs. This ensures the SCBA is available for immediate use.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position the SCBA</td>
<td>1a. On the ground</td>
</tr>
<tr>
<td></td>
<td>b. Cylinder valve toward fire fighter</td>
</tr>
<tr>
<td>2. Close cylinder valve</td>
<td>2a. Clockwise</td>
</tr>
<tr>
<td>3. Release residual pressure</td>
<td>3a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>4. Disconnect coupling</td>
<td>4a. From cylinder</td>
</tr>
<tr>
<td></td>
<td>b. Setting aside so no contamination of treads takes place</td>
</tr>
<tr>
<td>5. Release cylinder clamp</td>
<td>5a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>6. Remove empty cylinder</td>
<td>6a. Out of backpack assembly</td>
</tr>
<tr>
<td></td>
<td>b. Setting aside carefully</td>
</tr>
<tr>
<td>7. Inspect O-ring</td>
<td>7a. Present?</td>
</tr>
<tr>
<td></td>
<td>b. In good condition?</td>
</tr>
<tr>
<td>8. Install full cylinder</td>
<td>8a. Into backpack assembly</td>
</tr>
<tr>
<td></td>
<td>b. Outlet valve positioned towards high-pressure hose connection</td>
</tr>
<tr>
<td>9. Reconnect high-pressure hose</td>
<td>9a. Hand tight only</td>
</tr>
<tr>
<td>10. Tighten cylinder clamp</td>
<td>10a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td></td>
<td>b. Listening for air leaks</td>
</tr>
<tr>
<td>11. Open cylinder valve</td>
<td>11a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
<tr>
<td>12. Close cylinder valve</td>
<td>12a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>13. Release residual pressure</td>
<td>13a. In accordance with manufacturer's recommendations and directions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO CHANGE A SCBA AIR CYLINDER, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A donned SCBA, a full SCBA air cylinder, and appropriate personal protective equipment

Behavior: The students will change a SCBA air cylinder using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Donned SCBA
- Full SCBA air cylinder
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, Fourth Edition, Chapter 4

PREPARATION: Replacing an air cylinder while a fire fighter is still wearing the SCBA will allow that fire fighter to get back to work with minimal delays.

NOTE: This lesson plan will only apply to certain types of breathing apparatus. You must refer to the manufacturer's recommendations and directions to get the particulars of "How To" on specific units.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fire Fighter #1 (wearer) rests forward</td>
<td>1a. On knees</td>
</tr>
<tr>
<td></td>
<td>b. For stability</td>
</tr>
<tr>
<td>2. Fire Fighter #2 takes position</td>
<td>2a. Behind Fire Fighter #1</td>
</tr>
<tr>
<td></td>
<td>b. Centered positioning</td>
</tr>
<tr>
<td>3. Fire Fighter #2 closes cylinder valve</td>
<td>3a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
<tr>
<td>4. Release residual pressure</td>
<td>4a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td></td>
<td>b. Fire Fighter #1 or Fire Fighter #2</td>
</tr>
<tr>
<td>5. Fire Fighter #1 disconnects regulator</td>
<td>5a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td></td>
<td>b. Allowing Fire Fighter #1 to breathe</td>
</tr>
<tr>
<td>6. Fire Fighter #2 disconnects coupling</td>
<td>6a. From cylinder</td>
</tr>
<tr>
<td></td>
<td>b. Counterclockwise</td>
</tr>
<tr>
<td>7. Fire Fighter #2 releases cylinder clamp</td>
<td>7a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>8. Fire Fighter #2 removes cylinder</td>
<td>8a. Out of backpack assembly</td>
</tr>
<tr>
<td></td>
<td>b. Setting aside carefully</td>
</tr>
<tr>
<td>9. Fire Fighter #2 inspects O-ring</td>
<td>9a. Present?</td>
</tr>
<tr>
<td></td>
<td>b. In good condition?</td>
</tr>
<tr>
<td>10. Fire Fighter #2 installs full air cylinder</td>
<td>10a. Into backpack assembly</td>
</tr>
<tr>
<td></td>
<td>b. Outlet valve positioned towards high-pressure hose connection</td>
</tr>
<tr>
<td>11. Fire Fighter #2 reconnects high-pressure</td>
<td>11a. Hand tight only</td>
</tr>
<tr>
<td>hose</td>
<td></td>
</tr>
<tr>
<td>12. Fire Fighter #2 tightens cylinder clamp</td>
<td>12a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>13. Fire Fighter #2 opens cylinder valve</td>
<td>13a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
<tr>
<td></td>
<td>c. Listening for air leaks</td>
</tr>
<tr>
<td>14. Fire Fighter #1 reconnects regulator</td>
<td>14a. In accordance with manufacturer's recommendations and directions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: METHODS USED TO FILL SCBA CYLINDERS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the methods used to fill SCBA cylinders by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in *Self-Contained Breathing Apparatus*, IFSTA, Second Edition, Chapter 7

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- *Essentials of Fire Fighting*, IFSTA, Fourth Edition

PREPARATION: Extra cylinders should be available for self-contained breathing apparatus to ensure adequate air supplies for lengthy or numerous emergencies. Knowledge of how air cylinders can be filled will enable you to maintain an adequate air supply.
I. METHODS FOR FILLING AIR CYLINDERS

A. Cascade system
   1. Large bottles connected in series
      a) Securely stored
      b) Typically 300 cubic feet capacity
   2. Considerations
      a) Relatively inexpensive
      b) Simple to operate
      c) Must be refilled at another location
      d) Must be hydrostatically tested

B. Compressor
   1. SCBA cylinders filled directly by a compressor
   2. Power source
      a) Electrical
         1) Preferred
      b) Gasoline or diesel
         1) Not preferred
         2) Source of contamination
   3. Considerations
      a) Slow
      b) Requires quarterly testing of air
      c) Unlimited air supply

What is a cascade system?

Why are gasoline and diesel compressors not preferred?

What is an advantage of a compressor system?
**PRESENTATION** | APPLICATION
---|---

C. Complete air supply system

1. Four elements
   a) Compressor
   b) Purification system
   c) Air storage
      1) Cascade system
   d) Charging station
      1) Must have fragmentation containment device

2. Considerations
   a) Virtually unlimited capacity
   b) Expensive
   c) Requires quarterly testing of air

II. OTHER ARRANGEMENTS

A. Breathing support unit

1. Filling station mounted on a vehicle
   a) Cascade
   b) Complete system
   c) Vehicle
   d) Trailer

B. Sending cylinders out

1. Commercial filling service
   a) Dive shop
   b) Medical gas supply
   c) Welding supply

What is a breathing support unit?

Where can agencies send SCBA cylinders for filling?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Other fire agencies</td>
<td>What is a concern when sending cylinders out for refilling?</td>
</tr>
<tr>
<td>3. Need to be certain that the air meets the quality standards</td>
<td></td>
</tr>
<tr>
<td>a) Grade D per Compressed Gas Association pamphlet G-7.1-1989</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

There are different methods in which SCBA air cylinders are filled. The three basic methods include the cascade system, using a compressor, and a combination of both. The cylinders may be filled at a fixed in-house location, by a breathing support unit, or by being sent out. You need to be familiar with the options available to ensure adequate air supply for emergency response needs.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Self-Contained Breathing Apparatus, IFSTA, Second Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO FILL A SCBA CYLINDER, CASCADE METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: An SCBA air cylinder and compressor

Behavior: The student will fill a SCBA air cylinder using the cascade method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- SCBA air cylinder
- Compressor

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4
- Fire Department Occupational Safety, IFSTA, Second Edition, Chapter 7

PREPARATION:

Many fire departments fill their own SCBA air cylinders. It is essential for you to learn the proper procedures for charging SCBA cylinders to ensure personnel safety and air quality.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check hydrostatic test date</td>
<td>1a. Marked on cylinder</td>
</tr>
<tr>
<td></td>
<td>b. To confirm that bottle can be recharged</td>
</tr>
<tr>
<td>2. Inspect for damage</td>
<td>2a. Deep nicks</td>
</tr>
<tr>
<td></td>
<td>b. Cuts</td>
</tr>
<tr>
<td></td>
<td>c. Gouges</td>
</tr>
<tr>
<td></td>
<td>d. Discoloration</td>
</tr>
<tr>
<td>3. Secure cylinder</td>
<td>3a. In fragment-proof charging station</td>
</tr>
<tr>
<td></td>
<td>b. Do not submerge in water</td>
</tr>
<tr>
<td>4. Connect charging hose</td>
<td>4a. To SCBA cylinder</td>
</tr>
<tr>
<td>5. Open SCBA valve</td>
<td>5a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Counterclockwise</td>
</tr>
<tr>
<td>6. Open cascade cylinder</td>
<td>6a. Least pressurized cylinder</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. If opened too fast, a chattering noise may be noticed</td>
</tr>
<tr>
<td></td>
<td>d. Do not overheat cylinder</td>
</tr>
<tr>
<td>7. Equalize pressure</td>
<td>7a. Cascade cylinder and SCBA cylinder</td>
</tr>
<tr>
<td>8. Close cascade cylinder</td>
<td>8a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Clockwise</td>
</tr>
<tr>
<td>9. Record pressure</td>
<td>9a. Of cascade cylinder</td>
</tr>
<tr>
<td></td>
<td>b. On cylinder or record card</td>
</tr>
<tr>
<td>10. Open next cylinder</td>
<td>10a. Next higher pressure</td>
</tr>
<tr>
<td>11. Repeat Operations 7-9</td>
<td>11a. Until SCBA cylinder charged</td>
</tr>
<tr>
<td>12. Close all valves on cascade system</td>
<td>12a. Clockwise</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>13. Close SCBA cylinder valve</td>
<td>13a. Clockwise</td>
</tr>
<tr>
<td>14. Open cascade system bleeder valve</td>
<td>14a. Counterclockwise</td>
</tr>
<tr>
<td>15. Bleed off line pressure</td>
<td>15a. Failure to follow this step could result in injury or damage to the O-ring seal on the fill hose</td>
</tr>
<tr>
<td>16. Remove charging hose</td>
<td>16a. From SCBA cylinder</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF SCBA

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the inspection and maintenance of SCBA by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Self-Contained Breathing Apparatus*, IFSTA, Second Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- A complete SCBA

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: You should consider SCBA to be a critical element of your personal protective equipment. Like any other piece of equipment, the SCBA requires proper inspection and maintenance on a regular basis. It is also important to ensure that the SCBA is returned to service properly after each use.
How frequently should SCBA be inspected?

I. FREQUENCY
   A. Routine inspections
      1. Daily
      2. After each use
   B. Maintenance inspections
      1. Monthly
      2. Annually

II. ROUTINE INSPECTION
   A. Backpack assembly
      1. Check straps
         a) Not frayed
         b) Extended ready for donning
         c) Buckles and snaps operational
      2. Frame
         a) No visible damage
         b) Clean
   B. Cylinder
      1. Damage
         a) No scratches or gouges
      2. Gauge
         a) Full cylinder

   1) Replace if less than 90% of capacity

What should be checked on the backpack assembly?

When should a cylinder be replaced?
### Presentation

- **b)** Note pressure
  - 1) For comparison to remote gauge
- **c)** Cylinder secure in harness
- **d)** Hose securely connected

### Application

What should be checked on the regulator assembly?

<table>
<thead>
<tr>
<th>C. Regulator assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check that all hose connections are secure</td>
</tr>
<tr>
<td>2. Charge system</td>
</tr>
<tr>
<td>a) Open cylinder valve slowly</td>
</tr>
<tr>
<td>3. Low-pressure alarm should sound</td>
</tr>
<tr>
<td>4. Check all valves for proper operation</td>
</tr>
<tr>
<td>5. Compare remote gauge with cylinder gauge</td>
</tr>
</tbody>
</table>

How close should the readings of the two gauges be?

```
  a) Should be within 100 psi of each other
```

<table>
<thead>
<tr>
<th>D. Mask assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No cracks or scratches</td>
</tr>
<tr>
<td>2. Clean</td>
</tr>
<tr>
<td>3. Straps</td>
</tr>
<tr>
<td>a) No cracking or tearing</td>
</tr>
<tr>
<td>b) Extended ready for donning</td>
</tr>
<tr>
<td>4. Check operation of exhalation valve</td>
</tr>
<tr>
<td>a) Place mask on face and exhale</td>
</tr>
</tbody>
</table>

How does the exhalation valve get checked?
5. **Accessories**
   a) Nose cup  
   b) Spectacle kit  
   c) Radio/amplifier hookup

What should be done after the routine inspection is complete?

E. Return SCBA to in-service condition  
   1. Close all valves  
   2. Bleed off excess pressure in accordance with manufacturer's recommendations and directions  
   3. Ensure breathing apparatus is in a safe condition for immediate use

### III. MONTHLY INSPECTION

A. In accordance with manufacturer's recommendations and agency policy
B. Perform routine inspection
C. Disconnect all hoses  
   1. Check all threads for damage  
   2. Check O-rings
D. Low-pressure hose, if present  
   1. Stretch and look for cracks  
E. Check all components for deterioration  
F. Check operation of all valves and gauges  
G. Reassemble unit and don to verify proper operation  
H. Clean and sanitize unit

How should the hose be inspected?
IV. ANNUAL INSPECTION
   A. Should only be done by trained personnel
      1. Designated by agency
      2. Certified by manufacturer of SCBA

V. MAINTENANCE RECORDS
   A. In accordance with manufacturer's recommendations
   B. Follow department policies and procedures

Who should complete an annual inspection?
SUMMARY:

Routine inspection of SCBAs should be completed daily and after each use. Maintenance inspections are completed monthly and annually. It is essential that you are proficient and thorough in completing these inspections in order to ensure proper operation of your breathing apparatus.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Self-Contained Breathing Apparatus, IFSTA, Second Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROCEDURES USED TO CLEAN AND SANITIZE SCBA

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1 and CCR, Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the procedures used to clean and sanitize SCBA by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Self-Contained Breathing Apparatus, IFSTA, Second Edition

PREPARATION:
With the different diseases that confront fire fighters these days, it is becoming more important to clean and sanitize all equipment that touches any person. The SCBA is no exception.
### I. FACEPIECE

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How often should a facepiece be cleaned?</td>
</tr>
</tbody>
</table>

**A. Cleaning frequency**
1. After each use, even if it appears clean
2. Monthly
3. In accordance with manufacturer's recommendations and agency policy

**B. Use cleaning solution mixed with water**
1. Use solution recognized by the Centers for Disease Control (Atlanta, Georgia)
   a) Should be effective in the elimination of communicable disease agents
2. Refer to manufacturer's specifications for compatibility

**C. Immerse facepiece in cleaning solution**
1. Wash
   a) Use soft brush to gently clean facepiece
   b) Lenses are susceptible to scratching
2. Rinse
   a) Clear, warm water
3. Air dry
   a) Lint-free cloth
   b) Air dry
   1) Not in direct sunlight

4. Do not submerge units equipped with microphones or other electronic devices
D. Special attention given to the exhalation valve to ensure proper operation

II. HARNESS, HOSES, AND REGULATOR

A. Should be free of foreign matter
   1. Any hazardous material removed

B. Before cleaning, refer to manufacturer's recommendations and directions
**SUMMARY:**

Cleaning the SCBA is becoming an important preventive maintenance tool to ensure your health and safety. It is important to use the proper cleaning solution to disinfect the SCBA facepiece even when it appears to clean.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CLASSIFICATION OF FIRE AND FIRE EXTINGUISHERS

TIME FRAME: 1:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the classification of fire and fire extinguishers by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2 or the Firefighter's Handbook, Delmar, 2000 Edition, Chapter 4

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: Fires are classified depending on what materials are burning. Different methods of extinguishing agents are used for each "type" of fire. Safe and efficient operations are dependent on your ability to differentiate the types of fires and then employ the proper extinguishment methods.
## I. CLASS A FIRES

A. Involve ordinary combustible materials

1. Examples
   a) Wood (tables, chairs, paneling)
   b) Paper (books, notebooks)
   c) Cloth (furniture, clothing)
   d) Wall coverings
   e) Plastics (furniture)
   f) Styrofoam (cups)
   g) Rubber products
   h) Tires
   i) Fiberglass
   j) Styrene

B. Extinguishment

1. Water is the extinguishing agent of choice for Class A fires

   a) Water is used to cool the materials below their ignition point (removes heat)
What class of fire involves flammable liquids?

### II. CLASS B FIRES

A. Fires fueled by flammable liquids, gases, greases, and combustible liquids

<table>
<thead>
<tr>
<th>1. Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Gasoline</td>
</tr>
<tr>
<td>b) Diesel fuel</td>
</tr>
<tr>
<td>c) Stove oil</td>
</tr>
<tr>
<td>d) Lacquer</td>
</tr>
<tr>
<td>e) Mineral spirits</td>
</tr>
<tr>
<td>f) Alcohol</td>
</tr>
<tr>
<td>g) Crude oil</td>
</tr>
<tr>
<td>h) Flammable solids</td>
</tr>
</tbody>
</table>

What are some examples of Class B materials?

B. Extinguishment

1. Smothering or the blanketing effect of oxygen exclusion (removes oxygen)

What is the most effective method used in extinguishing these fires?

2. In most cases, water is not an effective agent
   a) Generally does not smother or exclude oxygen from the fuel
   b) Tends to spread the fire

Is water an effective extinguishing agent for Class B fires?
III. CLASS C FIRES

A. Involve energized electrical equipment

1. Examples
   a) Circuit breakers
   b) Fuse boxes
   c) Transformers
   d) Motors
   e) Generators
   f) Alternators
   g) Household appliances
   h) Computers
   i) Electrical transmission lines

B. Extinguishment

1. The most effective way to extinguish these fires is to de-energize the electrical equipment
   a) Turning off the power removes the heat source
      1) Usually is enough to extinguish the fire
   b) Once the power has been turned off, extinguish any left over fire based on what is still burning, i.e., ordinary combustibles (Class A) or flammable liquid (Class B)
### What is the most important characteristic of a Class C extinguishing agent?

2. Extinguishing agent must not conduct electricity
   a) Must not be water or a water-based agent (e.g., foam)

3. All electrical wires should be considered energized unless it is known to be otherwise
   a) Lock out and tag out electrical supply

### What agents are used to extinguish Class C fires?

C. Extinguishing agents
   1. Carbon dioxide (CO\(_2\))

   a) Advantages
   1) CO\(_2\) is an inert gas
   2) Cost is inexpensive
   3) Effective in confined spaces
   4) Will not leave a residue on electrical equipment, but will attract water to electrical surface

   b) Disadvantages
   1) Will dissipate if windy or drafty
   2) Will exclude oxygen
   3) Could be hazardous to user
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Must be close to fire during application</td>
<td></td>
</tr>
<tr>
<td>2. Dry chemical</td>
<td></td>
</tr>
<tr>
<td>a) Advantages</td>
<td>Present advantages of dry chemical agents?</td>
</tr>
<tr>
<td>1) Rapid flame knockdown</td>
<td></td>
</tr>
<tr>
<td>2) Can be applied at a distance</td>
<td></td>
</tr>
<tr>
<td>3) Some are effective on Class A fires</td>
<td></td>
</tr>
<tr>
<td>b) Disadvantages</td>
<td>Present disadvantages?</td>
</tr>
<tr>
<td>1) Leaves a residue that must be cleaned</td>
<td></td>
</tr>
<tr>
<td>3. Halon</td>
<td>Present advantages of Halon?</td>
</tr>
<tr>
<td>a) Advantages</td>
<td></td>
</tr>
<tr>
<td>1) Quick and effective knockdown</td>
<td></td>
</tr>
<tr>
<td>2) No residue on electrical equipment</td>
<td></td>
</tr>
<tr>
<td>b) Disadvantages</td>
<td>Present disadvantages?</td>
</tr>
<tr>
<td>1) High cost</td>
<td></td>
</tr>
<tr>
<td>2) Dissipated by wind and draft</td>
<td></td>
</tr>
<tr>
<td>3) In thermal decomposition, the agent becomes toxic to breath</td>
<td></td>
</tr>
<tr>
<td>4) Must use caution in confined spaces</td>
<td></td>
</tr>
</tbody>
</table>
IV. CLASS D FIRES

A. Involve combustible metals
   1. Magnesium
      a) Vehicle fires
         1) Older model Volkswagen
   2. Titanium
   3. Sodium
   4. Lithium
   5. Zinc
   6. Calcium
   7. Zirconium

B. Extinguishment
   1. Specialized techniques
      a) Normal extinguishing agents generally should not be used

   b) A given agent does not necessarily extinguish all metal fires
   c) Available in dry powder form
   d) Apply by shovel or portable extinguishers
   e) Apply in sufficient depth to adequately cover fire area to provide smothering blanket
   f) Apply gently

What do Class D fires involve?

Where might you find a magnesium fire?

Is there any agent capable of extinguishing all metal fires?
| PRESENTATION                                                                 | APPLICATION
|------------------------------------------------------------------------------|---------------
| g) Leave mass undisturbed until cool                                         |               |
| h) Avoid scattering metal                                                    |               |
| i) Reference should be made to manufacturer's recommendations and directions for use and special techniques for extinguishing fires in various metals |               |
| C. Extinguishing agents                                                      |               |
| 1. G-1 powder (pyrene, metal guard)                                         |               |
| a) Use on magnesium, sodium, potassium, titanium, zirconium, hafnium, thallium, lithium, calcium, uranium, and plutonium |               |
| b) Special application on powder fires in aluminum, iron, and zinc           |               |
| c) Apply with hand scoop or shovel                                           |               |
| 1) Spread evenly over fire                                                   |               |
| 2. Met-L-X powder                                                            |               |
| a) Use on most metal fires                                                   |               |
| b) Open nozzle fully and apply thin layer cautiously from a distance         |               |
| 3. Na-X powder                                                              |               |
| a) Sodium fires react violently to water                                     |               |
| b) Use on sodium fires                                                       |               |
| c) Aim nozzle and press handle or use hand scoop or shovel                   |               |
| What type of metals will burn?                                               |               |
| What will occur with the application of water on a sodium fire?              |               |
4. T.E.C. powder  
   a) Use on sodium and potassium type fires  
   b) Expel from extinguisher or use hand scoop or shovel  
5. Foundry flux  
   a) Use on magnesium  
   b) Apply with hand scoop or shovel  
6. Lith-X powder  
   a) Apply same as Met-L-X  
7. TMB liquid (trimethoxyboroxine)  
   a) Aim nozzle and press handle  
8. Pyromet powder  
   a) Aim nozzle and press handle  
   b) Allow agent to fall gently  

V. CLASS K FIRES  

A. Involve combustible cooking media  

1. Examples  
   a) Animal oils and fats  
   b) Vegetable oils  
B. Similar to Class B fuels but have been separated into a new class because they are being used in deep fryers using high temperatures  
C. Extinguishment  

1. Class K agents are generally "wet chemicals," solutions of water and potassium carbonate, potassium acetate, or potassium citrate, etc.  

What are some types of combustible cooking media and how do they differ from Class B fires?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Class K agents work as a coolant while also forming a foam blanket to prevent re-ignition</td>
</tr>
<tr>
<td>3. Because Class K fuels are similar to Class B fuels, Class B extinguishing agents can be used on these fires but are generally less effective due to the deep layers encountered</td>
</tr>
<tr>
<td>4. Class K extinguishing agents are generally available in fixed systems but some portable extinguishers are available</td>
</tr>
</tbody>
</table>
SUMMARY

Fires are extinguished by removing one or more of the essential components of the fire tetrahedron. Matching your extinguishing method or agent to the type of fire you encounter makes for a safe and efficient fire attack. Class A, ordinary combustible type fires, are best extinguished with water (temperature reduction). Class B, flammable liquid fires, are best extinguished with foam, dry chemical, or carbon dioxide (oxygen exclusion or chemical flame inhibition). Class C, energized fires, are best extinguished by shutting off the power (temperature reduction). Class D, metal fires, are usually best extinguished with dry powder specifically formulated for that metal (oxygen exclusion or chemical flame inhibition). Class K, combustible cooking fuels, are generally extinguished with "wet chemical" solutions of water and potassium carbonate, potassium acetate, or potassium citrate, etc.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:** CLASSIFICATION MARKINGS ON PORTABLE FIRE EXTINGUISHERS

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.15

**BEHAVIORAL OBJECTIVE:**

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the classification markings used on portable fire extinguishers by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 5 or Firefighter's Handbook, Delmar, 2000 Edition, Chapter 8

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Examples of classification markings

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- "Essentials of Fire Fighting" video, Action Training System, Inc., Volume 7-Portable Extinguishers

**PREPARATION:** Portable fire extinguishers are used as a first line of defense on incipient fires. In many cases, fire fighters can extinguish these small fires in less time than it would take to pull a hoseline. It is important to know the different types and applications of portable fire extinguishers because successful extinguishment is dependent on the proper selection.
I. MARKING OR CLASSIFYING EXTINGUISHERS

A. Two systems of marking or classifying extinguishers
   1. Pictorial markings or pictographs
      a) Specific uses
         1) Illustrated with a pictograph of the type of material that can be extinguished
            • Ordinary combustibles
            • Flammable liquids, etc.
      b) Nonuses
         1) Pictograph has a slash through it
      c) Recommended by NFPA Standard #10
   2. Geometric shape
      a) Color-coded, letter shaped markings
      b) Illustrate the specific uses of the extinguisher

B. Extinguishers may be marked with either or both methods

How many systems are there for marking fire extinguishers?

What does a slash through the picture represent?

Are these pictographs or symbols, recommended by NFPA?
## II. CLASS A EXTINGUISHERS

A. Can be used on any ordinary combustible materials

B. Markings

1. Pictograph
   a) A picture of a flaming waste basket and a flaming log pile

2. Geometric
   a) A large letter "A"
   b) Inside a green triangle

C. Class A extinguishers should not be used on Class B or Class C fires

## III. CLASS B EXTINGUISHERS

A. Can be used for use on flammable and combustible liquid fires

B. Markings

1. Pictograph
   a) A picture of a gasoline can with a fill spout and fire in the background

2. Geometric
   a) A large letter "B"
   b) Inside a red square
### IV. CLASS C EXTINGUISHERS

A. Suitable for use on fires in energized electrical equipment

B. Markings

1. Pictograph
   a) A cord plug and socket on fire

2. Geometric
   a) A large letter "C"
   b) Inside a blue circle

### V. CLASS D EXTINGUISHER

A. Suitable for use on fires involving combustible metals

B. There is no universal Class D extinguishing agent

C. Class D extinguishers have specific applications and must be used according to the directions listed on the agent

D. Markings

1. Pictograph
   a) None

2. Geometric
   a) A large letter "D"
   b) Inside a yellow star
VI. CLASS K EXTINGUISHERS

A. Suitable for use on combustible cooking media

B. Markings

1. Pictograph
   a) Flaming frying pan

2. Geometric
   a) A large black letter "K"

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI. CLASS K EXTINGUISHERS</td>
<td>What pictograph would you expect to find?</td>
</tr>
<tr>
<td>A. Suitable for use on combustible cooking media</td>
<td>What shape would you expect to find?</td>
</tr>
<tr>
<td>B. Markings</td>
<td></td>
</tr>
<tr>
<td>1. Pictograph</td>
<td></td>
</tr>
<tr>
<td>a) Flaming frying pan</td>
<td></td>
</tr>
<tr>
<td>2. Geometric</td>
<td></td>
</tr>
<tr>
<td>a) A large black letter &quot;K&quot;</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Portable fire extinguishers are used as a first line of defense on incipient fires. It is important to know the different types and applications of portable fire extinguishers, and successful extinguishment is dependent on the proper selection. Fire fighters should know, in addition to the types and sizes carried on their apparatus, the types found and/or needed in their response district.

Fire extinguishers are marked with pictographs and/or symbols for the type of fire they are designed. Pictographs not only illustrate the type of fire the extinguisher is designed for but a slash through a picture illustrates what it is not designed for. Pictograph illustrations are: a trash can and wood pile for Class A type fires, a gas can with spout for Class B fires, an electrical plug and socket for Class C fires, and a frying pan for Class K fires. Class D fires do not have a pictograph.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

**TOPIC:** PORTABLE FIRE EXTINGUISHER LAWS AND REGULATIONS

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-5.3

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The students will confirm a knowledge of portable fire extinguisher laws and regulations by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in Barclays Official California Code of Regulations, Title 19, West Group, Subchapter 3

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Barclays Official California Code of Regulations, Title 19, West Group
- UFC Standard 10-1, Nation Fire Codes, 1994 Edition

**PREPARATION:** Portable fire extinguishers serve a vital function in the supervision of small fires, and are required to be installed in various occupancies for life and property protection. It is essential that the extinguishers be serviced in accordance with national standards and state laws and regulations.
### LAWS

A. California Health and Safety Code

1. Requires that the State Fire Marshal adopt regulations that govern the sale, installation, and services of portable fire extinguishers

### REGULATIONS

A. Barclays Official California Code of Regulations, Title 19, West Group, Subchapter 3

1. Regulations and standards of the State Fire Marshal
2. Establishes regulations and standards for the control of portable fire extinguishers
3. Governs services, testing, and marketing of portable fire extinguishers
   a) Does not govern fire protection systems

4. Enforcement
   a) State Fire Marshal
   b) Local jurisdiction

B. Licensing

1. Any person, firm, corporation, or association to engage in the business of servicing, charging, inspecting, or hydrostatic testing of any portable fire extinguisher must be licensed
   a) Issued by the State Fire Marshal

---

What regulation covers the marketing, recharge, and testing of portable fire extinguishers?

Who enforces Title 19?

Who issues these licenses?
2. Types of licenses
   a) Shall be any one or combination of the following
   b) Type A license
      1) Any and all types of extinguishers
      2) Service, charge, recharge, inspect, or hydrostatic test
   c) Type B license
      1) Any and all types of extinguishers except dry chemical
      2) Service, charge, recharge, or inspect
   d) Type C license
      1) Water and chemical extinguishers
      2) Hydrostatic test
   e) Type D license
      1) Dry chemical extinguishers except hydrostatic test DOT-listed cylinders
      2) Inspect, service, charge, recharge, or hydrostatic test
   f) Type E
      1) DOT-listed extinguishers or cylinders
      2) Hydrostatic test

3. Change of location
   a) Licensee must notify State Fire Marshal's Office within 15 days
   b) Must notify local agency within 7 days
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What are some of license restrictions relating to the license?</td>
</tr>
</tbody>
</table>

4. Restrictive use
   a) Does not provide authorization to enter upon any person's property
   b) Does not allow licensee to enforce any of the regulations

5. Registration number
   a) Every license shall be identified with an "E" number
   b) Transfer of numbers must be approved by the State Fire Marshal

C. Certificates of registration
   1. Authorizes a person to charge, recharge, and test portable fire extinguishers
      a) Issued by the State Fire Marshal
   2. Shall indicate the type of act or acts for which the applicant is qualified to perform
      a) Type 1
         1) Charge, recharge, and/or inspect any or all types of extinguishers
      b) Type 2
         1) Hydrostatic test any extinguisher except DOT-listed cylinders
      c) Type 3
         1) Hydrostatic test any DOT-listed cylinders
   3. Change of address
      a) Certificate holder must notify the State Fire Marshal's Office within 15 days
4. Verify identity  
   a) Must show and permit the examination of such certificate by the local inspection authority upon request

5. Examination  
   a) The applicant must pass a State Fire Marshal examination to obtain a certificate of registration

6. Certificate identification  
   a) Every certificate shall be identified by an "EE" number  
      1) This number is nontransferable

D. Classification of fires and ratings of portable fire extinguishers  
   1. Class A fires  
      a) Fires in ordinary combustibles  
   2. Class B fires  
      a) Fires in flammable liquids  
   3. Class C fires  
      a) Fires in energized electrical equipment  
   4. Class D fires  
      a) Fires in combustible metals  
   5. Class K fires  
      a) Fires in combustible cooking media

E. Ratings  
   1. Fire extinguishers shall be rated as to their effectiveness on various sizes and classes of fires
2. Ratings shall consist of a numeral, a letter, or combination thereof
3. The numeral denotes the extinguisher's potential
4. The letter denotes the class of fire for which such extinguisher is most effective
5. Ratings are based upon the results obtained from tests conducted in accordance with Underwriters Laboratories
6. Ratings shall be affixed on a label for every approved fire extinguisher

**F. Labels**

1. Must comply with State Fire Marshal Regulations and Uniform Fire Code Standard 10-1
2. Required on all portable fire extinguishers

Who has the authority to determine the number and type of fire extinguishers to be installed?

**G. Placement of portable fire extinguishers**

1. The number and type of portable fire extinguishers to be installed shall be determined by the inspection authority
2. Multiple classifications may be used to meet combined extinguishing requirements
3. Accessibility
   a) Readily accessible
   b) Readily visible
      1) When approved by the inspecting agency extinguishers need not be visible if approved directional signs are provided
III. SERVICE REQUIREMENTS

A. Yearly service
   1. Shall be serviced or inspected each year or after each use whichever occurs first
   2. Nonrefillable extinguishers shall not be recharged
   3. Cartridges shall be weighed yearly

B. Service tags
   1. Every fire extinguisher inspected, serviced, charged or recharged shall have an approved service tag affixed
   2. Internal maintenance tag
      a) Shall be placed on the topmost portion of the siphon (pick-up) tube of all extinguishers when recharged except
         1) Carbon dioxide
         2) Halon
         3) External cartridge operated

IV. INSPECTION AND RECHARGE

A. Inspections and recharging of portable fire extinguishers shall be by trained personnel
B. All parts, chemicals, recharge equipment shall meet manufacturer's specifications for the various types of fire extinguishers
C. The technician shall complete the following procedures during an inspection

1. Located in an approved location both accessible and visible
2. Operating instructions are legible and facing outward
3. Seals and safety pins in place
4. Weigh the extinguisher with an approved scale
   a) Weight is listed on instruction plate
5. Hydrostatic test date has not expired
6. Examine for obvious physical damage, corrosion, leakage, or clogged nozzle or hose
7. Pressure gauge reading or indicator in the operable range or position
8. In annual inspections, affix a current service tag

D. The technician shall complete the following procedures during a recharge or annual service

1. Release any pressure in the cylinder and remove cartridge
2. Disassemble extinguisher
3. Clean all parts, threads, and O-rings
4. Inspect and/or replace chemical
   a) See manufacturer’s specifications
5. Apply internal tag if required
6. Reassemble extinguisher
   a) Hand tighten only

What are some procedures to complete during a recharge or annual service?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Repressurize with nitrogen or dry air</td>
<td></td>
</tr>
<tr>
<td>8. Replace safety pin and seal</td>
<td></td>
</tr>
<tr>
<td>a) On cartridge operated units replace cartridge</td>
<td></td>
</tr>
<tr>
<td>9. Attach service tag</td>
<td></td>
</tr>
</tbody>
</table>

V. HYDROSTATIC TEST REQUIREMENTS

A. Shall be performed by properly trained personnel with approved equipment and test facilities

B. Frequencies

1. Stored-pressure water, loaded stream, and/or antifreeze
   a) Every 5 years

2. Wetting agent
   a) Every 5 years

3. AFFF (aqueous film forming foam)
   a) Every 5 years

4. FFFP (film forming fluoro protein foam)
   a) Every 5 years

5. Dry chemical with stainless steel shells
   a) Every 5 years

6. Carbon dioxide
   a) Every 5 years

7. Wet chemical
   a) Every 5 years

8. Dry chemical, stored-pressure with mild steel shells, brazed brass shells, or aluminum shells
   a) Every 12 years

What are the hydrostatic test requirements?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Dry chemical, cartridge or cylinder-operated with mild, steel shells</td>
<td></td>
</tr>
<tr>
<td>a) Every 12 years</td>
<td></td>
</tr>
<tr>
<td>10. Halogenated agents</td>
<td></td>
</tr>
<tr>
<td>a) Every 12 years</td>
<td></td>
</tr>
<tr>
<td>11. Dry powder, stored-pressure, cartridge, or cylinder-operated with mild</td>
<td></td>
</tr>
<tr>
<td>steel shells</td>
<td></td>
</tr>
<tr>
<td>a) Every 12 years</td>
<td></td>
</tr>
<tr>
<td>12. All extinguishers in vehicles</td>
<td></td>
</tr>
<tr>
<td>a) Every 5 years</td>
<td></td>
</tr>
<tr>
<td>13. At any time physical damage, corrosion, or other reasons would effect the</td>
<td></td>
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<tr>
<td>structural integrity of the shell</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

The importance of servicing and installing portable fire extinguishers in accordance with national standards and state law is important to ensure that the extinguisher will work properly when used to protect life and property.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Barclays Official California Code of Regulations, Title 19, West Group, Subchapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
STATE FIRE

TRAINING

FIRE FIGHTER I

TOPIC: HOW TO OPERATE A PORTABLE FIRE EXTINGUISHER USING THE "PASS" METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A portable fire extinguisher and appropriate personal protective equipment

Behavior: The student will operate a portable fire extinguisher using the "PASS" method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Portable fire extinguisher
- Appropriate personal protective equipment

REFERENCES:

PREPARATION:
All fire department personnel must have a working knowledge of the operating principles of portable fire extinguishers. An acronym (PASS) has been developed to operate most extinguishers with four simple steps: Pull the pin; Aim the nozzle; Squeeze the handle; and Sweep the nozzle across the base of the fire. PASS keeps it simple and is easily taught to citizen groups.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check extinguisher</td>
<td>1a. Type and rating for fire</td>
</tr>
<tr>
<td>2. Carry extinguisher</td>
<td>2a. To fire location</td>
</tr>
<tr>
<td></td>
<td>b. By handle</td>
</tr>
<tr>
<td>3. Position yourself</td>
<td>3a. Upwind</td>
</tr>
<tr>
<td></td>
<td>b. Safe distance from fire</td>
</tr>
<tr>
<td></td>
<td>c. Keeping a path of escape available</td>
</tr>
<tr>
<td>4. Pull the pin</td>
<td>4a. Twisting</td>
</tr>
<tr>
<td></td>
<td>b. Forcefully</td>
</tr>
<tr>
<td></td>
<td>c. Breaking wire or plastic tie</td>
</tr>
<tr>
<td></td>
<td>d. Discarding pin</td>
</tr>
<tr>
<td>5. Aim the nozzle</td>
<td>5a. At base of fire</td>
</tr>
<tr>
<td>6. Squeeze the handle</td>
<td>6a. Discharging extinguishing agent</td>
</tr>
<tr>
<td>7. Sweep the nozzle</td>
<td>7a. Back and forth</td>
</tr>
<tr>
<td></td>
<td>b. Aimed at base of fire</td>
</tr>
<tr>
<td></td>
<td>c. Working fire closest to yourself</td>
</tr>
<tr>
<td></td>
<td>d. Pushing fire away</td>
</tr>
<tr>
<td></td>
<td>e. Until extinguished</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS WHEN USING PORTABLE FIRE EXTINGUISHERS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the safety considerations to be observed when operating extinguishers by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 5

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials • Six types of fire extinguishers

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: During your career in the fire service, you may be called upon to use or teach civilians how to use fire extinguishers. It is imperative for the safety of users that safety precautions are followed. A portable fire extinguisher is excellent to use on incipient fires. In many cases, a portable extinguisher can extinguish a small fire in much less time than it would take to deploy a hoseline.
I. FIRE SERVICE USE
   A. NFPA Standard #1901
      1. Requires that pumping apparatus have two approved portable fire extinguishers with mounting brackets
      
   B. Extinguishers must be suitable for use on Class B and C fires
   C. The stated minimum size requirements for a dry chemical extinguisher is one with a rating of 80 B:C
   D. Ratings represent the type of fire plus performance capability

NOTE: See Unit F - Topic, "Classification Of Fire And Fire Extinguishers."

II. PUBLIC USE
   A. Most common type for public use is a 20-A:10-B:C extinguisher
   
   B. Location
      1. Near means of egress
      2. Mounted in an accessible and visible area

III. ORDINARY COMBUSTIBLE AND STORED-PRESSURE WATER EXTINGUISHERS
   A. Aim at base of fire
   B. If a gauge is provided, note the amount of pressure in the cylinder
   C. Never use calcium chloride in this extinguisher

How are extinguishers rated?

What is the most commonly used by the public?

Where should these extinguishers be located?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Never use near energized electrical equipment</td>
<td>What are hazards when using Halon extinguishers?</td>
</tr>
</tbody>
</table>

### IV. HALON EXTINGUISHERS

A. Avoid breathing extinguishing agent or gases
   1. Decomposes and liberates toxic components
   2. These agents should not be used in unventilated confined spaces

B. Discharge of the extinguishing agent may be affected by draft and wind

C. Because of their ozone-depletion potential, Halogenated extinguishing agents are no longer being produced
   1. International agreement
      a) Montreal Protocol on Substances that Deplete the Ozone Layer
   2. The only exception is for essential uses where no suitable alternatives are available
   3. However, you may still encounter existing units

### V. CARBON DIOXIDE EXTINGUISHERS

A. B:C rating only
   1. Flammable liquids/energized electrical

B. High pressure used

C. Keep hands from metal parts (-100°F)

D. Direct away from hands or legs

E. Oxygen deficiency if used in confined area

F. Limited range

What classes of fires are carbon dioxide extinguishers designed for?
VI. DRY CHEMICAL EXTINGUISHERS

A. Do not direct at surface of burning liquids from closer than 8 feet
B. Note the total weight of the gas and the cartridge
   1. It must be weighed to determine if it is full
C. Not as effective on deep-seated fires

D. Never mix or contaminate dry chemicals with any other type of agent because they may chemically react and cause a dangerous rise in pressure inside the extinguisher
   1. There are many types of dry chemical agents

VII. DRY POWDER EXTINGUISHERS

A. Leaking, corroded, or otherwise damaged extinguisher shells or cylinders should be discarded or returned to the manufacturer for repair
B. Never try to repair the shell or cylinder subjected to pressure
C. In the case of a very hot fire, initial discharge should be started at maximum range
D. Direct stream at fire
   1. Completely cover burning metal

VIII. FOAM EXTINGUISHERS

A. Contents stored under pressure
B. Never direct stream into burning liquid
   1. Direct off back wall or object
   2. Direct stream at front of fire and push foam blanket
C. For Class A and B fires
D. If gauge is provided, note the amount of pressure

**IX. EXTINGUISHERS AND POWDER EXTINGUISHING AGENTS FOR METAL FIRES**

A. Combustible metals (Class D)

B. No single agent will control or extinguish fires in all combustible metals

C. Some agents are effective against fires in several metals, others are effective on fires in only one type of metal

D. Some powder agents can be applied with portable extinguishers, but others must be applied by either a hand scoop or shovel

E. Agent should be applied gently to avoid breaking any crust that may form over the burning metal
   1. Care should also be taken not to scatter the burning material

Will dry powder extinguish all combustible metals?
SUMMARY:

Familiarity with the safety considerations relating to the use of all types of fire extinguishers is necessary not only for your own safety on those occasions when you may have to use one, but also for the safety of the public when you are called upon to instruct nonfire service personnel in fire extinguisher use.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF PORTABLE FIRE EXTINGUISHERS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and function of portable fire extinguishers by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sample portable fire extinguishers

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: All fire department personnel must have a working knowledge of the characteristics and functions of portable fire extinguishers. The ability to choose the proper extinguisher when needed is critical. This ability will also be beneficial when performing fire prevention tasks and public education.
## I. WATER EXTINGUISHERS

### A. Stored-pressure

1. Capacities vary from 1-60 gallons

   a) Most common is the 2½ gallon
      1) Weighs about 30 pounds

2. Pressurized with air or inert gas between 90-125 psi

   What is the range for a stored-pressure water extinguisher?

3. Range is 30-40 feet

4. Underwriters' Laboratories (UL) rated for Class "A" fires only

5. Uniform Fire Code requires minimum protection 1-A:10-B:C extinguisher and you will see very few water extinguishers in businesses

### B. Pump tank/backpack

1. Capacities vary depending on type
   a) Pump tanks are generally 2½ gallons
   b) Most common backpack pump tanks are 5 gallons
      1) Weigh about 50 pounds

2. Water is delivered by a double action, trombone type hand pump

   What is the range of a backpack pump?

3. Range is 30-40 feet
4. Although UL listed, they do not carry a designated rating

C. Pails and buckets
   1. Fire pails and buckets are still in use, but generally in limited applications
      a) Lumberyards

D. Extinguishment
   1. Removes heat

E. Advantages
   1. Highly effective and easily recharged
   2. Class A foam may be added to help penetrate deep seated fires

F. Disadvantages
   1. Subject to freezing (32°F)
   2. Conducts electricity

II. DRY CHEMICAL EXTINGUISHERS
   A. Most common portable extinguisher in use today
      1. Nontoxic
2. Capacities vary widely from hand-held with a 2-30 pound capacity, to wheeled carts with a 350 pound capacity

Are the operating pressures for dry chemical extinguishers higher or lower than stored-water extinguishers?

3. Operating pressures range from 185-200 psi

What is the range of a dry chemical extinguisher?

4. Range for hand-held units is 5-20 feet

5. UL ratings vary depending on type of dry chemical
   a) Ordinary dry chemicals are rated B:C
   b) Multipurpose dry chemicals are rated A:B:C

B. Two basic kinds of dry chemical agents

1. Ordinary
   a) UL rated B:C includes
      1) Sodium bicarbonate (Purple K)
      2) Potassium bicarbonate (Monnex)
      3) Urea potassium bicarbonate
      4) Other potassium chloride based agents

2. Multipurpose
   a) UL rated A:B:C and includes
      1) Ammonium phosphate based agent
C. Two basic types of dry chemical extinguishers
   1. Stored-pressure
      a) Dry chemical and propellant (usually nitrogen or carbon dioxide) are stored together under pressure

   2. Gas cartridge operated
      a) Dry chemical and propellant are stored separately
      b) Propellant cartridge must be activated (punctured) to release pressure into the dry chemical chamber to pressurize contents

D. Extinguishment
   1. Disrupts chemical chain reaction
   2. Multipurpose dry chemicals also form a coating, which smothers and isolates the fuel

E. Advantages
   1. Readily available for home or office
   2. Greater range than carbon dioxide or Halon extinguishers
   3. Perform better under windy conditions

F. Disadvantages
   1. Leaves a residue
   2. No cooling effect
   3. Some of the agents are corrosive
III. CARBON DIOXIDE EXTINGUISHERS

A. Stored under its own pressure and self-expelled
   1. Capacities vary from 2-20 pounds for hand-held and up to 100 pounds for wheeled carts

   2. Carbon dioxide is stored as a liquid at 800-900 psi

   3. Carbon dioxide is expelled as a liquid, but immediately converts to gas in the discharge horn

   4. Range for most hand-held extinguishers is 3-8 feet

   5. UL rated for B:C fires
      a) It can be effective on small Class A fires

B. Extinguishment

   1. Carbon dioxide prevents combustion by displacing oxygen and cooling the fuel

C. Advantages
   1. Nonconductor of electricity
   2. Does not leave a residue

Why do you think carbon dioxide extinguishers have such thick cylinders as compared to dry chemical or water extinguishers?

What is the range for a carbon dioxide extinguisher?

Which component of the fire tetrahedron does carbon dioxide remove?
3. Effective on open or closed tanks of flammable liquids

### D. Disadvantages

1. After carbon dioxide dissipates, reignition may occur
2. Will not extinguish a smoldering Class A fire
3. Displacement of oxygen can cause asphyxiation
4. Discharge noise and limited visibility can cause panic in the operator

### IV. HALON EXTINGUISHERS

#### A. Halogenated extinguishing agents have been found to damage the ozone and are being phased out of production

#### B. Halon is a generic term for halogenated hydrocarbons; the most common being Halon 1211 and Halon 1301

1. Halon extinguishers are stored-pressure extinguishers
2. Capacities vary from 2-22 pounds
3. Pressurized with inert gas, usually nitrogen, between 185-200 psi
4. Range is from 6-18 feet
5. UL ratings vary depending on type, but generally have an A:B:C rating

#### C. Extinguishment

1. Disrupts the chemical chain reaction
2. Some smothering effect
D. Advantages
1. Leaves no residue
2. Not conductive
3. Low toxicity
E. Disadvantages
1. No cooling effect
2. Some forms of this agent can produce toxic by-products
3. Destroys the ozone

V. FOAM EXTINGUISHERS
A. Two types
1. Aqueous film forming foam (AFFF)
2. Film forming fluoroprotein foam (FFFP)
B. AFFF or FFFP as a water solution are stored under pressure and then expelled through aspirator hose mixing air into solution forming foam
1. Capacities vary from 2½-33 gallons
   a) Most common being the 2½-gallon stored-pressure extinguisher
2. Operating pressures range from 90-125 psi
3. Range for hand-held units is 20-25 feet
4. UL rated for A:B fires
C. Extinguishment
1. Forms vapor barrier between fuel and air
2. On Class A fuels AFFF can act as both a vapor barrier and coolant
D. Advantages of AFFF extinguishers
1. Good for Class A and B fires
2. Foam blanket prevents reignition
E. Disadvantages

1. Conducts electricity
2. Leaves residue
3. Not suitable for water soluble flammable liquids
   a) Polar solvents
4. Subject to freezing

F. Advantages specific to FFFP

1. Not affected by freezing
2. Compatible with dry chemical application
3. There are alcohol resistant types available
4. Good low temperature velocity
5. Longer lasting than AFFF

VI. DRY POWDER EXTINGUISHERS

A. Dry powder extinguishers are intended for specific use on Class D fires and specific metals

1. Cartridge operated hand-held extinguishers come in 30 pound models, but wheeled models can be as much as 350 pounds
2. Range for hand-held units is 6-8 feet

VII. WET CHEMICAL EXTINGUISHERS

A. Wet chemical extinguishers have been developed to extinguish fires in high-efficiency, high temperature cooking equipment

B. Wet chemicals used include
   1. Potassium acetate

What type of extinguisher is rated for Class D fires?

What type of extinguisher has been developed to handle Class K fires?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Potassium carbonate</td>
</tr>
<tr>
<td>3. Potassium citrate</td>
</tr>
<tr>
<td>C. Stored-pressure, wet chemical extinguishers come in 1½ and 2½ gallons</td>
</tr>
<tr>
<td>D. UL rated for fires involving A:B:C hazards, they have been found suitable for Class K fires</td>
</tr>
<tr>
<td>E. Extinguishment</td>
</tr>
<tr>
<td>1. Obtained by forming a foam blanket separating the fuel from the air and cooling it at the same time</td>
</tr>
<tr>
<td>F. Advantages</td>
</tr>
<tr>
<td>1. Improved visibility during fire fighting</td>
</tr>
<tr>
<td>2. Minimizes clean-up</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
</tr>
</thead>
</table>


SUMMARY:

Fire extinguishers have limited capabilities, and trying to exceed those capabilities can increase the damage done and cause injuries. They are designed for specific purposes and are usually a first-aid method for fire extinguishment. Fire extinguishers are designed and rated with certain types and sizes of fires in mind; using the wrong class extinguisher or the wrong size may cause problems. Pick the right extinguisher for the job!

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

HOW TO OPERATE A GAS CARTRIDGE PORTABLE FIRE EXTINGUISHER

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A fully charged gas cartridge portable fire extinguisher and appropriate personal protective equipment

Behavior: The student will operate a gas cartridge portable fire extinguisher

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- A fully charged gas cartridge portable fire extinguisher
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 5

PREPARATION: Portable fire extinguishers are found in various sizes and types, application, and methods of operation. To effectively use these extinguishers, a fire fighter must be familiar with the operational procedures of these extinguishers in order to extinguish the fire and to prevent personal harm while operating the portable extinguisher.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check extinguisher</td>
<td>1a. Type and rating for fire</td>
</tr>
<tr>
<td></td>
<td>b. Operating condition</td>
</tr>
<tr>
<td></td>
<td>c. Current service tag</td>
</tr>
<tr>
<td></td>
<td>d. Seal intact and in place</td>
</tr>
<tr>
<td>2. Place extinguisher</td>
<td>2a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. To stabilize extinguisher</td>
</tr>
<tr>
<td></td>
<td>c. Solid footing</td>
</tr>
<tr>
<td></td>
<td>d. Level location</td>
</tr>
<tr>
<td></td>
<td>e. Upright position</td>
</tr>
<tr>
<td></td>
<td>f. Safe distance from fire</td>
</tr>
<tr>
<td>3. Remove hose and nozzle</td>
<td>3a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. From nozzle holder</td>
</tr>
<tr>
<td></td>
<td>c. Breaking plastic or wire band</td>
</tr>
<tr>
<td>4. Hold hose and carry handle</td>
<td>4a. In same hand</td>
</tr>
<tr>
<td></td>
<td>b. To prevent hose from snapping upward once charged</td>
</tr>
<tr>
<td>5. Push on lever</td>
<td>5a. Heel of free hand</td>
</tr>
<tr>
<td></td>
<td>b. To puncture gas cartridge</td>
</tr>
<tr>
<td></td>
<td>c. Charging cylinder</td>
</tr>
<tr>
<td>6. Pick up extinguisher, if necessary</td>
<td>6a. With free hand</td>
</tr>
<tr>
<td></td>
<td>b. By handle</td>
</tr>
<tr>
<td>7. Point nozzle</td>
<td>7a. Toward ground</td>
</tr>
<tr>
<td>8. Squeeze nozzle lever</td>
<td>8a. To discharge agent</td>
</tr>
<tr>
<td></td>
<td>b. Ensuring agent will be expelled</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>9. Carry extinguisher</td>
<td>9a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. Using handle</td>
</tr>
<tr>
<td></td>
<td>c. To fire area</td>
</tr>
<tr>
<td>10. Point the nozzle</td>
<td>10a. Toward the fire</td>
</tr>
<tr>
<td>11. Squeeze nozzle lever</td>
<td>11a. To discharge agent from inside</td>
</tr>
<tr>
<td>12. Sweep the nozzle</td>
<td>12a. Back and forth</td>
</tr>
<tr>
<td></td>
<td>b. Side-to-side</td>
</tr>
<tr>
<td></td>
<td>c. At base of flames</td>
</tr>
<tr>
<td>13. Release nozzle lever</td>
<td>13a. To stop discharge of agent</td>
</tr>
<tr>
<td>14. Check fire</td>
<td>14a. For complete extinguishment</td>
</tr>
<tr>
<td>15. Return hose and nozzle</td>
<td>15a. To nozzle holder</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPERATE A STORED-PRESSURE PORTABLE FIRE EXTINGUISHER

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.15

BEHAVIORAL OBJECTIVE:

Condition: A fully charged stored-pressure portable fire extinguisher and appropriate personal protective equipment

Behavior: The student will operate a stored-pressure portable fire extinguisher

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Fully charged stored-pressure portable fire extinguisher
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 5

PREPARATION:

Portable fire extinguishers are found in various sizes and types, applications, and methods of operation. To effectively use these extinguishers, a fire fighter must be familiar with the operational procedures. An acronym (PASS) has been developed to operate most extinguishers with four simple steps: Pull the pin; Aim the nozzle; Squeeze the handle; and Sweep the nozzle across the base of the fire. PASS keeps it simple and is easily taught to citizen groups.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Check extinguisher</td>
<td>1a. Type and rating for fire</td>
</tr>
<tr>
<td></td>
<td>b. Operation condition</td>
</tr>
<tr>
<td></td>
<td>c. Pressure level full on gauge</td>
</tr>
<tr>
<td></td>
<td>d. Current service tag</td>
</tr>
<tr>
<td></td>
<td>e. Seal intact and in place</td>
</tr>
<tr>
<td>2. Carry extinguisher</td>
<td>2a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. Using handle</td>
</tr>
<tr>
<td></td>
<td>c. To fire area</td>
</tr>
<tr>
<td>3. Place extinguisher</td>
<td>3a. Safe distance from fire</td>
</tr>
<tr>
<td></td>
<td>b. On ground</td>
</tr>
<tr>
<td></td>
<td>c. To steady unit</td>
</tr>
<tr>
<td></td>
<td>d. Solid footing</td>
</tr>
<tr>
<td></td>
<td>e. Level location</td>
</tr>
<tr>
<td></td>
<td>f. Upright position</td>
</tr>
<tr>
<td>4. Grasp pin</td>
<td>4a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. At top of extinguisher</td>
</tr>
<tr>
<td>5. Pull or twist pin</td>
<td>5a. Breaking plastic or wire band</td>
</tr>
<tr>
<td></td>
<td>b. Clear of handle</td>
</tr>
<tr>
<td></td>
<td>c. Setting aside</td>
</tr>
<tr>
<td>6. Remove hose and nozzle</td>
<td>6a. With either hand</td>
</tr>
<tr>
<td></td>
<td>b. From retainer clip/holder</td>
</tr>
<tr>
<td>7. Grasp nozzle and hose, if applicable</td>
<td>7a. Same hand</td>
</tr>
<tr>
<td>8. Pick up extinguisher</td>
<td>8a. With free hand</td>
</tr>
<tr>
<td></td>
<td>8b. By handle</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 9. Point the nozzle or outlet (point the horn for CO₂ extinguisher) | 9a. Toward fire  
   b. Removing hand from horn and tubing |
| 10. Press or squeeze discharge handle | 10a. Above or below carrying handle  
   b. To discharge agent from inside |
| 11. Sweep the nozzle or horn | 11a. Back and forth  
   b. Side-to-side  
   c. At base of flames |
| 12. Release discharge handle | 12a. To stop discharge |
| 13. Check fire | 13a. For complete extinguishment |
| 14. Return hose/nozzle | 14a. To retain clip/holder |
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF PORTABLE FIRE EXTINGUISHERS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance procedures of portable fire extinguishers by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Portable fire extinguishers

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Inspection and maintenance of portable extinguishers is vital. It ensures that the portable extinguisher is in proper working order, is in the proper location, and is accessible. The ability to make use of the fire extinguisher as rapidly as possible will aid in keeping a fire small and possibly avoiding a major loss.
I. INSPECTION

A. Location of extinguisher
   1. Appropriate type and size
      a) Minimum number, type, and size requirements are listed in NFPA Standard #10
   2. Visible and accessible
      a) No obstructions
      b) Conspicuously located

   3. Height
      a) Bottom, no less than 4 inches from floor
      b) Top, no higher than 5 feet from floor
      c) If over 40 pounds
         1) No higher than 3½ feet from floor

B. Label
   1. UL approved
   2. Recharging instructions
   3. Hydrostatic test
      a) Date
      b) Pressure

C. Gauge
   1. Pointed to operational range
   2. Crystal or case not damaged
   3. Dial clear

What is the maximum height that an extinguisher may be placed from the floor?

What information should be on the extinguisher label?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D.</strong> Instruction label</td>
<td></td>
</tr>
<tr>
<td>1. Operating instructions face outward</td>
<td></td>
</tr>
<tr>
<td><strong>E.</strong> Handle</td>
<td></td>
</tr>
<tr>
<td>1. Not bent</td>
<td></td>
</tr>
<tr>
<td>2. In place</td>
<td></td>
</tr>
<tr>
<td>3. Safety pin in proper position and secured by an approved tamper seal</td>
<td></td>
</tr>
<tr>
<td><strong>F.</strong> Hose and nozzle</td>
<td></td>
</tr>
<tr>
<td>1. Hose not cracked</td>
<td></td>
</tr>
<tr>
<td>a) No obstruction</td>
<td></td>
</tr>
<tr>
<td>2. Nozzle</td>
<td></td>
</tr>
<tr>
<td>a) Not clogged</td>
<td></td>
</tr>
<tr>
<td>b) Not broken, cracked, or chipped</td>
<td></td>
</tr>
<tr>
<td><strong>G.</strong> Weight</td>
<td></td>
</tr>
<tr>
<td>1. Lift extinguisher to ensure it is near its proper weight</td>
<td></td>
</tr>
<tr>
<td>2. Weigh it</td>
<td></td>
</tr>
<tr>
<td>a) If CO₂</td>
<td></td>
</tr>
<tr>
<td><strong>H.</strong> Service tag</td>
<td></td>
</tr>
<tr>
<td>1. Date punched</td>
<td></td>
</tr>
<tr>
<td>a) Day</td>
<td></td>
</tr>
<tr>
<td>b) Month</td>
<td></td>
</tr>
<tr>
<td>c) Year</td>
<td></td>
</tr>
<tr>
<td>d) Not over one year</td>
<td></td>
</tr>
</tbody>
</table>

What should you look for in inspecting an extinguisher hose and nozzle?

What should be on an extinguisher service tag?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Signature of person servicing extinguisher and registration number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you need to see on the seal?</td>
</tr>
</tbody>
</table>

I. Seal
1. State Fire Marshal's certificate number

J. General condition
1. No rust
2. No agent on or around extinguisher shell
3. No dents or impact marks
**SUMMARY:**

Portable extinguishers are easy to inspect and they are a vital part of fire prevention inspections. The visual inspection should include checking for an approved service tag, proper pressure, any damage and the pin seal is secure. Visual inspections are intended to give reasonable assurance that they are in operable condition.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: HOW TO SERVICE A GAS CARTRIDGE PORTABLE FIRE EXTINGUISHER

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A gas cartridge portable fire extinguisher, recharge kit, spanner wrench or long screwdriver, and appropriate personal protective equipment

Behavior: The student will demonstrate how to service a gas cartridge portable fire extinguisher

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Gas cartridge portable fire extinguisher
- Recharge kit
- Spanner wrench or long screwdriver
- Appropriate personal protective equipment

REFERENCES:
- Manufacturer’s Recharge and Maintenance Manual
- NFPA Standard #10, NFPA, 1998

PREPARATION: Portable fire extinguishers serve a vital function in the extinguishment of small fires. The proper servicing of a portable fire extinguisher, whether annually or after use, is necessary to ensure that it will operate properly the next time it is needed.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct a visual inspection</td>
<td>1a. Physical damage</td>
</tr>
<tr>
<td></td>
<td>b. Date of expiration</td>
</tr>
<tr>
<td></td>
<td>c. Any obstructions</td>
</tr>
<tr>
<td>2. Remove cartridge cover</td>
<td></td>
</tr>
<tr>
<td>3. Unscrew cartridge</td>
<td>3a. Direction of turn varies with type of extinguisher</td>
</tr>
<tr>
<td>4. Remove cap</td>
<td>4a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Method and/or direction of turn may vary with manufacturer</td>
</tr>
<tr>
<td>5. Empty chemical</td>
<td>5a. From shell</td>
</tr>
<tr>
<td></td>
<td>b. Into a clean bucket</td>
</tr>
<tr>
<td>6. Remove nozzle</td>
<td></td>
</tr>
<tr>
<td>7. Clean all parts</td>
<td>7a. With soft cloth</td>
</tr>
<tr>
<td>8. Clean inside hose</td>
<td>8a. With air pressure</td>
</tr>
<tr>
<td>9. Clean threads</td>
<td>9a. With soft cloth</td>
</tr>
<tr>
<td></td>
<td>b. Or toothbrush</td>
</tr>
<tr>
<td>10. Clean and lubricate gaskets</td>
<td>10a. With manufacturer-approved lubricant</td>
</tr>
<tr>
<td>11. Inspect shell</td>
<td>11a. Physical damage</td>
</tr>
<tr>
<td></td>
<td>b. Rust</td>
</tr>
<tr>
<td></td>
<td>c. Corrosion</td>
</tr>
<tr>
<td>12. Inspect siphon tube</td>
<td>12a. For tightness</td>
</tr>
<tr>
<td>13. Inspect nozzle</td>
<td>13a. Nozzle tip in place</td>
</tr>
<tr>
<td></td>
<td>b. For attachment to hose</td>
</tr>
<tr>
<td>14. Weigh cartridge</td>
<td>14a. With approved ounce scale</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15. Replace cartridge</td>
<td>15a. If it does not meet manufacturer's specifications</td>
</tr>
<tr>
<td></td>
<td>b. With approved cartridges</td>
</tr>
<tr>
<td>16. Inspect plunger operation</td>
<td></td>
</tr>
<tr>
<td>17. Inspect chemical</td>
<td>17a. For caking or lumping</td>
</tr>
<tr>
<td>18. Replace chemical, if necessary</td>
<td>18a. With approved chemical</td>
</tr>
<tr>
<td>19. Refill extinguisher</td>
<td></td>
</tr>
<tr>
<td>20. Weigh chemical</td>
<td>20a. For proper amount</td>
</tr>
<tr>
<td>21. Clean threads</td>
<td></td>
</tr>
<tr>
<td>22. Replace cap</td>
<td>22a. Hand tight</td>
</tr>
<tr>
<td>23. Replace hose</td>
<td></td>
</tr>
<tr>
<td>24. Insert safety pin</td>
<td>24a. Only on some models</td>
</tr>
<tr>
<td>25. Attach seal</td>
<td></td>
</tr>
<tr>
<td>26. Replace cartridge</td>
<td></td>
</tr>
<tr>
<td>27. Replace cartridge cover</td>
<td></td>
</tr>
<tr>
<td>28. Affix new service tag</td>
<td></td>
</tr>
<tr>
<td>29. Log service information</td>
<td></td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOC: HOW TO SERVICE A STORED-PRESSURE PORTABLE FIRE EXTINGUISHER

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A stored-pressure portable fire extinguisher, recharge kit, adjustable wrench, pressure supply, and appropriate personal protective equipment

Behavior: The students will service a stored-pressure portable fire extinguisher

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Stored-pressure portable fire extinguisher
- Recharge kit
- Adjustable wrench
- Pressure supply
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 5
- Manufacturer's Recharge and Maintenance Manual
- NFPA Standard #10, NFPA, 1998

PREPARATION: Portable fire extinguishers serve a vital function in the extinguishment of small fires. The proper servicing of a portable fire extinguisher after use or for yearly service is needed to ensure that it will operate properly when needed.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inspect extinguisher</td>
<td>1a. Physical damage</td>
</tr>
<tr>
<td></td>
<td>b. Hydrostatic test date</td>
</tr>
<tr>
<td></td>
<td>c. Hose and nozzle</td>
</tr>
<tr>
<td>2. Break tamper seal</td>
<td>4a. In a safe direction</td>
</tr>
<tr>
<td>3. Remove safety pin</td>
<td>6a. Counterclockwise</td>
</tr>
<tr>
<td>4. Point nozzle</td>
<td>7a. Counterclockwise</td>
</tr>
<tr>
<td>5. Press discharge lever</td>
<td>8a. Of shell</td>
</tr>
<tr>
<td>6. Remove hose assembly</td>
<td>9a. From head</td>
</tr>
<tr>
<td>7. Remove head assembly</td>
<td>11a. Soft cloth</td>
</tr>
<tr>
<td>8. Empty contents</td>
<td>b. No oily chemicals or abrasive materials</td>
</tr>
<tr>
<td>9. Unscrew siphon tube</td>
<td></td>
</tr>
<tr>
<td>10. Remove spring and valve</td>
<td></td>
</tr>
<tr>
<td>11. Wipe parts</td>
<td></td>
</tr>
<tr>
<td>12. Rinse parts and shell</td>
<td></td>
</tr>
<tr>
<td>13. Inspect valve stem and seat</td>
<td>13a. For cuts abrasions or other damage</td>
</tr>
<tr>
<td>14. Inspect O-rings</td>
<td>14a. For cuts or other damage</td>
</tr>
<tr>
<td>15. Check siphon tube</td>
<td>15a. For cracks, holes, or other damage</td>
</tr>
<tr>
<td>16. Inspect shell</td>
<td>16a. For physical damage, rust, or corrosives</td>
</tr>
<tr>
<td>17. Refill water extinguisher</td>
<td>17a. In accordance with manufacturer's</td>
</tr>
<tr>
<td></td>
<td>recommendations and directions</td>
</tr>
<tr>
<td></td>
<td>b. Clean or filtered water</td>
</tr>
<tr>
<td></td>
<td>c. To indicating mark</td>
</tr>
<tr>
<td>18. Add antifreeze, if required</td>
<td>18a. Approved antifreeze solution</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>19. Replace valve</td>
<td>19a. In head assembly</td>
</tr>
<tr>
<td>20. Install siphon tube</td>
<td></td>
</tr>
<tr>
<td>21. Replace head assembly</td>
<td>21a. Nozzle aligned with holder</td>
</tr>
<tr>
<td>22. Tighten head assembly lock nut</td>
<td>22a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until tight</td>
</tr>
<tr>
<td></td>
<td>c. Using wrench</td>
</tr>
<tr>
<td>23. Adjust pressure regulator</td>
<td>23a. Not over 25 psi above service pressure on instruction plate</td>
</tr>
<tr>
<td>24. Pressurize extinguisher</td>
<td>24a. In the operable range</td>
</tr>
<tr>
<td>25. Soap test for leaks</td>
<td>25a. Valve assembly and all threads</td>
</tr>
<tr>
<td>26. Insert hose</td>
<td>26a. Into head assembly</td>
</tr>
<tr>
<td>27. Hand tighten</td>
<td></td>
</tr>
<tr>
<td>28. Insert safety pin</td>
<td></td>
</tr>
<tr>
<td>29. Install tamper seal</td>
<td></td>
</tr>
<tr>
<td>30. Affix new service tag</td>
<td></td>
</tr>
<tr>
<td>31. Log service information</td>
<td></td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE ROPE AND WEBBING

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

| Condition: | A written test |
| Behavior: | The student will confirm a knowledge of the characteristics and functions of fire service rope and webbing by completing the written test |
| Standard: | With a minimum 80% accuracy according to the information contained in the in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6 |

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Rope samples

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Rescue Systems 1 Student Manual, SFT, 2000 Edition

PREPARATION:
Rope is one of the most versatile rescue tools. It can be used for anything from a lifeline to a means for hoisting, lowering, anchoring, rigging, or even controlling crowds. Rope must be of high quality to ensure the stresses placed on it can be done safely. There are many different types of ropes made. It is important that you understand the differences, so that you can identify and use the proper rope.
## I. INTRODUCTION

A. Rope or "lines" fall into two categories
   1. Life safety
      a) One-person rope
      b) Two-person rope
   2. Utility line

B. Life safety rope
   1. Also known as lifelines
   2. Used to raise or lower human life
   3. Used in structural search and rescue
   4. Lift objects off of human life
   5. Reserved for and identified as such

C. Utility rope
   1. Pulling, lifting, and hauling objects or equipment
      a) Not endangering human life
   2. Identical to lifeline, except subjected to more use/abuse
      a) Renders them less reliable
   3. Used to lash or secure loads
   4. Used to lift/lower small appliances and tools

## II. CHARACTERISTICS

A. Tensile strength
   1. Static force to break rope
b) NFPA Standard #1983
   1) 4,500 pounds for one-person life safety ropes
   2) 9,000 pounds for two-person life safety ropes

2. Not an indicator of rope strength

B. Working strength
   1. One-fifteenth current tensile strength
      a) 300 pounds for one-person
      b) 600 pounds for two-person
   2. Maximum load that rope can support
      a) While in use
      b) Without damage or failure
   3. Each use decreases strength
      a) Never constant
      b) Varies with type of use

C. Energy absorption
   1. Shock absorbing quality of rope
   2. Types of rope

a) High stretch (dynamic)
   1) Greater than 10% stretch at 440 pounds force (1.95kN)
   2) May stretch to 60% at breaking strength
   3) Recreational climbing rope
### Characteristics And Functions Of Fire Service Rope And Webbing

#### b) Low stretch (static)
1. Preferred choice of the fire service
2. ½-inch nylon kernmantle
3. 150 feet minimum

#### 3. Force applied should not exceed rope's working strength
   a) Rope loaded to 50% of tensile strength twelve times in succession may fail

#### D. Safe life
1. Total life of rope as it is subjected to
   a) Ultraviolet radiation
   b) Moisture/caustics
   c) Chemicals
   d) Abrasion
   e) Number of days in use
   f) Age
2. Abrasion is the most important

### What is the safe life of a rope?

#### 3. Natural fiber rope deteriorates rapidly
   a) 10% loss in strength per year used or not
   b) Never use in conjunction with human life

#### 4. Nylon deteriorates in direct proportion to
   a) Number of times used
   b) Abrasion
   c) Type of use

### What is one drawback of natural fiber rope?
### E. Strength of application

1. Tensile strength less the percentage of knots and bends
2. Every angle potentially weakens the rope

### III. CONSTRUCTION

#### A. Laid rope

1. A number of fibers twisted into a single strand
2. Strands counter twisted into finished rope

3. Safety hazards
   - a) Prone to abrasion
   - b) Kinks easily due to twisting during manufacturing
     1) Do not use in devices which tend to additionally twist
        - Life belts
        - Carabiner
     2) Use rope roller or personal protective equipment

#### B. Braided rope

1. Weaving process which joins strands into a solid braid
2. Used on capstan style winches
   - a) Soft nature
   - b) Large surface area
3. Is sometimes braid on braid
   - a) Reduces abrasion by 60%

---

What is one safety hazard of laid rope?
4. Safety Hazards
   a) Loose weave subject to abrasion
      1) One hundred percent of fiber exposed over length of rope
   b) Elongation is excessive

C. Static kernmantle rope
   1. Kern = core
      a) Block creel is NFPA requirement
         1) Continuous parallel fibers throughout the length of the rope
   b) 75-90% of breaking strength

   2. Mantle = sheath
      a) Braided jacket with half of strands having a left twist, the other half a right twist
         1) Eliminates torque when loaded
      b) Protects kern (core)
      c) 10-28% of breaking strength

   3. Construction results in little stretch
      a) Less than 5% stretch at 440 pounds force (2kN)
      b) Minimum stretch of not less than 15% at 75% of breaking strength
      c) Maximum stretch of not more than 45% at 75% of breaking strength
      d) Minimum melting temperature if 400°F
IV. WEBBING

A. Function
1. Anchor sling
2. Harness
3. Lashing

B. Construction
1. Nylon
   a) Strong, lightweight, synthetic material

2. Tubular spiral weave
   a) Continuous strand wrapped around horizontal strands
      1) Shuttle loom construction

3. Width
   a) 1 inch wide

4. Length
   a) Common color coding
      1) Green
         • 5 feet
      2) Yellow
         • 12 feet
      3) Blue
         • 15 feet
      4) Orange
         • 20 feet
5. **Strength**
   
a) Minimum breaking strength of 4,000 pounds force (17.77kN)

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What is the minimum breaking strength of webbing?</td>
</tr>
</tbody>
</table>
SUMMARY:

A fire fighter must know the characteristics of different styles or types of rope in order to properly select the correct type of rope for the intended use. Some ropes cannot be used for life safety and these must be known.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF FIRE SERVICE ROPE AND WEBBING

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance of fire service rope and webbing by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- One length of kernmantle rope
- Damaged rope
- Webbing

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: "Lifeline" is a very descriptive term used to describe one type of fire service rope. This is one piece of equipment that, quite literally, from which your life will be hanging. If you expect to have a lengthy career in the fire service, then you need to have confidence in your lifeline. In order to do this, you need to be familiar with inspection and maintenance procedures for ropes and webbing.
I. INSPECTION

A. Inspection schedule
   1. Monthly
   2. After each use
   3. Same inspection procedures for rope and webbing

   NOTE: Show example of rope.

B. Components of inspection
   1. Visual
      a) Cuts
      b) Abrasions
      c) Discolorations/stains
      d) Musty odors
      e) Unusual wear pattern
      f) Outer fiber separation
      g) Dirt and grit ground into fibers
   2. Touch/feel
      a) Bunching or thinness under the sheath cover of kernmantle ropes
      b) Soft or hard spots
   3. Rope should be removed from service when
      a) Sheath is broken or shows excessive sheath wear
      b) Core is visible
      c) Mushy areas of the core are detected

When will we inspect ropes?

What are some of the things to look for when performing an inspection?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>d) Strands of the core are broken</td>
<td></td>
</tr>
<tr>
<td>e) More than half of the outer sheath yarns are broken in one pique</td>
<td></td>
</tr>
<tr>
<td>f) Involved in a severe shock load from a fall</td>
<td></td>
</tr>
<tr>
<td>g) Stressed with a load beyond its working strength</td>
<td></td>
</tr>
<tr>
<td>h) Contaminated by chemicals</td>
<td></td>
</tr>
<tr>
<td>i) Worn out from use or age</td>
<td></td>
</tr>
<tr>
<td>j) Previous use cannot be accounted for</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Show example of log

4. Inspection log
   a) Kept with rope at all times
   b) Filled out after each use and inspection

   c) Identification
      1) Type
      2) Size
         • Length
         • Diameter
      3) Number
      4) Color
      5) Manufacturer
         • Model
      6) In-service date

   d) History and use
      1) Date used
      2) Incident/location

What type of information do you think we should record on the log?
II. MAINTENANCE

A. Keep coiled or bagged in dry compartment away from batteries and fuel
B. Protect from abrasion at all times
C. Keep lines clean
D. Avoid heat and direct sunlight

Why should rope be stored in the dark?

1. Sunlight decomposes fibers
E. Avoid contact with all petroleum products and other chemicals and vapors
F. Don't step on ropes
G. Don't overload lines
H. For supporting human life only
I. Avoid sharp bends
J. Avoid abrasive surfaces
K. Cleaning
   1. Clear water only
   2. Manufacturer's recommendation
   3. Dry completely
   4. Do not use washing machine or dryer to clean rope
L. Do not store with knots tied in line
   1. Eventually weakens rope
M. Same maintenance procedures for rope and webbing
**SUMMARY:**

Inspection of ropes and webbing needs to be accomplished and recorded both monthly and after each use. The care with which we handle our ropes and webbing will determine their relative safety and length of service.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting, IFSTA, Fourth Edition*, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INTRODUCTION TO FIRE SERVICE RESCUE KNOTS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of fire service rescue knots by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Rescue Systems 1 Student Manual, SFT, 2000 Edition

PREPARATION: Rescue knots are a key link in all rescue systems using rope. Rescue personnel must continually practice and develop this skill until they can tie knots in the dark, when cold, or tired. An improperly tied knot or the incorrect knot could result in a system failure and ultimately in injuries or death to crewmembers or victims.
### I. PURPOSE

A. Secure equipment in place  
B. Hoist or lower equipment or personnel  
C. Join two pieces of rope together  
D. Create rescue systems

### II. CHARACTERISTICS

A. Should be easy to tie and untie  
B. Should not tighten when wet  
C. Must hold securely without slipping  
D. Should not damage rope  
E. Should be neat in appearance  
   1. Easily recognized  
F. Should reduce the rope's strength as little as possible  
G. Should always be backed up with a safety knot

### III. KNOT TERMINOLOGY

A. Knot  
   1. Rope or webbing that is intertwined  
B. Bend  
   1. Connects two rope or webbing ends  
C. Hitch  
   1. Rope or webbing around an object  
   2. If the object were removed the hitch would fall apart
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D. Bight</strong></td>
<td></td>
</tr>
<tr>
<td>1. Formed by simply bending the rope back on itself while keeping the sides parallel</td>
<td></td>
</tr>
<tr>
<td><strong>E. Loop</strong></td>
<td></td>
</tr>
<tr>
<td>1. Made by crossing the sides of a bight over the standing part</td>
<td></td>
</tr>
<tr>
<td><strong>F. Round turn</strong></td>
<td></td>
</tr>
<tr>
<td>1. Made by continuing to cross one side of a loop all the way around to form a circle with the ends of the rope parallel as in a bight</td>
<td></td>
</tr>
<tr>
<td><strong>G. Running end</strong></td>
<td></td>
</tr>
<tr>
<td>a) Part of the rope that is to be used for work such as hoisting, pulling, or belaying</td>
<td>What is the running end of a rope?</td>
</tr>
<tr>
<td><strong>H. Working end</strong></td>
<td></td>
</tr>
<tr>
<td>1. The part of the rope used in forming of the knot</td>
<td>What is the working end?</td>
</tr>
<tr>
<td>2. Commonly referred to as the &quot;loose end&quot; or &quot;bitter end&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>I. Standing part</strong></td>
<td></td>
</tr>
<tr>
<td>1. The part of the rope between the working end and the running end</td>
<td></td>
</tr>
<tr>
<td><strong>IV. COMMON FIRE SERVICE RESCUE KNOTS</strong></td>
<td>What is the purpose of the half hitch?</td>
</tr>
<tr>
<td><strong>A. Half hitch</strong></td>
<td></td>
</tr>
<tr>
<td>1. Used to secure the working end of a rope or webbing</td>
<td></td>
</tr>
<tr>
<td>2. Can be formed using the end of a rope or a bight may be formed in the rope to simulate the end</td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>B. Clove hitch</strong>&lt;br&gt;1. Used to secure a rope or webbing around an object&lt;br&gt;2. Standing part is cinched up by pulling on the working end of the rope or webbing to remove slack from the standing part</td>
<td>What is the primary use of the clove hitch?</td>
</tr>
<tr>
<td><strong>C. Square knot</strong>&lt;br&gt;1. Used for tying two ropes of equal diameter together</td>
<td></td>
</tr>
<tr>
<td><strong>D. Bowline</strong>&lt;br&gt;1. Used to form a single loop to an object&lt;br&gt;2. Will not constrict</td>
<td></td>
</tr>
<tr>
<td><strong>E. Bowline on a bight</strong>&lt;br&gt;1. Used to form a single loop&lt;br&gt;2. Used for attaching to an anchor point&lt;br&gt;3. Will constrict</td>
<td></td>
</tr>
<tr>
<td><strong>F. Becket bend</strong>&lt;br&gt;1. Used to tie ropes of unequal diameter together&lt;br&gt;2. Bight is placed in larger of two ropes</td>
<td>What is the purpose of the becket bend?</td>
</tr>
<tr>
<td><strong>G. Half sheepshank (trucker's hitch)</strong>&lt;br&gt;1. Used for tying a rope between two objects</td>
<td></td>
</tr>
<tr>
<td><strong>H. Figure-eight family of knots</strong>&lt;br&gt;1. Most common and largest grouping of rescue knots&lt;br&gt;2. Figure-eight stopper&lt;br&gt; a) The foundation knot for the family of figure-eight rescue knots</td>
<td></td>
</tr>
</tbody>
</table>
### 3. Figure-eight on a bight

- **a)** Used primarily as a rescue knot to form a secure loop at the end of a line
- **b)** Used to attach to equipment, anchors, or rescuers/victims
- **c)** The tail must be at least 6 inches in length

### 4. Figure-eight follow through

- **a)** Produces the same knot as the figure-eight on a bight
- **b)** Used to tie a bight around an object whose configuration is such that the bight cannot be placed over it
  1) A large tree or a railing with no open end

### 5. In-line figure eight

- **a)** A directional knot that can be tied in the middle of the rope
- **b)** Produces a loop
  1) For attaching loads
6. **Figure-eight bend**
   a) Particularly good for joining two sections of rope of the same diameter or to form a continuous loop of rope

I. **Handcuff knot**
   1. Quickly attached
   2. Attached to arms and legs
   3. Tension must be maintained

J. **Overhand bend (water knot)**
   1. Used for tying webbing ends together
      a) To form a continuous loop of webbing
      b) To connect two lengths of webbing
   2. Tied with at least 2-inch tails
   3. All four parts must be dressed by pulling on each one to take out any slack

What is the purpose of the overhand bend?
SUMMARY:

When working with ropes and knots, it is important that fire fighters understand the terminology used. Fire fighters rely on a small number of knots that perform a variety of functions. These knots share characteristics that ensure they are easily tied and untied, are recognizable, and provide for maximum safety.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO TIE A HALF HITCH

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

Condition: A rope and appropriate personal protective equipment

Behavior: The student will tie a half hitch

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
• Job breakdown
• 5-12 foot length of ½-inch tie rope
• Appropriate personal protective equipment

REFERENCES:

PREPARATION: The half hitch is used in conjunction with other knots and hitches. It is nothing more than a loop used to stabilize hoisted objects. While it is a very simple knot, the half hitch is the foundation of other knots and hitches. Mastery of the simple knots will help achieve competency with more difficult ones.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Make a loop</td>
<td>1a. In standing part of rope</td>
</tr>
<tr>
<td></td>
<td>b. 2-3 feet from end</td>
</tr>
<tr>
<td>2. Slide loop</td>
<td>2a. Around object</td>
</tr>
<tr>
<td></td>
<td>b. Either side</td>
</tr>
<tr>
<td>3. Pull tight</td>
<td>3a. Pulling the running end</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE A CLOVE HITCH

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

Condition: A rope and appropriate personal protective equipment

Behavior: The student will tie a clove hitch

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 5-12 foot length of ½-inch tie rope
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

PREPARATION:
The clove hitch's principle use is to attach a rope to an object such as a post, pole, or hose. The clove hitch is not suitable for life safety work. It can be tied anywhere along a ropes length, by one of two methods.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>METHOD 1 - AROUND AN OBJECT</strong></td>
<td></td>
</tr>
<tr>
<td>1. Make one complete loop</td>
<td>1a. Around the object</td>
</tr>
<tr>
<td></td>
<td>b. Tightly</td>
</tr>
<tr>
<td></td>
<td>c. Crossing the working end over the standing part</td>
</tr>
<tr>
<td></td>
<td>d. Leaving enough length to wrap the anchor point a second time</td>
</tr>
<tr>
<td></td>
<td>e. Plus an additional 12 inches</td>
</tr>
<tr>
<td>2. Complete the round turn</td>
<td>2a. Around the same object</td>
</tr>
<tr>
<td></td>
<td>b. With the working end</td>
</tr>
<tr>
<td></td>
<td>c. Just above the first loop</td>
</tr>
<tr>
<td>3. Pass the working end</td>
<td>3a. Under the upper wrap</td>
</tr>
<tr>
<td></td>
<td>b. Just above the cross</td>
</tr>
<tr>
<td>4. Set the hitch</td>
<td>4a. By pulling</td>
</tr>
<tr>
<td></td>
<td>b. Removing any slack</td>
</tr>
<tr>
<td><strong>METHOD 2 - IN THE OPEN</strong></td>
<td></td>
</tr>
<tr>
<td>1. Form a loop</td>
<td>1a. In your left hand</td>
</tr>
<tr>
<td></td>
<td>b. Working end to the right</td>
</tr>
<tr>
<td></td>
<td>c. Crossing under the standing part</td>
</tr>
<tr>
<td>2. Form a second loop</td>
<td>2a. In your right hand</td>
</tr>
<tr>
<td></td>
<td>b. Working end crossing under the standing part</td>
</tr>
<tr>
<td>3. Slide the right-hand loop</td>
<td>3a. On top of the left-hand loop</td>
</tr>
<tr>
<td>4. Hold the two loops</td>
<td>4a. Together</td>
</tr>
<tr>
<td></td>
<td>b. At the rope forming the clove hitch</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>5. Slide the knot</td>
<td>5a. Over the object</td>
</tr>
<tr>
<td>6. Pull ends</td>
<td>6a. In opposite directions</td>
</tr>
<tr>
<td></td>
<td>b. To tighten</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE A SQUARE KNOT

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A rope and appropriate personal protective equipment

Behavior: The student will tie a square knot

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 5-12 foot length of ½-inch tie rope
- Appropriate personal protective equipment

REFERENCES:
- None

PREPARATION: The square knot is generally used to attach two ropes or web ends. While it is not the best choice for life safety unless it is backed up, it is frequently used when working with webbing.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp line</td>
<td>1a. Both ends</td>
</tr>
<tr>
<td></td>
<td>b. Both hands</td>
</tr>
<tr>
<td>2. Cross ropes</td>
<td>2a. Left over right within 8-12 inches from ends</td>
</tr>
<tr>
<td>3. Turn under</td>
<td>3a. Right end</td>
</tr>
<tr>
<td>4. Cross ropes</td>
<td>4a. Right over left</td>
</tr>
<tr>
<td>5. Turn under</td>
<td>5a. Left end</td>
</tr>
<tr>
<td>6. Pull through</td>
<td>6a. Tightly</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO TIE A BOWLINE

0:15

Level II

1997 NFPA 1001 3-1.1.1

A rope and appropriate personal protective equipment

The student will tie a bowline

Completing all operations within __________ according to the job breakdown

Job breakdown

5-12 foot length of ½-inch tie rope

Appropriate personal protective equipment

Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6


Historically, the bowline has been the most frequently used knot in the fire service because of its two main attributes -- it is slip proof and easy to untie. Many situations during fire department operations call for a loop in the end of a rope, provided by the bowline.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Form an overhand loop</td>
<td>1a. In the standing part</td>
</tr>
<tr>
<td>2. Pass the working end</td>
<td>2a. Upward</td>
</tr>
<tr>
<td></td>
<td>b. Through the loop</td>
</tr>
<tr>
<td>3. Pass the working end</td>
<td>3a. Over the top of the loop</td>
</tr>
<tr>
<td></td>
<td>b. Under the standing part</td>
</tr>
<tr>
<td>4. Bring the working end</td>
<td>4a. Completely around the standing part</td>
</tr>
<tr>
<td></td>
<td>b. Down through the loop</td>
</tr>
<tr>
<td>5. Pull the knot</td>
<td>5a. Snugly into place</td>
</tr>
<tr>
<td></td>
<td>5b. Forming an inside bowline with the working end on the inside of the loop</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE A BECKET BEND

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:
Condition: Two ropes and appropriate personal protective equipment
Behavior: The student will tie a becket bend
Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
• Job breakdown
• Two 5-12 foot lengths of ½-inch tie rope
• Appropriate personal protective equipment

REFERENCES:
• Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6
• Fire Service Rescue, IFSTA, Sixth Edition, Chapter 4

PREPARATION: The becket or sheet bend is used for joining two ropes. It is adaptable to ropes of unequal size, and it is not likely to slip when the ropes are wet.
1. Form a bight
   1a. In one of the ends to be tied (larger diameter)

2. Pass the end of second rope
   2a. Through the bight

3. Bring the loose end
   3a. Around both parts of the bight

4. Tuck this end
   4a. Under its own standing part
       b. And over the bight

5. Pull the knot
   5a. Snug
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE A HALF SHEEPSHANK (TRUCKER'S HITCH)

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A rope and appropriate personal protective equipment

Behavior: The student will tie a half sheepshank

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 5-12 foot length of ½-inch tie rope
- Appropriate personal protective equipment

REFERENCES:
- None

PREPARATION: The half sheepshank's principal use is in conjunction with the tightening of a rope between two objects, such as would be done in roping off an area, or guying a pole or wall. It is commonly known as the trucker's hitch and is effective for securing loads.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Secure rope | 1a. To fixed anchor point  
|  | b. With approved knot  
| 2. Pass rope | 2a. Around second anchor  
|  | b. Taking out slack  
| 3. Grab running end | 3a. With nonworking hand  
|  | b. Maintaining grip  
| 4. Grasp standing part | 4a. With working hand  
|  | b. In position of comfort  
| 5. Cross rope | 5a. Running end over standing part  
| 6. Release running end | 6a. Maintaining cross  
| 7. Form bight | 7a. With standing part  
|  | b. Using hands  
|  | c. Until bight is contained in working hand  
| 8. Grasp standing part | 8a. With nonworking hand  
|  | b. Beyond point of crossover  
| 9. Make half hitch | 9a. Twisting 270° to form  
| 10. Pass bight | 10a. Through half hitch  
|  | b. Until adequate amount of bight is through  
|  | c. 4-6 inches minimum  
|  | d. Regripping bight beyond half hitch  
|  | e. Releasing hitch with nonworking hand  
| 11. Repeat Operations 7-9 | 11a. To form safety  

How To Tie A Half Sheepshank (Trucker’s Hitch)
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Pull running end</td>
<td>12a. Taking out slack between anchors</td>
</tr>
<tr>
<td></td>
<td>b. Releasing bight</td>
</tr>
<tr>
<td></td>
<td>c. Tensioning rope</td>
</tr>
<tr>
<td>13. Grasp all lines</td>
<td>13a. At newly formed bight</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining tension with nonworking hand</td>
</tr>
<tr>
<td></td>
<td>c. Releasing with working hand</td>
</tr>
<tr>
<td>14. Tie off sheepshank</td>
<td>14a. Forming bight</td>
</tr>
<tr>
<td></td>
<td>b. Tying off with two half hitches over all ropes</td>
</tr>
<tr>
<td></td>
<td>c. Until secure against last bight</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE THE FIGURE-EIGHT FAMILY OF KNOTS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A rope and appropriate personal protective equipment

Behavior: The student will tie a figure-eight stopper, figure-eight on a bight, figure-eight follow through, figure-eight bend, and an in-line figure eight

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 5-12 foot length of ½-inch tie rope
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

PREPARATION:

The figure-eight family of knots is very simple to tie. They will not slip or pull from the rope, even when tied incorrectly. They place less stress on the rope since the turns are not as sharp as for other knots. The following are the five common figure eight knots used in the fire service.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIGURE-EIGHT STOPPER</strong></td>
<td>1a. In the working end of the rope</td>
</tr>
<tr>
<td>1. Form a bight</td>
<td>2a. Over the standing part</td>
</tr>
<tr>
<td></td>
<td>b. Forming a loop</td>
</tr>
<tr>
<td></td>
<td>c. Without altering the parallel arrangement of the rope</td>
</tr>
<tr>
<td>2. Pass the bight</td>
<td>3a. Under the standing part</td>
</tr>
<tr>
<td></td>
<td>b. Completely around</td>
</tr>
<tr>
<td>3. Pass the bight</td>
<td>4a. Down through the loop</td>
</tr>
<tr>
<td></td>
<td>b. Forming the figure eight</td>
</tr>
<tr>
<td>4. Pass the bight</td>
<td>5a. Through the knot</td>
</tr>
<tr>
<td></td>
<td>b. To the desired size</td>
</tr>
<tr>
<td>5. Extend the bight</td>
<td>6a. By pulling on the bight and the working end and standing part</td>
</tr>
<tr>
<td></td>
<td>b. At the same time</td>
</tr>
<tr>
<td>6. Dress the knot</td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE-EIGHT ON A BIGHT**

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Form a bight</td>
<td>1a. In the working end of the rope</td>
</tr>
<tr>
<td>2. Pass the bight</td>
<td>2a. Over the standing part</td>
</tr>
<tr>
<td></td>
<td>b. Forming a loop</td>
</tr>
<tr>
<td></td>
<td>c. Without altering the parallel arrangement of the rope</td>
</tr>
<tr>
<td>3. Pass the bight</td>
<td>3a. Under the standing part</td>
</tr>
<tr>
<td></td>
<td>b. Completely around</td>
</tr>
<tr>
<td>4. Pass the bight</td>
<td>4a. Down through the loop</td>
</tr>
<tr>
<td></td>
<td>b. Forming the figure eight</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5. Extend the bight</td>
<td>5a. Through the knot</td>
</tr>
<tr>
<td></td>
<td>b. To the desired size</td>
</tr>
<tr>
<td>6. Dress the knot</td>
<td>6a. By pulling on the bight and the working end and standing part</td>
</tr>
<tr>
<td></td>
<td>b. At the same time</td>
</tr>
<tr>
<td><strong>FIGURE-EIGHT FOLLOW THROUGH</strong></td>
<td></td>
</tr>
<tr>
<td>1. Tie a loose figure-eight stopper knot</td>
<td>1a. Near the working end of the rope</td>
</tr>
<tr>
<td></td>
<td>b. At a point to allow sufficient rope for encircling the object and tying another figure eight</td>
</tr>
<tr>
<td>2. Encircle the object</td>
<td>2a. With the working end of the rope</td>
</tr>
<tr>
<td>3. Feed the working end of the rope</td>
<td>3a. Through the figure eight in reverse</td>
</tr>
<tr>
<td></td>
<td>b. Following the original path</td>
</tr>
<tr>
<td>4. Dress the knot</td>
<td>4a. By pulling on both the working end and standing part</td>
</tr>
<tr>
<td></td>
<td>b. At the same time</td>
</tr>
<tr>
<td><strong>FIGURE-EIGHT BEND</strong></td>
<td></td>
</tr>
<tr>
<td>1. Tie a loose figure-eight stopper knot</td>
<td>1a. In one end of the rope</td>
</tr>
<tr>
<td>2. Feed other end of the rope</td>
<td>2a. Through the figure eight knot in reverse</td>
</tr>
<tr>
<td></td>
<td>b. Following the original path</td>
</tr>
<tr>
<td>3. Dress the knot</td>
<td>3a. By pulling on both the working end and standing part</td>
</tr>
<tr>
<td></td>
<td>b. At the same time</td>
</tr>
</tbody>
</table>
### IN-LINE FIGURE EIGHT

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Form a 12-18-inch underhand loop</td>
<td>1a. At desired knot location</td>
</tr>
<tr>
<td>2. Pass the loop</td>
<td>2a. Over and around the running end</td>
</tr>
<tr>
<td></td>
<td>b. 360°</td>
</tr>
<tr>
<td></td>
<td>c. Forming a new loop</td>
</tr>
<tr>
<td></td>
<td>d. Without releasing the working end or standing part</td>
</tr>
<tr>
<td>3. Pass the loop</td>
<td>3a. Down through the newly formed loop</td>
</tr>
<tr>
<td>4. Dress the knot</td>
<td>4a. By pulling on the bight and running end</td>
</tr>
<tr>
<td></td>
<td>b. At the same time</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO TIE A HANDCUFF KNOT

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-1.1.1

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A rope or webbing and appropriate personal protective equipment
- **Behavior:** The student will tie a handcuff knot
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- 5-12 foot length of ½-inch tie rope or 1-inch webbing
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Fighter Rescue and Survival, Hoff and Kolomay, 1999 Edition

**PREPARATION:**

A useful knot for rescue work is the handcuff knot. It is a quick and easy knot to tie. Once applied and tension is maintained it will not slip off the victim.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp the rope</td>
<td>1a. Running end in each hand</td>
</tr>
<tr>
<td></td>
<td>b. Palms down</td>
</tr>
<tr>
<td></td>
<td>c. Approximately 18 inches apart</td>
</tr>
<tr>
<td>2. Form two overhand loops</td>
<td>2a. Both clockwise</td>
</tr>
<tr>
<td></td>
<td>b. One with each hand</td>
</tr>
<tr>
<td>3. Bring loops</td>
<td>3a. Together</td>
</tr>
<tr>
<td></td>
<td>b. Placing right loop behind left loop</td>
</tr>
<tr>
<td>4. Pull inside ropes</td>
<td>4a. Opposite direction</td>
</tr>
<tr>
<td>5. Regrip loops</td>
<td>5a. Holding side of loops with fingers of opposite hands</td>
</tr>
<tr>
<td>6. Pull loops</td>
<td>6a. To adjust</td>
</tr>
<tr>
<td></td>
<td>b. Making loops large enough to slip over intended object</td>
</tr>
<tr>
<td>7. Place loops</td>
<td>7a. Over object, such as victims arms</td>
</tr>
<tr>
<td></td>
<td>b. Using care not to place directly at a joint</td>
</tr>
<tr>
<td>8. Cinch knot</td>
<td>8a. By pulling on running ends</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining tension on running ends to keep slip knot tight on victim</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE AN OVERHAND BEND (WATER KNOT) WITH WEBBING

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: Webbing and appropriate personal protective equipment

Behavior: The student will tie an overhand bend

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 5 foot length of 1-inch webbing
- Appropriate personal protective equipment

REFERENCES:

- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 4

PREPARATION: Webbing has become very popular and is carried by many fire fighters. It has many uses including use as an emergency harness. It must be kept neat and tightly set.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tie a loose overhand knot</td>
<td>1a. In one end of the webbing</td>
</tr>
<tr>
<td></td>
<td>b. Leaving a 2-inch tail</td>
</tr>
<tr>
<td>Feed other end of the webbing</td>
<td>2a. Through the overhand knot in reverse</td>
</tr>
<tr>
<td></td>
<td>b. Following the original path</td>
</tr>
<tr>
<td></td>
<td>c. Keeping the webbing flat and untwisted in the knot</td>
</tr>
<tr>
<td>Dress the bend</td>
<td>3a. By pulling on both the working end and standing part</td>
</tr>
<tr>
<td></td>
<td>b. At the same time</td>
</tr>
<tr>
<td></td>
<td>c. 2-inch tails minimum</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS WHEN HOISTING OR LOWERING EQUIPMENT

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic safety considerations when hoisting or lowering equipment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Fighter Occupational Safety, IFSTA, First Edition
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: As with all fire department operations, hoisting and lowering equipment requires a conscious effort to avoid accidents and injuries. Even though most safety rules are basically common sense, it is necessary to be constantly aware of the dangers associated with objects being moved overhead. You must know how to avoid situations that could lead to injury while hoisting or lowering equipment.
# I. SAFETY
A. Every student has the responsibility for a positive attitude toward safety

# II. REASONS FOR HOISTING/LOWERING FAILURES
A. Lack of training
B. Lack of practice
C. Worn/defective rope
   1. Due to repeated exposure to weather and abrasions
   2. Inspect prior to use
D. Load limit of rope exceeded
E. Worn or defective hardware
   1. Inspect before and after each use

# III. INJURY PREVENTION
A. Appropriate personal protective equipment
   1. Turnout coat
   2. Helmet
      a) Shield or goggles down
         1) Rope fragments
         2) Debris from equipment or building
3. Gloves
   a) Abrasion protection
   b) Control rope

B. Never stand under suspended equipment

C. Use tag line to prevent/reduce swinging

D. Tag line person must be very alert

E. Protect rope from physical damage
   1. Sharp edges
   2. Walking on
   3. Glass and debris
**SUMMARY:**

The basic reason for safety rules is to protect you, as well as those around you from injury. It is important that you know and understand safety rules for hoisting and lowering equipment.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO TIE-OFF A PICK-HEAD AXE FOR HOISTING

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

Condition: A rope, pick-head axe, and appropriate personal protective equipment

Behavior: The student will secure a rope to a pick-head axe for raising aloft

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Appropriate length of rope
- Pick-head axe
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

PREPARATION: The effective use of ropes, knots, and hitches is one of the foundations of a fire fighter's work. It is critical that you comprehend and perform all rope work automatically and with precision. During this session, you will be taught how to correctly secure a pick-head axe with a rope for hoisting.
**METHOD 1**

1. Tie a clove hitch
   - 2a. Down the axe handle
   - b. To the axe head
2. Slide the clove hitch
   - a. Down the axe handle
   - b. To the axe head
3. Loop the working end
   - 3a. Around the axe head
   - b. And back up the handle
4. Tie half hitch
   - 4a. On the handle
   - b. A few inches above the clove hitch

**METHOD 2**

1. Tie figure-eight on a bight
   - 1a. 4-6 inch loop
2. Attach rope
   - 2a. To axe
   - b. Looping over axe handle
   - c. Running end around axe head and back up handle
3. Tie half hitch
   - 3a. On butt end of axe handle
   - b. 6-8 inches below end
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE-OFF A PIKE POLE FOR HOISTING

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

Condition: A rope, pike pole, and appropriate personal protective equipment

Behavior: The student will tie-off a pike pole for hoisting

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Appropriate length of rope
- Pike pole
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

PREPARATION: The effective use of ropes, knots, and hitches is one of the basic foundations of a fire fighter's work. It is absolutely critical that you comprehend and perform all rope work automatically and with precision. You will need to know how to correctly hoist a pike pole, using a rope.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position pike pole</td>
<td>1a. Flat on ground</td>
</tr>
<tr>
<td></td>
<td>b. Tool head toward building</td>
</tr>
<tr>
<td>2. Secure rope</td>
<td>2a. To pike pole</td>
</tr>
<tr>
<td></td>
<td>b. Clove hitch &quot;up&quot;</td>
</tr>
<tr>
<td></td>
<td>c. 8-10 inches from handle end</td>
</tr>
<tr>
<td>3. Tie a half hitch</td>
<td>3a. Running end of rope</td>
</tr>
<tr>
<td></td>
<td>b. To handle</td>
</tr>
<tr>
<td></td>
<td>c. 12 inches from tool head</td>
</tr>
<tr>
<td>NOTE: More half hitches may be needed depending on length of pike pole.</td>
<td></td>
</tr>
<tr>
<td>4. Give command</td>
<td>4a. &quot;RAISE!&quot;</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE-OFF A ROOF LADDER FOR HOISTING

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

Condition: A rope, roof ladder, and appropriate personal protective equipment

Behavior: The student will tie-off a roof ladder for hoisting

Standard: Completing all operations within ________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Appropriate length of rope
- Roof ladder
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 5

PREPARATION: The effective use of ropes, knots, and hitches is one of the basic foundations of a fire fighter's work. It is absolutely critical that you comprehend and perform all rope work automatically and with precision. You will need to know how to correctly secure a roof ladder with a rope for hoisting.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place ladder</td>
<td>1a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Tip toward building</td>
</tr>
<tr>
<td>Tie a bowline knot or figure-eight on a bight</td>
<td>2a. Forming a large loop</td>
</tr>
<tr>
<td></td>
<td>b. 4-foot diameter minimum</td>
</tr>
<tr>
<td>Place loop</td>
<td>3a. Underneath ladder</td>
</tr>
<tr>
<td></td>
<td>b. Stopping ⅓ length down ladder</td>
</tr>
<tr>
<td>Bring loop</td>
<td>4a. Through rungs</td>
</tr>
<tr>
<td></td>
<td>b. Three rungs from tip</td>
</tr>
<tr>
<td>Pull loop and knot</td>
<td>5a. To tip of ladder</td>
</tr>
<tr>
<td>Place loop</td>
<td>6a. Over beam ends</td>
</tr>
<tr>
<td>Complete the tie</td>
<td>7a. By pulling on running end</td>
</tr>
<tr>
<td>Give command</td>
<td>8a. &quot;RAISE!&quot;</td>
</tr>
</tbody>
</table>

**NOTE:** Some applications or departments require a tag line.
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE-OFF A DRY HOSELINE FOR HOISTING

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.2

BEHAVIORAL OBJECTIVE:

Condition: A rope, hoseline, and appropriate personal protective equipment

Behavior: The student will tie-off a dry hoseline for hoisting

Standard: Completing all operations within ___________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50 foot length
- 50 foot length of 2½" hoseline with nozzle attached
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

PREPARATION:

The effective use of ropes, knots, and hitches is one of the basic foundations of a fire fighter's work. It is absolutely critical that you comprehend and perform all rope work automatically and with precision. You must know how to correctly secure a rope to a hoseline for hoisting. You should quickly realize that the same process applies to an uncharged hoseline without a nozzle.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prepare hoseline</td>
<td>1a. Dry, no water in it</td>
</tr>
<tr>
<td></td>
<td>b. Laid straight</td>
</tr>
<tr>
<td></td>
<td>c. Nozzle in off position</td>
</tr>
<tr>
<td>2. Fold hoseline and nozzle</td>
<td>2a. Over 3 feet of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. With end back against hoseline</td>
</tr>
<tr>
<td></td>
<td>c. Ball of nozzle against hoseline</td>
</tr>
<tr>
<td>3. Secure rope</td>
<td>3a. Around hoseline</td>
</tr>
<tr>
<td></td>
<td>b. With clove hitch</td>
</tr>
<tr>
<td></td>
<td>c. At tip of nozzle</td>
</tr>
<tr>
<td></td>
<td>d. Tightly</td>
</tr>
<tr>
<td>4. Secure rope</td>
<td>4a. Above clove hitch</td>
</tr>
<tr>
<td></td>
<td>b. With half hitch</td>
</tr>
<tr>
<td></td>
<td>c. Over hoseline</td>
</tr>
<tr>
<td></td>
<td>d. 6-12 inches from fold</td>
</tr>
<tr>
<td>5. Give command</td>
<td>5a. &quot;RAISE!&quot;</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO TIE-OFF A CHARGED HOSELINE FOR HOISTING

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-1.1.2

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A hoseline with nozzle attached, rope, a means for charging the hoseline with water, and appropriate personal protective equipment

- **Behavior:** The student will tie-off a charged hoseline for hoisting

- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- 50 feet of 1½” or 1⅜” hoseline with nozzle attached
- 50 foot length of utility rope
- A means for charging the hoseline with water
- Appropriate personal protective equipment

**REFERENCES:**

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

**PREPARATION:**

The effective use of ropes, knots, and hitches is one of the basic foundations of a fire fighter's work. It is absolutely critical that you comprehend and perform all rope work automatically and with precision. You must know how to correctly secure a charged hoseline, with attached nozzle, with a rope and prepare it to be raised or lowered.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prepare rope</td>
<td>1a. Along side hoseline</td>
</tr>
<tr>
<td>2. Secure rope</td>
<td>2a. To hoseline</td>
</tr>
<tr>
<td></td>
<td>b. With clove hitch</td>
</tr>
<tr>
<td></td>
<td>c. Around hoseline 1-3 feet from nozzle</td>
</tr>
<tr>
<td>3. Secure nozzle bale</td>
<td>3a. Bight through bale</td>
</tr>
<tr>
<td></td>
<td>b. From coupling side</td>
</tr>
<tr>
<td>4. Secure nozzle tip</td>
<td>4a. Flipping bight over</td>
</tr>
<tr>
<td></td>
<td>b. Placing over tip</td>
</tr>
<tr>
<td>5. Give command</td>
<td>5a. &quot;RAISE!&quot;</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
METHODS OF STORING ROPE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the basic requirements for proper storage of rope by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6 or Firefighter's Handbook, Delmar, 2000 Edition, Chapter 15

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Rope
- Rope bag

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: The effective use of ropes, knots, and hitches is one of the foundations of a fire fighter's work. It is critical that you comprehend and perform all rope work automatically and with precision. The proper storage of ropes will allow them to have a long and safe service life. In addition, properly stored ropes ensure ease of deployment for the next incident.
I. STORING ROPE

A. Climate conditions
   1. Cool temperature best
   2. Good circulation of air
   3. Direct sunlight causes the rope to deteriorate

B. Environmental conditions
   1. Do not store near petroleum products or batteries
   2. Should not contact metal (rust)
   3. Should be completely dry before storing
   4. Should be clean

C. Coiled rope storage
   1. Advantages
      a) Compact bundle
      b) Free from kinks and tangles
   2. Disadvantages
      a) Numerous bends
      b) Lacks air circulation

D. Bagged rope storage
   1. Preferred by the fire service
2. Advantages
   a) Feeds out in orderly manner
   b) Compact bundle
   c) Easier to load
   d) Fair air circulation

3. Disadvantages.
   a) Difficult to inspect for damage
   b) Improper loading may cause kinks
**SUMMARY:**

With life safety often depending on the integrity of your ropes, you should be thoroughly familiar with the storage requirements.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: HOW TO MAKE A BARREL COIL

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-1.1.1

BEHAVIORAL OBJECTIVE:

Condition: A rope, rope coiler or ladder, and appropriate personal protective equipment

Behavior: The student will make a barrel coil

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 125 foot length of rope
- Rope coiler or ladder
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

PREPARATION: Ropes must be stored properly to assure it does not deteriorate. It is also essential that the method of storing allow easy deployment without tangling of the rope. You must know how to correctly make a barrel coil.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place coiler or ladder in position</td>
<td>1a. Securely</td>
</tr>
<tr>
<td>2. Hold rope</td>
<td>2a. Working end</td>
</tr>
<tr>
<td></td>
<td>b. 9-10 feet from end</td>
</tr>
<tr>
<td>3. Start wraps</td>
<td>3a. With either post or beam</td>
</tr>
<tr>
<td></td>
<td>b. Horizontal and parallel</td>
</tr>
<tr>
<td></td>
<td>c. 6-7 wraps</td>
</tr>
<tr>
<td></td>
<td>d. Depending on length of rope, may be more or less</td>
</tr>
<tr>
<td>4. Start second layer</td>
<td>4a. Same post as first layer</td>
</tr>
<tr>
<td></td>
<td>b. On top of first layer</td>
</tr>
<tr>
<td></td>
<td>c. One less than first layer</td>
</tr>
<tr>
<td>5. Start coil</td>
<td>5a. With eye splice end</td>
</tr>
<tr>
<td></td>
<td>b. With same end as wraps</td>
</tr>
<tr>
<td></td>
<td>c. 4-6 inches from post</td>
</tr>
<tr>
<td>6. Lock first coil</td>
<td>6a. With second coil</td>
</tr>
<tr>
<td>7. Stop coils</td>
<td>7a. Using all rope</td>
</tr>
<tr>
<td></td>
<td>b. 4-6 inches from post</td>
</tr>
<tr>
<td></td>
<td>c. Opposite end from starting</td>
</tr>
<tr>
<td>8. Place eye splice</td>
<td>8a. Over post</td>
</tr>
<tr>
<td></td>
<td>b. Opposite end from starting</td>
</tr>
</tbody>
</table>

**NOTE:** Rope may be removed or left in place on the coiler for the rest of the tie.

9. Make bight                     | 9a. Standing part                                    |
10. Pass bight                    | 10a. Up center of wraps, starting end                |
11. Leave working end             | 11a. About 3 feet out                                |
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Pass bight</td>
<td>12a. Down center of wraps opposite end</td>
</tr>
<tr>
<td></td>
<td>b. Through about 6 inches</td>
</tr>
<tr>
<td></td>
<td>c. Double rope makes carrying straps</td>
</tr>
<tr>
<td>13. Tie off</td>
<td>13a. Bight end and bitter end</td>
</tr>
<tr>
<td></td>
<td>b. Becket bend</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO LOAD A DROP BAG

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-1.1.1

**BEHAVIORAL OBJECTIVE:**

*Condition:* A drop bag, rope, and appropriate personal protective equipment

*Behavior:* The student will load a drop bag

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Drop bag
- Appropriate length of rope
- Appropriate personal protective equipment

**REFERENCES:**

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 6

**PREPARATION:** Rope must be stored properly to assure it does not deteriorate. It is also essential that the method of storing allow for deployment. The drop bag is one of the better ways of storing rope to meet both requirements. You need to know the correct way for loading a drop bag.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position rope</td>
<td>1a. Next to bag</td>
</tr>
<tr>
<td></td>
<td>b. Neatly</td>
</tr>
<tr>
<td></td>
<td>c. Free of dirt and grime</td>
</tr>
<tr>
<td></td>
<td>d. No knots or kinks</td>
</tr>
<tr>
<td>2. Hold bag</td>
<td>2a. With open end up</td>
</tr>
<tr>
<td>3. Open bag</td>
<td>3a. Releasing drawstring</td>
</tr>
<tr>
<td>4. Inspect rope</td>
<td>4a. For damage</td>
</tr>
<tr>
<td></td>
<td>b. Abrasion/wear</td>
</tr>
<tr>
<td></td>
<td>c. Cuts</td>
</tr>
<tr>
<td></td>
<td>d. Foreign materials</td>
</tr>
<tr>
<td></td>
<td>e. Lumps/deformities</td>
</tr>
<tr>
<td>5. Stuff rope</td>
<td>5a. Newest end of rope in last</td>
</tr>
<tr>
<td></td>
<td>b. Eye splice in last (if applicable)</td>
</tr>
<tr>
<td></td>
<td>c. Loosely</td>
</tr>
<tr>
<td></td>
<td>d. With no sharp kinks or binds</td>
</tr>
<tr>
<td>6. Close bag</td>
<td>6a. Closing device (drawstring)</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE HOSE AND COUPLINGS

TIME FRAME: 1:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.6(a), 3-3.7(a), 3-3.9(a), and 3-3.10(a)

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire hose and couplings by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 and Hose Practices, IFSTA, Seventh Edition, Chapter 1

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Section of woven-jacket, lined hose
- Section of woven-jacket, unlined hose
- Section of nitrile rubber-covered hose
- Section of braided (booster) hose
- Section of wrapped, hard-suction hose

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION: Fire hose is the most used item in the fire service. Because it is used for a number of functions during fire fighting operations, there are many different types of fire hose. It is manufactured in different lengths and sizes; it is made of natural or synthetic materials, lined or unlined, and has different types and sizes of couplings. Fire fighters must clearly comprehend the methods of hose construction, the types of hose, and the respective uses for each type, as well
as the limitations of each type of hose. Every member of a fire suppression team has a part in repair and maintenance of equipment, including an understanding of hose coupling parts and components. With this knowledge, every fire fighter can become an active and reliable team member who can hold up his or her end of the duties that must be accomplished.
## I. BASIC INFORMATION

### A. Fire hose defined

1. Flexible tube used by fire fighters to carry water from the source of supply to a point where it is discharged
2. Should only be used for fire fighting

### B. Characteristics

1. Flexible
   a) For loading into hose compartment
   b) To maneuver during interior and exterior fire attack
2. Watertight
   a) To withstand high pressure
3. Smooth inner lining
   a) To transport water with a minimum loss in pressure
4. Durable covering
   a) To withstand damage from fireground operations

### C. Function

1. Attack line
2. Supply (relay) line
3. Intake line
4. Extinguisher
### Characteristics and Functions of Fire Hose and Couplings

#### II. CONSTRUCTION

<table>
<thead>
<tr>
<th>A. Hose classification factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Material from which it is constructed</td>
</tr>
<tr>
<td>2. Size</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Outer jacket materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cotton</td>
</tr>
<tr>
<td>2. Nylon</td>
</tr>
<tr>
<td>3. Rayon</td>
</tr>
<tr>
<td>4. Rubber blends</td>
</tr>
<tr>
<td>a) Nitrile rubber</td>
</tr>
<tr>
<td>5. Polyester fibers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Each size designed for a specific purpose</td>
</tr>
<tr>
<td>2. Dimensions</td>
</tr>
<tr>
<td>a) Inside diameter of the hose</td>
</tr>
<tr>
<td>b) Length of hose</td>
</tr>
<tr>
<td>1) Commonly cut and coupled into lengths of 50 or 100 feet</td>
</tr>
<tr>
<td>2) Conveniences of handling and replacement</td>
</tr>
</tbody>
</table>

What are the two factors for classifying fire hose by construction?

What materials are commonly used in the construction of the outer jacket?

Why is fire hose commonly cut in these lengths?
### III. ATTACK LINE

**A. Defined as any hose line used to directly control and extinguish fire**

**B. Typical sizes for attack handlines**
1. ¾”-2½” fire hose
2. Some agencies may use 3” hose line for attack handlines

**C. Types of attack lines**
1. Fire department hoses
   - Heavy duty, lined hose
2. Wildland hose
3. Standpipe hose
4. Noncollapsible rubber hose

**NOTE:** List student responses on board or easel pad. Subcategorize responses into: (1) Fire Department Hose, (2) Wildland Hose, (3) Standpipe Hose, and (4) Noncollapsible Rubber Hose.

**WARNING:**
- What are some common applications for attack lines?
- What is range of fire hose sizes used for attack handlines?
- What is meant by the term “attack line?”
- What is the term most commonly used to identify these lengths of hose?
- Other lengths of hose may be obtained. Couple sections together to produce a continuous hose line.
**b) Variety of sizes**

1) Diameters of 1½", 1¾", 2", and 2½" are common
2) 3" used by some agencies

**c) Construction**

1) Usually double-jacketed and lined for maximum durability
2) Newer inner liners made from thermoplastic instead of rubber
3) Woven fabric-jacket
   - May be single or multiple-jacketed
4) Rubber-covered
   - Jacket and lined
   - Rubber and fabric bonded into a single inseparable unit

---

2. **Wildland hose**

a) **Characteristics**

1) Used to suppress wildland and vegetation fires

---

- What are some common sizes of fire department hose used for attack?

- Are fire department hoses usually single- or double-jacketed, and why?

- What is wildland hose used for?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>

2) Differs from fire department hose
   - Size
   - Weight
   - Optional rubber lining

b) Variety of sizes
   1) 1"-1½" diameters common

c) Construction
   1) Single-jacket, small diameter hose
   2) May be lined or unlined
   3) Lightweight

d) Need for wildland hose
   1) Carried long distances over uneven terrain, often uphill
   2) Can be used in a way that conserves water
   3) Can be backpacked or air-dropped to a remote scene
   4) Used with portable pump that drafts water from an open water source

How does it differ from fire department hose?

What are some common sizes of wildland hose?

What logistical advantages will wildland hose provide over fire department hose?
### 3. Standpipe hose

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Used primarily by building occupants to mount a quick attack</td>
<td>Who is the intended user of standpipe hose?</td>
</tr>
<tr>
<td>1) For use on incipient/ignition stage fires</td>
<td>What stage of fire development is standpipe hose intended for when used by building occupants?</td>
</tr>
<tr>
<td>b) May also be used by private fire brigades that lack fire apparatus and a standard fire hose complement</td>
<td></td>
</tr>
<tr>
<td>c) Characteristics</td>
<td></td>
</tr>
<tr>
<td>1) Usually preconnected to a water source</td>
<td>What are two ways that standpipe hose may be stored?</td>
</tr>
<tr>
<td>• Smaller diameter domestic standpipe</td>
<td></td>
</tr>
<tr>
<td>• Yard hydrant</td>
<td></td>
</tr>
<tr>
<td>2) Complete with a nozzle and stored</td>
<td></td>
</tr>
<tr>
<td>• Suspended, accordion-like, from a rack within a cabinet</td>
<td></td>
</tr>
<tr>
<td>• On a reel</td>
<td></td>
</tr>
<tr>
<td>d) Size</td>
<td></td>
</tr>
<tr>
<td>1) 1½&quot; most common size</td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics And Functions Of Fire Hose And Couplings

#### Construction
- **1) Single-jacket**
- **2) Unlined, but may be lined**

**f) Disadvantages**
- **1) Unreliable with age, particularly with unlined type**
- **2) Ruptures typically occur at the folds**
- **3) Not designed to withstand higher pressures typically supplied by fire department pumping apparatus**

Because of the unreliability of standpipe hose, what should fire fighters use?

**g) Fire fighters only use fire department hose on standpipe systems**

#### Noncollapsible rubber hose

**a) Also known as booster hose or hard line**

**b) Usually carried on a reel**

**c) Purpose**
- **1) Extinguish relatively small fires**
- **2) Overhaul work**

What are the more common names for this type of hose?

What fireground applications are "booster" lines intended for?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>d) Size</td>
<td></td>
</tr>
<tr>
<td>1) ¾&quot; and 1&quot;</td>
<td></td>
</tr>
<tr>
<td>2) Usually carried on reels</td>
<td>How does the diameter affect the pressure needed for maximum water flow?</td>
</tr>
<tr>
<td>3) Higher pressure needed to overcome friction loss for maximum water flow</td>
<td></td>
</tr>
<tr>
<td>e) Construction</td>
<td></td>
</tr>
<tr>
<td>1) Rubber-covered, made of several layers of braided, rubberized material</td>
<td></td>
</tr>
</tbody>
</table>

IV. SUPPLY (RELAY) LINE

A. Move large volumes of water at low pressure

B. Two groups
   1. Medium diameter hose (MDH)
   2. Large diameter hose (LDH)

C. MDH
   1. Attack line used for supply

   2. Best for relatively short distances and operations that do not routinely require large water volume

   In what type of supply situations will MDH provide satisfactory service?
What is the problem with using attack lines for long-distance water supply?

If MDH must be used for large volumes of water, how can this be achieved?

What size hoseline would fall into this category?

What are the advantages gained by using LDH for supply operations?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Pressure loss caused by water friction on inner lining of hose seriously depletes water flow in long-distance supply</td>
<td></td>
</tr>
<tr>
<td>3. For large volumes</td>
<td></td>
</tr>
<tr>
<td>a) Several parallel lines must be laid, or</td>
<td></td>
</tr>
<tr>
<td>b) Pumpers must be placed at intervals along the hose lay to boost the pressure</td>
<td></td>
</tr>
<tr>
<td>4. Size</td>
<td></td>
</tr>
<tr>
<td>a) 2½&quot;-3&quot; diameter</td>
<td></td>
</tr>
<tr>
<td>D. LDH</td>
<td></td>
</tr>
<tr>
<td>1. Developed to overcome the pressure loss problems of MDH</td>
<td></td>
</tr>
<tr>
<td>2. Size</td>
<td></td>
</tr>
<tr>
<td>a) 3½&quot;, 4&quot;, 4½&quot;, 5&quot;, and 6&quot; sizes available</td>
<td></td>
</tr>
<tr>
<td>3. Construction</td>
<td></td>
</tr>
<tr>
<td>a) May be woven-jacket or rubber-covered</td>
<td></td>
</tr>
<tr>
<td>4. Advantages</td>
<td></td>
</tr>
<tr>
<td>a) Flows large quantities of water without need for parallel supply lines</td>
<td></td>
</tr>
</tbody>
</table>
### Fire Hose and Couplings

<table>
<thead>
<tr>
<th><strong>PRESENTATION</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>b)</strong> Moves large volumes of water quickly with a minimum number of pumpers and personnel</td>
<td>How is pressure loss affected when LDH is used to move smaller volumes of water?</td>
</tr>
<tr>
<td><strong>c) Virtually no loss of pressure with low volume flows</strong></td>
<td>If a pumper used one of the larger sizes of LDH in a hose lay from the hydrant to the fire scene, how would this benefit the fireground operation?</td>
</tr>
<tr>
<td><strong>d) Often eliminates the need for a second pumper at the hydrant to boost the pressure to the first pumper</strong></td>
<td>Once charged, what problem may LDH present if there is a need to move the hose?</td>
</tr>
</tbody>
</table>

#### 5. Disadvantages

<table>
<thead>
<tr>
<th><strong>PRESENTATION</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Heavy and not easy to move once charged</strong></td>
<td>What limitation does nitrile rubber LDH present when used on the discharge side of the pump?</td>
</tr>
<tr>
<td><strong>b) Nitrile rubber LDH may not handle the higher pressures that woven-jacket hoses can</strong></td>
<td></td>
</tr>
</tbody>
</table>
c) Must pre-incident plan the hose lay so as not to block major response routes by other units

6. Crossing nitrile rubber LDH
   a) NEVER cross LDH when dry or damage will occur at edges
   b) Most desirable method is to use hose bridges/ramps
   c) If no hose bridges/ramps available, cross when charged at an angle, one wheel at a time, slowly
   d) Do NOT attempt to cross charged LDH perpendicular or hose will roll in front of tires
   e) Do NOT cross hose at the couplings, or coupling could get stuck in dual rear tires
   f) Vehicles that do NOT have higher ground clearance must NOT cross LDH without a hose bridge/ramp, or the underside of the vehicle will damage the hose

V. INTAKE HOSE
   A. Used to connect a fire department pumper or a portable pump to a nearby water source
### Characteristics And Functions Of Fire Hose And Couplings

#### B. Two groups within this category

1. Soft sleeve hose (soft suction)
2. Hard suction hose (hard sleeve)

#### C. Soft sleeve

1. Used to transfer water from a pressurized water source, such as a fire hydrant, to the pump intake
2. Construction
   - a) Multiple-jacket and lined
   - b) Rubber covered
3. Sizes
   - a) Range from 2½"-6"

#### D. Hard suction

1. Used primarily to draft water from an open source
2. Also used to siphon water from one portable tank to another
   - a) Usually in connection with a tanker shuttle operation
3. Constructed of a rubberized, reinforced material
   - a) Noncollapsible
   - b) To withstand the partial vacuum conditions created when drafting
4. Sizes
   a) Range from 2½"-6"

VI. FIRE EXTINGUISHER HOSE
   A. Used on large extinguisher units that may be stationary, wheeled, or vehicle mounted
   B. May be coiled or on reels
   C. Transports liquid, gaseous, or powder extinguishing agents from the extinguisher container to the nozzle
   D. Two groups of extinguisher hose
      1. Conventional
         a) Used with extinguishers that discharge at pressures no greater than 400 psi
      2. High-pressure
         a) Withstands pressures of up to 1250 psi

3. Constructed similar to noncollapsible rubber/booster hose

Both the conventional and high-pressure extinguisher hoses are made in essentially the same way as what other hose?

VII. CLASSIFICATION OF FIRE HOSE
   A. Four basic classifications
      1. Woven jacket
      2. Rubber-covered
      3. Braided

What are the four basic classifications of fire hose?
4. Wrapped

**NOTE:** Display two woven jacket hose sections: one lined and one unlined.

---

**B. Woven jacket**

1. Uses
   - a) Attack
   - b) Medium and large diameter hose relay and supply
   - c) Soft sleeve

2. General types
   - a) Two types
     - 1) Unlined
     - 2) Lined
   - b) Unlined hose
     - 1) No inner tube or liner

- Standpipe hose
  - 2) Closely woven linen jacket serves same function as rubber tube in lined hose
  - 3) Seepage occurs when first charged until fabric becomes saturated and swells

---

**APPLICATION**

- What are some common uses of woven jacket hose?
- What are the two general types of woven jacket fire hose?
- What type of attack hose is typically unlined?
### Advantages of Unlined Hose

4) **Advantages**
- Lightweight
- Compactness

### Disadvantages of Unlined Hose

5) **Disadvantages**
- More vulnerable to abrasion damage
- Higher friction loss compared to lined hose
- Must be dried after use, if cotton jacketed
- More difficult to clean

### Lined Hose

- **c) Lined hose**
  1) More widely used

- **1) More widely used**
  - Fire department hose
  - Wildland hose

- **2) Consists of one or more woven-fabric seamless jackets**

- **3) Smooth-walled rubber tube inserted and vulcanized into jacket(s)**
  - Makes the hose leak-proof

### Questions

- What are the advantages of unlined hose?

- What are the disadvantages?

- What category of attack hose is normally lined?

- How does the smooth-walled rubber tube contribute to the efficiency of water flow through the hose?
### Presentations Application

<table>
<thead>
<tr>
<th><strong>PRESENTATION</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduces friction that occurs when water moves through hose at high velocity</td>
<td>How does the lined fire hose compare to the unlined fire hose with respect to internal pressure and abrasion resistance?</td>
</tr>
</tbody>
</table>

4) Advantages

- Withstands higher internal pressures than unlined hose
- Greater abrasion resistance
- High burn resistance
- Resistance to cuts

What are the disadvantages of the woven jacket lined hose?

5) Disadvantages

- Must be dried after use if cotton jacketed
- More difficult to clean

**NOTE:** Display a section of rubber-covered, nitrile hose.

C. Rubber-covered

1. Uses
   a) Attack
   b) Medium and large diameter hose relay and supply
   c) Soft sleeve

What are some common uses of rubber-covered hose?
### 2. Construction methods

<table>
<thead>
<tr>
<th></th>
<th>EXTRUSION PROCESS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Permeating and coating a circular woven fabric tube with nitrile rubber, inside and out</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Three-ply vulcanized process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1) Nitrile rubber vulcanized to interior surface of woven polyester tube</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) Outside coated with layer of protective rubber</td>
<td></td>
</tr>
</tbody>
</table>

### 3. Advantages

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Lightweight</td>
</tr>
<tr>
<td>b)</td>
<td>Durable</td>
</tr>
<tr>
<td>c)</td>
<td>Resists deterioration when wet (mildew)</td>
</tr>
<tr>
<td>d)</td>
<td>May be reloaded in fire apparatus without drying</td>
</tr>
<tr>
<td>e)</td>
<td>Resists deterioration when in contact with chemicals</td>
</tr>
<tr>
<td>f)</td>
<td>Does not kink as readily</td>
</tr>
<tr>
<td>g)</td>
<td>Won't rip or tear when punctured</td>
</tr>
</tbody>
</table>

### 4. Disadvantage

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Greater friction when advancing across ground or around covers</td>
</tr>
<tr>
<td>b)</td>
<td>Less heat resistant compared to woven-jacket</td>
</tr>
</tbody>
</table>

**NOTE:** Display a section of braided hose.

What are the disadvantages of rubber-covered hose?
### Characteristics And Functions Of Fire Hose And Couplings

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Braided</td>
<td></td>
</tr>
<tr>
<td>1. Use</td>
<td></td>
</tr>
<tr>
<td>a) Booster reel hoselines</td>
<td></td>
</tr>
<tr>
<td>b) Portable fire extinguisher hose</td>
<td></td>
</tr>
<tr>
<td>2. Construction</td>
<td></td>
</tr>
<tr>
<td>a) Rubber liner covered with several alternating layers of braided yarn and rubber, then vulcanized</td>
<td></td>
</tr>
<tr>
<td>b) Also called reinforced, rubber-covered, or rubber-lined hose</td>
<td></td>
</tr>
<tr>
<td>3. Advantages</td>
<td></td>
</tr>
<tr>
<td>a) Rigid, noncollapsible</td>
<td></td>
</tr>
<tr>
<td>b) Able to withstand high internal pressure</td>
<td></td>
</tr>
<tr>
<td>c) Usually found on a reel for easy deployment</td>
<td></td>
</tr>
<tr>
<td>d) Maintains an open water way when coiled or rolled on a reel</td>
<td></td>
</tr>
<tr>
<td>e) Resists abrasion</td>
<td></td>
</tr>
<tr>
<td>f) Resists deterioration from chemical contact</td>
<td></td>
</tr>
<tr>
<td>g) Easy to clean and put back in service</td>
<td></td>
</tr>
<tr>
<td>h) Strong and durable</td>
<td></td>
</tr>
<tr>
<td>i) Moisture cannot enter jacket, so no drying is required</td>
<td></td>
</tr>
<tr>
<td>4. Disadvantages</td>
<td></td>
</tr>
<tr>
<td>a) Requires high internal pressure to achieve maximum water flow</td>
<td></td>
</tr>
<tr>
<td>b) Smaller diameter limits flow to a range of 10-30 gpm</td>
<td></td>
</tr>
<tr>
<td>c) Heavier hose to maneuver and drag</td>
<td></td>
</tr>
</tbody>
</table>

What are the advantages?
### Characteristics And Functions Of Fire Hose And Couplings

**NOTE:** Display a section of wrapped hose.

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Wrapped</td>
<td></td>
</tr>
<tr>
<td>1. Hard suction hose</td>
<td>What type of hose is wrapped?</td>
</tr>
<tr>
<td>a) Also known as intake hose</td>
<td></td>
</tr>
<tr>
<td>b) Use</td>
<td>If hard suction hose is used to supply water from a hydrant to the pump intake, what factor is most critical?</td>
</tr>
<tr>
<td>1) Drafting water from a static source</td>
<td></td>
</tr>
<tr>
<td>2) Distance from hydrant to the pump intake connection is most critical</td>
<td></td>
</tr>
<tr>
<td>• Usually only 20 feet of hard suction carried on pumping apparatus</td>
<td></td>
</tr>
<tr>
<td>2. Construction</td>
<td>What prevents the hose from collapsing during drafting operations?</td>
</tr>
<tr>
<td>a) Extruded rubber tube wrapped with several layers of fabric</td>
<td></td>
</tr>
<tr>
<td>1) Rubber compound applied between layers</td>
<td></td>
</tr>
<tr>
<td>2) Heavy gauge galvanized or copper wire coiled around the hose between layers</td>
<td></td>
</tr>
</tbody>
</table>
b) Newer construction method
   1) Corrugated design

How does the fabric wrapped and corrugated designs compare?

3. Fabric-wrapped versus corrugated design
   a) Fabric wrapping
      1) Adds strength to hose
      2) Heavier hose
         • Requires two to three persons to couple and position for drafting
      3) Slightly flexible
   b) Corrugated design
      1) More flexible
      2) Considerably lighter

VIII. INTRODUCTION TO COUPLINGS
   A. Since the earliest use of leather and canvas hose, a means of coupling it together has been necessary
   B. Many improvements have been made over the years
      1. First made of metal
      2. Now manufactured from brass, aluminum, or an alloy called pyrolite which is lighter and stronger than brass

IX. COMPONENTS
   A. Three-piece coupling
      1. Male threaded shank
      2. Female threaded swivel
      3. Nonthreaded shank
         a) Female swivel attaches to
b) Usually does not have any lugs

B. Five-piece reducing coupling
   1. Male threaded shank
   2. Reducer
   3. Female threaded swivel
   4. Reducer
   5. Male threaded shank
      a) Fits into reducer

C. Other types of couplings
   1. Snap
   2. Quarter turn
   3. Storz

What are some other types of couplings?

What are the methods of forming materials into couplings?

X. COUPLING CONSTRUCTION

A. Methods
   1. Cast
      a) Weakest
      b) Least resistance to internal and external forces
   2. Extended
      a) Somewhat stronger than cast
      b) Resistant to external forces
      c) Smoother surfaces and lock swivel protection
   3. Drop forged
      a) More desirable
### Characteristics And Functions Of Fire Hose And Couplings

#### II. Materials

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Strong</td>
<td></td>
</tr>
<tr>
<td>c) Resistant to damage</td>
<td></td>
</tr>
<tr>
<td>d) Embossed ridge on swivel shank</td>
<td></td>
</tr>
<tr>
<td>1) Swivel protection</td>
<td></td>
</tr>
<tr>
<td>What are the materials are generally used?</td>
<td></td>
</tr>
</tbody>
</table>

#### B. Materials

1. Brass
   a) Doesn't lend self to recoupling because of permanent expansion
   b) Drop forged does not expand as readily

2. Aluminum alloy
   a) Considerable merit with hard coating
   b) About half the weight of brass
   c) Can be reused without excessive stretching
   d) Do not intermix brass and aluminum
      1) Electrolysis

#### What are the different types of lugs?

### XI. COUPLING LUGS

#### A. Types

1. Rocker lug
2. Recessed lug
3. Pin lug
4. Extended lug
5. Storz quick connect

#### B. Rocker lug coupling

1. Rounded ears to provide a good gripping surface
## Characteristics And Functions Of Fire Hose And Couplings

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Designed to slide over obstructions when the hose is moved</td>
<td></td>
</tr>
<tr>
<td>3. Come in either 2 or 3 lug design</td>
<td></td>
</tr>
<tr>
<td><strong>C. Recessed lug coupling</strong></td>
<td></td>
</tr>
<tr>
<td>1. Holes drilled into sides of coupling</td>
<td></td>
</tr>
<tr>
<td>2. Requires special wrench</td>
<td></td>
</tr>
<tr>
<td>3. Holes tend to plug with mud</td>
<td></td>
</tr>
<tr>
<td>4. Smooth surface when advancing hose linr</td>
<td></td>
</tr>
<tr>
<td><strong>D. Pin lug coupling</strong></td>
<td></td>
</tr>
<tr>
<td>1. Tends to get caught on objects as it is pulled past</td>
<td></td>
</tr>
<tr>
<td>2. Round pin sticks out from coupling in two to three places</td>
<td></td>
</tr>
<tr>
<td>3. Used on noncollapsible hose (hard suction)</td>
<td></td>
</tr>
<tr>
<td>4. Requires a special wrench</td>
<td></td>
</tr>
<tr>
<td>a) Common spanner may work</td>
<td></td>
</tr>
<tr>
<td><strong>E. Extended lug</strong></td>
<td></td>
</tr>
<tr>
<td>1. Has large ears that extend out from the coupling</td>
<td></td>
</tr>
<tr>
<td>2. May be easily tightened or loosened by grasping large lugs</td>
<td></td>
</tr>
<tr>
<td>a) Rubber mallet may be used</td>
<td></td>
</tr>
<tr>
<td>3. Used on soft suction hose couplings for speed and ease of making connection</td>
<td></td>
</tr>
<tr>
<td><strong>F. Storz coupling</strong></td>
<td></td>
</tr>
<tr>
<td>1. Void of threads</td>
<td></td>
</tr>
<tr>
<td>2. Requires only ¼ turn to couple or uncouple</td>
<td></td>
</tr>
</tbody>
</table>

What would the greatest disadvantage of the pin lug?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>
| 3. All couplings are the same  
  a) No male or female end  
  b) Eliminate adapter usage  
  4. Range from 1-6 inches | |

SUMMARY:

Fire hose is essential to the fire suppression effort, so a thorough knowledge of fire hose is necessary to select and use it properly. Understanding the different fireground applications of fire hose will aid the fire fighter in determining the correct hose to choose for a given operation. Realizing the strengths and limitations associated with different types of hose will also aid the fire fighter in selecting the most appropriate hose for deployment. A clear understanding of the methods and types of construction will provide the fire fighter with the foundation necessary to appreciate the procedures to be followed for proper care and maintenance of the fire hose after use.

Hose couplings are many and varied. They are made of brass, aluminum, and alloys of magnesium.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: INSPECTION AND MAINTENANCE OF FIRE HOSE

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the care and maintenance of fire hose by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Proper maintenance and inspection of fire hose will increase the life span and reliability of the hose. Fire hose is a tool used during fire fighting that will be subjected to all sorts of situations that can and will cause damage. The life of fire hose is dependent upon how well the fire hose is maintained, inspected, and cleaned.
I. INSPECTION
   A. After each use
      1. Hose
         a) Cuts
         b) Abrasions
         c) Burns
         d) Other damage

II. GENERAL MAINTENANCE
   A. Washing
      1. Method depends on the type of hose
      2. Synthetic and rubber hose require little more then a rinse and can be placed right back on the apparatus
         a) If the hose is dirty, use a mild detergent first

      3. Woven-cotton jacket fire hose requires a little more care
         a) Will mildew if not properly cared for
         b) Thoroughly wash with a mild soap and rinse with clear water
         c) Thoroughly dry hose before placing back on apparatus

      4. Process
         a) Use a scrub brush to clean and fire hose
         b) Use water jet type hose washer
         c) Use hose washing machines

What is the procedure for inspecting hose?

Are there any special considerations for the care of woven-cotton jacket fire hose?
# B. Drying
1. Lay on an inclined drying rack
2. Hang from hose tower
   a) Provides complete draining of hose
   b) Should be well-ventilated to provide good air movement and to avoid excess temperatures
3. Use a mechanical hose dryer

# C. Storing
1. Roll
2. Racks
   a) Prevents mildew or rot
   b) Located in clean, well ventilated room
   c) Can be mobile for easy access

---

### Why should hose be stored in racks?

---

### What can be done on the fireground to prevent damage?

---

# III. FIREGROUND MAINTENANCE

## A. Avoid damage by
1. Not laying hose over rough sharp corners
2. Use hose bridges and prevent vehicles from running over hose
3. Avoiding excessive pump pressure on hoselines
4. Protect hose from excessive heat or fire when possible
5. Avoid chemical exposure
6. Remove all wet cotton jacket hose from apparatus after a fire and replace with dry hose
IV. FIRE STATION MAINTENANCE

A. Hose should be periodically unloaded from the apparatus, inspected, cleaned, and reloaded

B. If any suspicion of damage exists, the hose should be tested

C. Do not allow hose to remain in any heated area after it is dry, it is not good practice to dry hose on hot pavement

V. CHEMICAL DAMAGE

A. Chemicals and chemical vapors will damage the rubber lining and often cause the lining and jacket to separate
   1. When hose is exposed to petroleum products or paints, scrub hose thoroughly with mild detergent and test hose if any suspicion of damage
   2. If hose is exposed to hazardous materials use proper decontamination procedure to clean hose
   3. If hose cannot be decontaminated it should be disposed of using proper hazardous material disposal procedures

What can be done at the fire station to prolong the life of hose?

What should you do if your hose is exposed to hazardous materials?
SUMMARY:

The inspection and maintenance of fire hose is essential. A properly cared for hose will be reliable and less likely to rupture at a fire. A ruptured fire hose may cause serious injury to fire fighters and other persons.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: INSPECTION AND MAINTENANCE OF HOSE COUPLINGS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance of hose couplings by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sample couplings

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION: Fire hose and the water it supplies is the lifeline of the fire service. Properly cared for couplings will continue to function as designed and deliver the water that is needed.
# Inspection

## A. Examine coupling when hoseline is washed and dried

- Out-of-round couplings must be discarded

## Process

1. **Remove gasket**
   - a) Free swivel in warm soapy water
   - b) Complete at anytime resistance is felt in swivel after washing hoseline
2. **Clean thread of tar, dirt, gravel, oil**
   - a) Stiff brush
   - b) Soapy water
   - c) May need a thread file or tap and die
3. **Inspect gasket**
   - a) A watertight seal will not be obtained if the swivel gasket is broken or not used at all
   - b) Periodically and during annual hose test
   - c) Pinch gasket between thumb and index finger to disclose any defects
d) Replace if cracked or creased
   1) Hold gasket thumb and big finger on outside of gasket and index finger on inside rim of gasket
   2) Fold the outer ring of the gasket upward by pulling on the index finger
   3) Place the large loop into the swivel groove and release

II. MAINTENANCE
   A. Avoid dropping
      1. Can damage the threads
   B. Avoid dragging
      1. Will wear down the lugs
      2. Abrade hose jacket
   C. Do not permit vehicles to run over fire hose
      1. California vehicle code prohibits
      2. Can distort couplings

Which is more susceptible to damage, coupled or uncoupled hose?

D. Uncoupled hose is more susceptible to damage
SUMMARY:

Couplings can be damaged in various ways. It is essential that a fire fighter is aware of these and takes precautions to prevent this from happening. Couplings can become difficult to operate or rendered useless if they are not in a continuous maintenance process. Proper maintenance will ensure that when you need them most, they will function properly.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF NOZZLES

TIME FRAME: 1:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of nozzles necessary to provide sufficient water to extinguish fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essential of Fire Fighting, IFSTA, Fourth Edition, Chapter 13

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials
• Examples of new and old nozzles

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Stream Practices, IFSTA, Seventh Edition
• Firefighter’s Handbook, Delmar, 2000 Edition

PREPARATION: There are six categories of nozzles using solid, fog, or broken stream properties. It is essential that fire fighters understand the proper application of each of these types of nozzles. The fire fighter must be able to select the best nozzle to effectively and safely extinguish a fire.
## I. NOZZLE OVERVIEW

### A. Factors influencing the efficiency of nozzles
- 1. Design
- 2. Pressure
- 3. Velocity
- 4. The size of the water particles

### B. Types of nozzles
- 1. Solid stream
- 2. Fog stream
- 3. Broken stream
- 4. Master stream
- 5. Special

### C. Major components
- 1. Nozzle control valves (shut-offs)
  - a) Ball valves
  - b) Slide valves
- 2. Tips
- 3. Playpipe
- 4. Stream straightener

What are some types of nozzles used by firefighters today?

What is the purpose of a stream straightener?

- a) Reduces turbulence
- b) Improves effective reach of stream
### Characteristics And Functions Of Nozzles

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Nozzle tip</td>
<td></td>
</tr>
<tr>
<td>a) Used on smoothbore tips</td>
<td></td>
</tr>
<tr>
<td>b) Identified by size of tip orifice</td>
<td></td>
</tr>
<tr>
<td>6. Rubber bumper</td>
<td></td>
</tr>
<tr>
<td>a) Found on end of some individual smoothbore tips</td>
<td></td>
</tr>
<tr>
<td>7. Gaskets</td>
<td></td>
</tr>
<tr>
<td>a) Make the connection water tight</td>
<td></td>
</tr>
<tr>
<td>8. Accessories</td>
<td></td>
</tr>
<tr>
<td>a) Make nozzles easier to maneuver</td>
<td></td>
</tr>
<tr>
<td>b) Pistol grips</td>
<td></td>
</tr>
<tr>
<td>c) Double handles</td>
<td></td>
</tr>
</tbody>
</table>

#### D. Nozzle reaction

1. Caused by the velocity and volume of the stream
   a) When water flows from the nozzle tip, it provides a reaction that is equally as strong in the opposite direction

2. The greater the nozzle pressure, the greater the reach, and the greater the nozzle reaction

---

**II. SOLID STREAM NOZZLES**

A. Designed to produce a stream as compact as possible with little shower or spray

1. A straight stream is from a fog nozzle and is not a solid stream

---

What is a solid stream nozzle?

Is a solid stream the same as a straight stream?
### FIRE FIGHTER I

#### Characteristics And Functions Of Nozzles

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Nozzle design</td>
<td>What type of nozzle produces a solid stream?</td>
</tr>
<tr>
<td>1. Fixed orifice</td>
<td>How does a smoothbore nozzle produce a solid stream?</td>
</tr>
<tr>
<td>2. Smoothbore</td>
<td>Why is the nozzle reaction lower for a solid stream?</td>
</tr>
<tr>
<td></td>
<td>D. Specifications</td>
</tr>
<tr>
<td>C. Mechanical principles</td>
<td>What is the maximum tip size that should be used on a 2½&quot; hoseline?</td>
</tr>
<tr>
<td>1. Size of stream gradually reduced in nozzle</td>
<td></td>
</tr>
<tr>
<td>2. True cylindrical bore near discharge tip</td>
<td></td>
</tr>
<tr>
<td>a) Length of bore is 1-1½ times its diameter</td>
<td></td>
</tr>
<tr>
<td>3. Provides compact, tight stream</td>
<td></td>
</tr>
<tr>
<td>a) Maximum reach and penetration</td>
<td></td>
</tr>
<tr>
<td>4. Lower pressure than fog streams</td>
<td></td>
</tr>
<tr>
<td>a) 50 psi for handlines</td>
<td></td>
</tr>
<tr>
<td>b) 80 psi for master streams</td>
<td></td>
</tr>
<tr>
<td>c) The lower the pressure, the lower the nozzle reaction</td>
<td></td>
</tr>
<tr>
<td>D. Specifications</td>
<td></td>
</tr>
<tr>
<td>1. Tip size should be no larger than half the diameter of the hoseline</td>
<td></td>
</tr>
</tbody>
</table>
2. Stream angle should be near 32° from a flat surface for maximum reach

E. Advantages
   1. Greater penetration
   2. Further reach
   3. Hoseline can be easier to manipulate due to lower pressure
   4. Does not disrupt thermal balance

F. Disadvantages
   1. Can cause property damage due to the force of water
   2. Does not allow for stream pattern selection
   3. Provides less heat absorption for firefighter safety

III. FOG STREAM NOZZLES
   A. A fog stream is a patterned stream composed of fine water droplets

   B. Most fog nozzles provide the ability to adjust the pattern
      1. Straight stream

   What are some disadvantages of a solid stream nozzle?

   What are some advantages of a solid stream nozzle?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Narrow fog</strong>&lt;br&gt;a) 15°-45°</td>
<td></td>
</tr>
<tr>
<td><strong>3. Wide fog</strong>&lt;br&gt;a) 45°-90°</td>
<td></td>
</tr>
<tr>
<td><strong>C. Types</strong></td>
<td></td>
</tr>
<tr>
<td>1. Periphery (deflected) stream nozzle&lt;br&gt;a) Water deflected against inside, circular stem</td>
<td>What is a periphery stream nozzle?</td>
</tr>
<tr>
<td>b) Water deflected against exterior barrel&lt;br&gt;1) Space between stem and barrel determines shape of pattern&lt;br&gt;2) Patterns usually adjust by turning exterior barrel</td>
<td></td>
</tr>
<tr>
<td>c) May have spinning tooth-like protrusions on exterior barrel&lt;br&gt;1) Breaks water into finer droplets</td>
<td></td>
</tr>
<tr>
<td>2. Variable gallonage nozzles</td>
<td></td>
</tr>
<tr>
<td>a) Change in pattern also causes a change in gallonage</td>
<td></td>
</tr>
<tr>
<td>b) As pattern is narrowed to a straight stream, gallonage decreases</td>
<td></td>
</tr>
<tr>
<td>c) As the pattern changes from straight stream to fog nozzle, reaction decreases</td>
<td></td>
</tr>
</tbody>
</table>
Which stream gives you the highest gpm?

d) Maximum gpm is in a full fog position

What would be the advantage of constant gallonage nozzle?

a) Constant flow despite pattern
b) As pattern is changed, the orifice remains the same allowing constant flow

4. Adjustable gallonage nozzle

a) Pattern remains constant as flow is adjusted
b) Fire fighters can adjust flow regardless of pattern
c) Fire fighters can compensate for change in nozzle pressure
d) Fire fighters can adjust flow to meet demands of the fire situation

5. Automatic (constant pressure) nozzle

a) Maintains constant nozzle pressure
   1) Requires a minimum pressure for adequate streams
      • This varies per manufacturer
   2) Regardless of flow
b) Serves as a pressure regulator
   1) When other lines are shutdown or opened
### Characteristics And Functions Of Nozzles

**PRESENTATION**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>c) Some brands flow little or no water under 100 psi</td>
</tr>
<tr>
<td></td>
<td>1) This can be dangerous if you have unreliable water pressure</td>
</tr>
<tr>
<td></td>
<td>6. Impinging stream nozzle</td>
</tr>
<tr>
<td></td>
<td>a) Water jets are driven together at a set angle to provide a fog pattern</td>
</tr>
<tr>
<td></td>
<td>b) Usually a short reach</td>
</tr>
<tr>
<td>D. Components</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Shut-off valve</td>
</tr>
<tr>
<td></td>
<td>2. Adjustable tip</td>
</tr>
<tr>
<td></td>
<td>a) &quot;Left for Life&quot;</td>
</tr>
<tr>
<td></td>
<td>1) Fog pattern to block radiant heat</td>
</tr>
<tr>
<td></td>
<td>b) &quot;Right to Fight&quot;</td>
</tr>
<tr>
<td></td>
<td>1) Straight stream for penetration</td>
</tr>
<tr>
<td></td>
<td>3. Handle</td>
</tr>
<tr>
<td></td>
<td>4. Gallonage selector</td>
</tr>
</tbody>
</table>

**APPLICATION**

- How does an impinging stream nozzle create a fog pattern?
- What are the components?
- If you are unable to see the nozzle, which way do you turn it to make a fog stream?
- What are the advantages?

1. Wide fog pattern has greater heat absorption
   a) More surface area covered
2. Good for protection from radiant heat
3. Less nozzle reaction than solid streams
   a) Wide fog pattern has less nozzle reaction than narrow fog
4. Excellent stream production
5. Nozzle can be adjusted from a wide-angle to a straight stream

F. Disadvantages
1. Less reach
2. Less penetration
3. Greater chance of nozzle becoming clogged
4. Stream produced can create untenable environment
5. Disturbs thermal balance

   a) The wider the stream the more untenable the environment
   b) This decreases visibility
6. Produces negative pressure behind nozzle that can "pull" fire around endangering fire fighters

Why is disturbing the thermal balance a disadvantage?

What are some of the disadvantages?

What is a "broken stream"?
### How can a broken stream be developed?

2. Direct streams at fixed objects  
   a) Rafters  
   b) Walls  
3. Natural point of breakover

### What type of nozzle produces a broken steam?

B. Produced by special or distributing nozzles  
   1. Distributor  
   2. Cellar pipe  
   3. Bresnan distributor  
   4. Cellar  
   5. Piercing  
   6. Industrial  
   7. Low expansion foam  
   8. High expansion foam

### What are the advantages of a broken stream?

C. Advantages  
   1. Greater penetration  
   2. Able to reach difficult areas

### When would you use a distributor nozzle?

D. Types  
   1. Distributor or cellar nozzles  
      a) Series of orifices positioned around a rotating sphere  
      b) Used to extinguish fires in
## V. MASTER STREAM NOZZLES

### A. A master stream is any fire stream that is too large to be controlled without mechanical aid

1. Turret pipe
2. Deluge set
3. Monitor
4. Elevated master stream
   - a) Ladder pipe

### B. A turret pipe is mounted on the deck of a fire apparatus and connected directly to the fire pump
1. Deck gun
2. Deck pipe

C. A deluge set is composed of a short length of large diameter hoseline with a large nozzle

D. The monitor is a master stream device whose stream direction can be changed while water is being discharged
   1. Master streams come in three basic types
      a) Fixed
      b) Portable
      c) Combination

E. Elevated master streams are operated from truck companies

VI. SPECIAL STREAM NOZZLES
A. Designed for a specific purpose
   1. Foam application
   2. Exposure protection
B. Many are specific to each department's needs
C. Some are common to many departments

VII. SAFETY PRECAUTIONS FOR ALL NOZZLES
A. Always use appropriate personal protective equipment
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Open and close the nozzle <strong>slowly</strong></td>
<td>Why is it important to open and close nozzles slowly?</td>
</tr>
<tr>
<td>1. For control</td>
<td>Where on the nozzle should you keep your hand while operating a hoseline?</td>
</tr>
<tr>
<td>2. To prevent water hammer</td>
<td></td>
</tr>
<tr>
<td>C. Keep a hand close to the bale so it may be closed if control is being lost</td>
<td></td>
</tr>
<tr>
<td>D. Place feet in a firm stance</td>
<td></td>
</tr>
<tr>
<td>1. Shoulder width apart</td>
<td></td>
</tr>
<tr>
<td>E. Lean forward slightly to counter nozzle reaction</td>
<td></td>
</tr>
<tr>
<td>F. Avoid uneven surfaces</td>
<td></td>
</tr>
<tr>
<td>G. Avoid slippery surfaces</td>
<td></td>
</tr>
<tr>
<td>H. Keep hoseline as straight behind the nozzle as possible</td>
<td>Why?</td>
</tr>
<tr>
<td>1. Decreases nozzle reaction</td>
<td>What can assist you in controlling a hoseline?</td>
</tr>
<tr>
<td>I. Absorb the weight with your legs when pulling hoseline</td>
<td></td>
</tr>
<tr>
<td>J. Maintain proper grip on hoseline and nozzle</td>
<td></td>
</tr>
<tr>
<td>1. Use a hose strap, if available</td>
<td></td>
</tr>
<tr>
<td>K. Look before stepping</td>
<td></td>
</tr>
<tr>
<td>L. Shutdown nozzle to reposition</td>
<td></td>
</tr>
<tr>
<td>M. Watch for night-time obstructions</td>
<td></td>
</tr>
<tr>
<td>N. Have a backup fire fighter, if possible</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

We have discussed the types of nozzles used today in the fire service. There are important differences to remember between fog nozzles and solid streams. We also discussed the advantages and disadvantages of broken streams and specialized nozzles. There will always be new types of nozzles to enhance fire fighter safety and effectiveness. It is important that we keep current with new equipment, so that we can be as effective on the fireground by properly using our training and equipment provided.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essential of Fire Fighting, IFSTA, Fourth Edition, Chapter 13 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF NOZZLES

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.3 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance of nozzles by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 13

MATERIALS NEEDED:
• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:
• Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Inspection and maintenance are basic skills for any firefighter. Lack of either leads to possible failure on the fireground, possibly resulting in injury to firefighters or civilians.
I. INSPECTIONS

A. Frequency
   1. Daily
   2. After use
      a) If used with salt or dirty water source, flush immediately after use

B. Starts during cleaning phase

1. Out-of-round fittings
2. Gasket present and in good condition

3. Free movement of parts
   a) Bale, valves
   b) Pattern adjustment
   c) Condition of disbursement vanes

4. Condition of main body
   a) Cracks
   b) Separation
   c) Deformation

When are nozzles and inspected?

What are some important things to look for during an inspection of a nozzle?

When you are inspecting the free movement of parts, what items are you checking?

When checking the main body of nozzles, what items do you look for?
5. Screens, if present
6. Foreign objects

How do you properly clean a nozzle?

II. CLEANING
A. Soft brush
B. Mild soapy water
C. Clean flush

III. LUBRICATION
A. If needed, in accordance with manufacturers recommendations and directions

If the nozzle requires repair, what should you do?

IV. SERVICING
A. Return to manufacturer or approved repair facility
B. Repair in-house, according to department policy
SUMMARY:

It is very important to inspect and maintain nozzles after each use and on a routine basis. A well-maintained nozzle will not only ensure the proper functioning of these fire fighting tools, but will also offer maximum safety and protection for the nozzle operator.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 13 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE WYSES

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.2 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service wyes by completing the written test


MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials • Examples of wyes


PREPARATION: Many times on the fireground, it becomes necessary to divide one line into two or more lines for increased flow due to line placement or friction loss. Wyes are the components that allow us to divide lines in this way. All fire fighters should be familiar with the use of these appliances.
What is the purpose of a wye?

I. CHARACTERISTICS AND FUNCTIONS

A. To divide one line into two or more lines

B. Divides lines of like or varying sizes
   1. A commonly used wye has a 2½” inlet to two 1½” outlets
   2. Divides one 2½” or larger line into two 2½” hoselines
   3. Divides large diameter hose into numerous outlets

C. Configurations of wyes
   1. Often gated
      a) To allow control of water
   2. Supply side of wye has a female connection
   3. Outlets are male connections
   4. Some wyes have locking handles to prevent accidental shutdown

D. Added to hose bundles for
   1. High-rise packs
   2. Apartment house lays
   3. School fires
   4. Progressive hose lays

What is the purpose of gates on some wyes?

Why would a locking handle be beneficial?

What are some common uses for wyes?
SUMMARY:

Wye appliances become an essential part of fireground evolutions when it becomes necessary to divide lines. Wyes can make fireground operations run more effectively and safely, especially when extending hoselines beyond engine preconnects.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE SIAMESE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.2 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service siamese by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Examples of siamese hose appliance

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION: Many times on the fireground, it becomes necessary to utilize two lines going into one for increased flow due to friction loss. The siamese is the component that allows us to combine lines in this way. All fire fighters should be familiar with the use of this appliance.
I. **CHARACTERISTICS AND FUNCTIONS**

A. To combine two or more lines into one hoseline or device

1. Reduces friction loss developed in long hose lays
2. Increases the amount of water available

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<table>
<thead>
<tr>
<th>Why?</th>
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</table>

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What differentiates a siamese from a wye?

B. Siamese appliances are manufactured in various configurations

1. A true siamese has two female connections on the inlet side, one male coupling on the outlet side
2. Clapper valves prevent water from exiting another inlet part
3. 2½”-4½” or larger siamese are used to connect 2½” supply lines into pump intake

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What is the purpose of a clapper siamese?

C. Deluge set and monitors use a form of siamese that is a part of the set

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Why is the use of a siamese an advantage in areas with poor water supply?

D. Suitcases are siamese appliances used on forward lays, so the supply line can be pumped or boosted without disconnecting the hoseline from the hydrant in areas with poor water supply

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<table>
<thead>
<tr>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>Why?</td>
</tr>
<tr>
<td>What?</td>
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<tr>
<td>What?</td>
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<tr>
<td>Why?</td>
</tr>
</tbody>
</table>
SUMMARY:

Siamese appliances become an essential part of fireground evolutions when it is necessary to combine lines or to supplement water supply. Siamese appliances can make fireground operations run more efficiently and safely, especially when multiple lines are needed to supply an appliance.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF SPECIAL HOSE APPLIANCES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.2 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of all special hose appliances to include adapters, reducers and increasers, elbows, flow control devices, hydrant valves, water thieves and the hose jacket tool by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Example of each type of special hose appliance being taught

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION: The fire service utilizes a variety of special hose appliances that make it possible to function on the ground. Not all departments are alike when it comes to types and sizes of kinds of equipment. It is essential that you as a fire fighter have a good working knowledge of these appliances in order to adapt with other agencies.
I. SPECIAL HOSE APPLIANCES
   A. Adapters
   B. Reducers and increasers
   C. Elbows
   D. Flow control devices
   E. Hydrant valves
   F. Water thieves
   G. Hose jacket tool

II. CHARACTERISTICS
   A. Allows unlike hoselines to be connected together
      1. Size
      2. Coupling type
   B. Allows hoselines to be placed in a particular position
      1. For protection of hoseline
      2. Eliminate sharp bends
   C. Allows water flow to be restricted or shut-off
   D. Allow specialized control of hydrants
      1. Automatic operation
      2. Greater flexibility
         a) Additional lines
         b) Larger lines
   E. Water thief
      1. Allows multiple hoselines from one primary line

What are some characteristics of special hose appliances?

Why is the term "water thief" applicable to this device?
2. Similar to wye appliances
3. Can have pressure control device

**F. Hose jacket tool**
1. For use when it is not possible to shutdown a hoseline for small cuts or breaks
2. Connect mismatched or damaged couplings of the same size

### III. FUNCTIONS

<table>
<thead>
<tr>
<th><strong>A. Adapters</strong></th>
<th><strong>Application</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Connect two threaded couplings of the same thread type, size, and sex</td>
<td></td>
</tr>
<tr>
<td>a) Double males</td>
<td></td>
</tr>
<tr>
<td>b) Double females</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>B. Reducers and increasers</strong></th>
<th><strong>Application</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Used to connect hoselines of different size together</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>C. Elbows</strong></th>
<th><strong>Application</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Used commonly at pump discharge and intakes to eliminate bend in hoseline</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>D. Flow control devices</strong></th>
<th><strong>Application</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Can be gate, butterfly, ball, or piston type</td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2. Used as single valve that can restrict or shut-off the flow</td>
<td>Where can a flow control device be commonly found?</td>
</tr>
<tr>
<td>3. Commonly found on pump section inlet when large diameter hose is used</td>
<td></td>
</tr>
<tr>
<td>E. Hydrant valves</td>
<td></td>
</tr>
<tr>
<td>1. Types</td>
<td></td>
</tr>
<tr>
<td>a) Four-way valve</td>
<td>Why are hydrant valves used?</td>
</tr>
<tr>
<td>b) Automatic hydrant valves</td>
<td></td>
</tr>
<tr>
<td>2. Four-way valve</td>
<td></td>
</tr>
<tr>
<td>a) Allows placing engine at a single outlet hydrant after a forward lay has</td>
<td></td>
</tr>
<tr>
<td>been accomplished</td>
<td></td>
</tr>
<tr>
<td>b) Second engine connects to valve and pumps to first engine by repositioning</td>
<td></td>
</tr>
<tr>
<td>valve</td>
<td></td>
</tr>
<tr>
<td>3. Automatic hydrant valves</td>
<td>How do automatic hydrant valves open?</td>
</tr>
<tr>
<td>a) Eliminates the need to leave a person at the hydrant</td>
<td></td>
</tr>
<tr>
<td>b) Hydrant opens immediately, allowing hydrant operator to rejoin the crew</td>
<td></td>
</tr>
<tr>
<td>c) Types</td>
<td></td>
</tr>
<tr>
<td>1) Mechanically delayed</td>
<td></td>
</tr>
<tr>
<td>2) Radio controlled</td>
<td></td>
</tr>
</tbody>
</table>
F. Water thief

1. Is attached parallel with the primary line
   a) Primary line is usually 2½" or larger, exception is wildland
   b) Typically has a valve that can shut-off the wyed line

2. Allows tapping in two or more hoselines
   a) Smaller diameter
   b) Quarter turn valves for control to each line

3. Common uses
   a) Reverse hose lays
   b) Lateral lines on progressive hose lays
   c) When more than two similar lines are needed from a single hoseline

G. Hose jacket tool

1. Two piece cylindrical device, hinged in a longitudinal direction
   a) Hasp on opposite edge to lock halves together

2. Flexible rubber seal at both ends
   a) Hose seals against device when pressurized

3. Only tool in the fire service that is designed to be stepped on to close
SUMMARY:

Special hose appliances allow the fire fighter to adapt to special circumstances or situations. Appliances can provide special means of activating hydrants, or allowing a primary line to be divided into two or more smaller lines. It is very important for the fire fighter to be familiar with the operation and uses of special hose appliances.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC:  INSPECTION AND MAINTENANCE OF HOSE APPLIANCES

TIME FRAME:  0:30

LEVEL OF INSTRUCTION:  Level II

AUTHORITY:  1997 NFPA 1001 4-5.3 and SBFS

BEHAVIORAL OBJECTIVE:

Condition:  A written test

Behavior:  The student will confirm a knowledge of the inspection and maintenance of hose appliances by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Hose appliances and cleaning equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION:  It is important that all moving parts of hose appliances be kept in proper alignment, all threads be kept in shape, and that the surfaces of all appliances be kept smooth and free of sharp edges. Without proper maintenance, hose appliances will become useless.
I. TYPES OF APPLIANCES

A. Fittings
   1. Double male
   2. Double female
   3. Reducer
   4. Siamese

B. Valves
   1. Gated wye
   2. Four-way
   3. Gleason
      a) Pressure reducing hydrant valve
   4. Water thief
   5. Hydrant gate

II. INSPECTION AND MAINTENANCE

A. Swivels
   1. Female couplings
      a) If egg-shaped, repair or replace
   2. Bearings
      a) Replace, if missing
      b) Lubricate
         1) In accordance with manufacturer's recommendations and directions
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>During valve inspection, what items should you be checking?</td>
<td></td>
</tr>
</tbody>
</table>

**B. Valves**
1. **Gate**
   a) **Handle**
      1) Free play (loose)
      2) Proper alignment  
   b) **Valve body**
      1) Proper alignment

2. **Ball**
   a) **Handle**
      1) Free play (loose)
      2) Proper alignment

What is the major area of concern for thread maintenance?

**C. Threads**
1. Smooth surfaces
2. File burrs, if necessary

**D. Body**
1. Check for rough surface or cracks
2. Repair or replace

What are some problems that can be found during gasket inspection?

**E. Gaskets**
1. Cracked
2. Missing
3. Hard
4. Out-of-round

What methods are used to clean hose appliance?

III. CLEANING
A. Warm water and soap
   1. Brush off dirt
   2. Dry thoroughly
B. Lubricate
   1. In accordance with manufacturer's recommendations and directions
SUMMARY:

Care of hose appliances is simple but very important. Following all the steps required for inspecting, cleaning, and adjusting, and lubricating can ensure proper performance.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: HOW TO MAKE AN IN-SERVICE STRAIGHT ROLL

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline and appropriate personal protective equipment

Behavior: The student will make an in-service straight roll

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50 foot length of 2½” hoseline
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: There are a number of different methods of rolling hoseline, depending on its intended use. In all methods, care must be taken to protect the couplings. It is frequently necessary to roll sections of hoseline following fires and drill evolutions. The in-service straight roll method is quick and easy to perform.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out hoseline</td>
<td>1a. On clean surface</td>
</tr>
<tr>
<td></td>
<td>b. Flat, straight line</td>
</tr>
<tr>
<td></td>
<td>c. Without twisting</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. At male coupling</td>
</tr>
<tr>
<td></td>
<td>b. To start the roll</td>
</tr>
<tr>
<td>3. Grasp male coupling</td>
<td>3a. With both hands</td>
</tr>
<tr>
<td></td>
<td>b. Facing female end of hoseline</td>
</tr>
<tr>
<td>4. Roll coupling</td>
<td>4a. Forward over hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Forming a coil open enough to insert fingers</td>
</tr>
<tr>
<td></td>
<td>c. Tightly</td>
</tr>
<tr>
<td>5. Roll hoseline</td>
<td>5a. Toward female coupling</td>
</tr>
<tr>
<td></td>
<td>b. Keeping edges evenly aligned</td>
</tr>
<tr>
<td></td>
<td>c. Tightly</td>
</tr>
<tr>
<td></td>
<td>d. Not rolling over female coupling</td>
</tr>
<tr>
<td></td>
<td>e. To end of hoseline</td>
</tr>
<tr>
<td>6. Lay hose roll</td>
<td>6a. On its side</td>
</tr>
<tr>
<td></td>
<td>b. When completely rolled to female coupling</td>
</tr>
<tr>
<td>7. Align protruding coils</td>
<td>7a. By tamping down into roll with a foot</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE AN OUT-OF-SERVICE STRAIGHT ROLL

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

**Condition:** Sufficient hoseline and appropriate personal protective equipment

**Behavior:** The student will make an out-of-service straight roll

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50 foot length of 2½” hoseline
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

When a section of hoseline or its couplings becomes damaged at the scene of a fire, on a drill, or when testing, it is necessary to identify it as out-of-service. The out-of-service straight roll is a variation of the in-service straight roll. The main difference between the two hose rolls is that the out-of-service roll begins at the female end so that when it is completed, the male coupling is exposed.

Damaged hoseline rolled in this manner can be quickly identified as out-of-service and separated from serviceable hoseline for repair. The hoseline is usually marked to identify the damage, rolled with the male coupling exposed and tied in a knot. The hoseline should be tagged and the company officer notified.
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<td></td>
<td>c. Without twisting</td>
</tr>
<tr>
<td>2. Mark hoseline</td>
<td>2a. Where damage occurred</td>
</tr>
<tr>
<td></td>
<td>b. With felt pen or other device</td>
</tr>
<tr>
<td>3. Take position</td>
<td>3a. At female coupling</td>
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</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td>9. Tag hoseline</td>
<td>9a. Out of service</td>
</tr>
<tr>
<td></td>
<td>b. Reason out of service</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO MAKE A DONUT ROLL, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline and appropriate personal protective equipment

Behavior: The student will make a donut roll using the one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50 foot length of 2½" hoseline
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

Rolling hoseline is necessary to transport it and store it. Use caution with the couplings to prevent damaging them. Roll the hoseline correctly so it may be deployed in time of emergency without embarrassment or loss.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>

**METHOD 1**

1. Lay out hoseline  
   1a. On clean surface  
   b. Flat, straight line  
   c. Without twisting
2. Fold couplings  
   2a. 6 inches back on hoseline  
   b. For protection
3. Form a bight  
   3a. 5-6 feet short of center  
   b. Toward the male coupling
4. Begin roll  
   4a. Facing female end of hoseline
5. Roll hoseline  
   5a. Towards the female end  
   b. Leaving sufficient space at center of loop to insert a hand for carrying
6. Stop roll  
   6a. At male coupling  
   b. Do not roll over male coupling
7. Lay hose roll  
   7a. On the ground  
   b. Flat
8. Complete roll  
   8a. Bringing female coupling around male coupling  
   b. To protect male coupling

**METHOD 2**

1. Grasp hoseline  
   1a. At either end
2. Carry hoseline  
   2a. To opposite end  
   b. Both couplings side-by-side
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 3. Adjust looped section | 3a. To lie flat  
                        | b. Straight  
                        | c. Without twisting |
| 4. Start roll       | 4a. On male coupling side  
                        | b. About 2½ feet from the bend  
                        | c. Facing coupling ends |
| 5. Roll hoseline    | 5a. Toward male coupling  
                        | b. If hoseline behind roll becomes tight, pull female side back |
| 6. Stop roll        | 6a. When male coupling is reached  
                        | b. Not rolling over male coupling |
| 7. Lay hose roll    | 7a. On the ground  
                        | b. Flat |
| 8. Complete roll    | 8a. Bringing female coupling around male coupling |
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO MAKE A DONUT ROLL, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline and appropriate personal protective equipment

Behavior: The students will demonstrate how to make a donut roll using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50 foot length of 2½" hoseline
- Appropriate personal protective equipment

REFERENCES:

- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

The two-person method for making the donut roll is a faster operation to complete than the one-person method. The two-person technique allows the hoseline to be doubled on itself, with the second person getting the slack out of the hoseline during the rolling process. Since the setup for rolling the hoseline in the two-person method differs from the one-person method, it is essential that the fire fighter clearly understands and practices the two-person technique with proficiency.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out hoseline</td>
<td>1a. Flat</td>
</tr>
<tr>
<td></td>
<td>b. Straight line</td>
</tr>
<tr>
<td>2. Carry male coupling</td>
<td>2a. Towards female coupling</td>
</tr>
<tr>
<td>3. Place male coupling</td>
<td>3a. On top of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. 3-4 feet short of the female coupling</td>
</tr>
<tr>
<td>4. Adjust hoseline</td>
<td>4a. Doubled back upon itself</td>
</tr>
<tr>
<td></td>
<td>b. Lapped over smoothly and without kinks</td>
</tr>
<tr>
<td>5. Fire Fighter #1 takes position</td>
<td>5a. Straddling hoseline</td>
</tr>
<tr>
<td></td>
<td>b. At fold</td>
</tr>
<tr>
<td></td>
<td>c. Facing female coupling</td>
</tr>
<tr>
<td>6. Fire Fighter #2 takes position</td>
<td>6a. Straddling hoseline</td>
</tr>
<tr>
<td></td>
<td>b. 4-5 feet in front of first fire fighter</td>
</tr>
<tr>
<td>7. Fire Fighter #1 picks up hoseline</td>
<td>7a. At looped end</td>
</tr>
<tr>
<td>8. Roll the loop</td>
<td>8a. Over</td>
</tr>
<tr>
<td></td>
<td>b. To form a small coil</td>
</tr>
<tr>
<td></td>
<td>c. Leaving sufficient space in center for carrying</td>
</tr>
<tr>
<td>9. Roll hoseline</td>
<td>9a. Upon the doubled hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Toward couplings</td>
</tr>
<tr>
<td></td>
<td>c. Hand over hand</td>
</tr>
<tr>
<td></td>
<td>d. Keeping edges aligned on hoseline</td>
</tr>
<tr>
<td></td>
<td>e. Making sure not to roll over male coupling</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10. Fire Fighter #2 removes slack</td>
<td>10a. Out of top layer of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Ahead of the roll</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining alignment of doubled hoseline</td>
</tr>
<tr>
<td>11. Stop hose roll</td>
<td>11a. At male coupling</td>
</tr>
<tr>
<td>12. Lay hose roll</td>
<td>12a. Flat</td>
</tr>
<tr>
<td></td>
<td>b. On ground</td>
</tr>
<tr>
<td></td>
<td>c. Gently</td>
</tr>
<tr>
<td></td>
<td>d. Without damage or injury</td>
</tr>
<tr>
<td>13. Overlap female coupling end</td>
<td>13a. Of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Around male coupling</td>
</tr>
<tr>
<td></td>
<td>c. Either hand</td>
</tr>
<tr>
<td></td>
<td>d. Tight</td>
</tr>
<tr>
<td></td>
<td>e. To prevent damage to male threads</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE A TWIN DONUT ROLL

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline and appropriate personal protective equipment

Behavior: The student will make a twin donut roll

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 50 foot length of 2½" hoseline or 100 foot length of 1½" hoseline
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:
The twin donut roll is more adaptable to 1½" and 1¾" hoseline, although 2, 2½", or 3" hoseline can be used. Its purpose is to arrange a compact roll that may be transported and carried for special applications such as high-rise operations. The standard method requires both couplings to be side by side upon completion of the roll. Although offsetting the couplings is another acceptable alternative.

If the couplings are offset by about one foot at the beginning, they can be coupled together after the roll is tied or strapped. This forms a convenient loop that can be slung over one shoulder for carrying while leaving the hands free. By offsetting the couplings at the beginning, they do not dig into the shoulder but are still readily accessible when needed to place the section in service.
### OPERATIONS | KEY POINTS
---|---
1. Lay out hoseline | 1a. On clean surface  
b. Folded in half  
c. Both couplings together  
d. Flat  
e. Forming two parallel lines from the loop end to the couplings  
f. Creating an upside-down bowl-like loop free of twists
2. Fold loop end | 2a. Over and upon the two lines  
b. To start the roll  
c. Forming a triangle pointing toward the coupling ends of the hoseline
3. Roll both hoselines | 3a. Simultaneously  
b. Toward the coupling ends  
c. Forming a twin roll with a decreased diameter
4. Stop roll | 4a. Before couplings  
b. Making sure not to roll over couplings
5. Loop a short piece of strap or rope | 5a. If desired  
b. Through the roll  
c. With quick-releasing hitch  
d. For fireground operations or storage on fire apparatus
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE A SELF-LOCKING TWIN DONUT ROLL

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline and appropriate personal protective equipment

Behavior: The student will make a self-locking twin donut roll

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50 foot length of 2½" hoseline or 100 foot length of 1½" hoseline
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

The self-locking twin donut roll is a twin donut roll that has a built-in carrying strap formed from the hoseline itself. This strap locks over the couplings to keep the roll intact for carrying. Then length of the carrying strap may be adjusted to accommodate the height of the person carrying the hoseline. The self-locking twin donut roll makes a more compact roll for long lengths of hoseline while still providing both couplings at the same end. When carried, the coupling ends may face either the front or the rear.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out hoseline</td>
<td>1a. On clean surface&lt;br&gt;b. Folded in half&lt;br&gt;c. Both couplings together&lt;br&gt;d. Flat&lt;br&gt;e. Forming two parallel lines from the loop end to the couplings&lt;br&gt;f. Creating a bowl-like loop&lt;br&gt;g. Free of twists</td>
</tr>
<tr>
<td>2. Cross hoseline</td>
<td>2a. Over itself&lt;br&gt;b. At two locations&lt;br&gt;c. First cross at 2½-3 feet from fold to prevent twist in hoseline at big loop&lt;br&gt;d. Second cross approximately one-third the distance from coupling to prevent the hose rolls from separating when completed</td>
</tr>
<tr>
<td>3. Take position</td>
<td>3a. At fold&lt;br&gt;b. Facing coupling&lt;br&gt;c. On one knee</td>
</tr>
<tr>
<td>4. Bring backside of loop</td>
<td>4a. Forward&lt;br&gt;b. Toward the couplings</td>
</tr>
<tr>
<td>5. Place backside of loop</td>
<td>5a. On top of point where hoseline crosses&lt;br&gt;b. Creating a &quot;triangle&quot; pointing at firefighter&lt;br&gt;c. Forming a loop on each side&lt;br&gt;d. Without twisting</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>6. Roll hoseline</td>
<td>6a. Both lines</td>
</tr>
<tr>
<td></td>
<td>b. Simultaneously</td>
</tr>
<tr>
<td></td>
<td>c. Toward the coupling ends</td>
</tr>
<tr>
<td></td>
<td>d. Forming two rolls</td>
</tr>
<tr>
<td></td>
<td>e. Side-by-side</td>
</tr>
<tr>
<td>7. Stop roll</td>
<td>7a. Before couplings</td>
</tr>
<tr>
<td></td>
<td>b. Making sure not to roll over couplings</td>
</tr>
<tr>
<td>8. Adjust hose roll</td>
<td>8a. To allow couplings to lie across the top of each roll</td>
</tr>
<tr>
<td>9. Pull loop</td>
<td>9a. Only one side</td>
</tr>
<tr>
<td></td>
<td>b. Creating one short and one long loop</td>
</tr>
<tr>
<td>10. Place long loop</td>
<td>10a. Through short loop</td>
</tr>
<tr>
<td></td>
<td>b. Just behind couplings</td>
</tr>
<tr>
<td>11. Tighten loops</td>
<td>11a. Snugly</td>
</tr>
<tr>
<td></td>
<td>b. Forming a shoulder sling</td>
</tr>
<tr>
<td></td>
<td>c. Protecting coupling ends</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
PROCEDURES FOR INSPECTING, COUPLING, AND UNCOUPLING HOSELINE

0:15

Level II

1997 NFPA 1001 3-5.3

A written test

The student will confirm a knowledge of the procedures for inspecting, coupling, and uncoupling hoseline during loading operations by completing the written test

With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

Writing board with markers/erasers

Appropriate audiovisual equipment

Appropriate audiovisual materials

Essentials of Fire Fighting, IFSTA, Fourth Edition

Hose Practices, IFSTA, Seventh Edition

Before any piece of equipment is placed on the apparatus, it should be in good operating condition. Hose couplings are vital for attaching hoseline to other hoseline and nozzles. If damaged, they can hinder the mission and endanger the lives of fire fighters.
I. INSPECTIONS WHILE COUPLING HOSELINES

A. Male couplings
   1. Connection is tight on hoseline or appliance
   2. Threads are not damaged
   3. Coupling is not out-of-round
   4. Coupling is free of burrs
   5. Coupling is clean

B. Female couplings
   1. Connection is tight on hoseline or appliance
   2. Threads are not damaged
   3. Coupling is not out-of-round
   4. Coupling is free of burrs
   5. Coupling is clean
   6. Swivel spins freely
   7. Swivel gasket is in place

C. Storz couplings
   1. Connection is tight on hoseline or appliance
   2. Coupling is not out-of-round
   3. Coupling is free of burrs
   4. Coupling is clean
   5. Swivel spins freely
   6. Gasket in place and clean
II. CONNECTING COUPLINGS

A. When connecting couplings together
   1. Keep the flat sides of the hoseline in the same plane
      a) Flat to flat
   2. Couplings should be made hand tight only

   3. Do not use wrenches or undue force

B. During normal operations
   1. One-person, tilt method
   2. Two-person method
   3. One-person, between-the-foot method
   4. One-person, over-the-hip method

C. Uncommon situations or tight couplings
   1. One-person, knee-press method
   2. Two-person, stiff-arm method
   3. Use of spanner wrenches

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Connecting lugs are <strong>not</strong> damaged</td>
<td>What can you do to make coupling hoselines easier?</td>
</tr>
<tr>
<td>II. CONNECTING COUPLINGS</td>
<td>Should you use a spanner wrench to prevent couplings from leaking?</td>
</tr>
<tr>
<td>A. When connecting couplings together</td>
<td>What are two methods used to uncouple a tight coupling?</td>
</tr>
<tr>
<td>1. Keep the flat sides of the hoseline in the same plane</td>
<td></td>
</tr>
<tr>
<td>a) Flat to flat</td>
<td></td>
</tr>
<tr>
<td>2. Couplings should be made hand tight only</td>
<td></td>
</tr>
<tr>
<td>3. Do not use wrenches or undue force</td>
<td></td>
</tr>
<tr>
<td>B. During normal operations</td>
<td></td>
</tr>
<tr>
<td>1. One-person, tilt method</td>
<td></td>
</tr>
<tr>
<td>2. Two-person method</td>
<td></td>
</tr>
<tr>
<td>3. One-person, between-the-foot method</td>
<td></td>
</tr>
<tr>
<td>4. One-person, over-the-hip method</td>
<td></td>
</tr>
<tr>
<td>C. Uncommon situations or tight couplings</td>
<td></td>
</tr>
<tr>
<td>1. One-person, knee-press method</td>
<td></td>
</tr>
<tr>
<td>2. Two-person, stiff-arm method</td>
<td></td>
</tr>
<tr>
<td>3. Use of spanner wrenches</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Hoselines and their couplings require constant attention and inspection. If inspections are not done properly, fireground operations may suffer.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO COUPLE HOSELINE, ONE-PERSON, FOOT-TILT METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with male and female couplings and appropriate personal protective equipment

Behavior: The student will couple hoseline using the one-person, foot-tilt method

Standard: Completing all operations within ________ according to the job breakdown

MATERIALS NEEDED: • Job breakdown
• Two lengths of 2½" hoseline with male and female couplings
• Appropriate personal protective equipment

• Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Keeping a constant flow of water can be critical. If you fail to get water quickly, it could be disastrous. This method of coupling hoseline can be used on flat ground to quickly set up a hoseline and deliver water before fire can threaten life or property.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Sections outstretched</td>
</tr>
<tr>
<td></td>
<td>b. Male and female couplings facing each other</td>
</tr>
<tr>
<td>2. Position yourself</td>
<td>2a. Standing</td>
</tr>
<tr>
<td></td>
<td>b. Facing the two couplings</td>
</tr>
<tr>
<td></td>
<td>c. One foot near male coupling</td>
</tr>
<tr>
<td>3. Step on hoseline</td>
<td>3a. Either foot</td>
</tr>
<tr>
<td></td>
<td>b. Directly behind male coupling</td>
</tr>
<tr>
<td></td>
<td>c. Applying pressure to tilt up coupling</td>
</tr>
<tr>
<td></td>
<td>d. Feet well apart for balance</td>
</tr>
<tr>
<td>4. Pick up female coupling</td>
<td>4a. One hand directly behind coupling</td>
</tr>
<tr>
<td></td>
<td>b. Other hand on coupling swivel</td>
</tr>
<tr>
<td></td>
<td>c. Firm grasp</td>
</tr>
<tr>
<td>5. Inspect couplings</td>
<td>5a. Checking gasket, threads, shape, and looking for obstructions</td>
</tr>
<tr>
<td>6. Align couplings</td>
<td>6a. Bringing the couplings together</td>
</tr>
<tr>
<td></td>
<td>b. Aligning Higbee indicator</td>
</tr>
<tr>
<td>7. Set threads</td>
<td>7a. Twisting counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until click</td>
</tr>
<tr>
<td>8. Connect couplings</td>
<td>8a. Turning swivel clockwise with thumb</td>
</tr>
<tr>
<td></td>
<td>b. Until hand tight</td>
</tr>
<tr>
<td>9. Position connection</td>
<td>9a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. With hoseline flat</td>
</tr>
<tr>
<td></td>
<td>d. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO COUPLE HOSELINE, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with male and female couplings and appropriate personal protective equipment

Behavior: The students will couple hoseline using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Two lengths of 2½" hoseline with male and female couplings
- Appropriate personal protective equipment

REFERENCES:

- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: It is extremely important to perform fire fighting tasks on the fireground quickly and efficiently. Certain tasks require two people to safely complete the task. Fire fighters need to be proficient at performing two-person tasks to minimize time and prevent injuries on the fireground.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Male and female couplings facing each other</td>
</tr>
<tr>
<td>2. Position fire fighters</td>
<td>2a. Standing</td>
</tr>
<tr>
<td></td>
<td>b. Facing each other</td>
</tr>
<tr>
<td></td>
<td>c. Holding opposite couplings</td>
</tr>
<tr>
<td></td>
<td>d. Feet shoulder width apart for balance</td>
</tr>
<tr>
<td>3. Fire Fighter #1 cradles the male coupling</td>
<td>3a. Firmly</td>
</tr>
<tr>
<td></td>
<td>b. Against upper thigh or midsection</td>
</tr>
<tr>
<td></td>
<td>c. Both hands directly behind coupling</td>
</tr>
<tr>
<td></td>
<td>d. Hoseline bent directly behind coupling</td>
</tr>
<tr>
<td></td>
<td>e. Threads facing outward</td>
</tr>
<tr>
<td></td>
<td>f. Not looking at coupling</td>
</tr>
<tr>
<td>4. Fire Fighter #2 inspects female coupling</td>
<td>4a. Gasket, threads, shape, and obstructions</td>
</tr>
<tr>
<td></td>
<td>b. Visually and by feel</td>
</tr>
<tr>
<td>5. Fire Fighter #2 sets the threads</td>
<td>5a. Holding female coupling in both hands</td>
</tr>
<tr>
<td></td>
<td>b. Bringing female coupling to male coupling</td>
</tr>
<tr>
<td></td>
<td>c. Aligning Higbee indicator or turning coupling counterclockwise until click is heard</td>
</tr>
<tr>
<td>6. Fire Fighter #2 connects the couplings</td>
<td>6a. Turning female swivel clockwise with thumb</td>
</tr>
<tr>
<td></td>
<td>b. Aligning flat sides of hoseline</td>
</tr>
<tr>
<td></td>
<td>c. Hand tight</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>7. Fire Fighter #2 positions connection</td>
<td>7a. Gently</td>
</tr>
<tr>
<td></td>
<td>b. With hoseline flat</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO COUPLE HOSELINE, ONE-PERSON, BETWEEN-THE-FEET METHOD

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9

**BEHAVIORAL OBJECTIVE:**

- **Condition:** Sufficient hoseline with male and female couplings and appropriate personal protective equipment
- **Behavior:** The student will couple the hoseline using the one-person, between-the-feet method
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Two lengths of 2½" hoseline with male and female couplings
- Appropriate personal protective equipment

**REFERENCES:**
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

**PREPARATION:** Staffing on the fireground is sometimes limited. Fire fighters must become proficient in performing tasks without the aid of another fire fighter.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Sections outstretched</td>
</tr>
<tr>
<td></td>
<td>b. Male and female couplings facing each other</td>
</tr>
<tr>
<td>2. Position yourself</td>
<td>2a. Standing</td>
</tr>
<tr>
<td></td>
<td>b. Facing the two couplings</td>
</tr>
<tr>
<td></td>
<td>c. One foot near male coupling</td>
</tr>
<tr>
<td>3. Step on hoseline</td>
<td>3a. Directly behind male coupling</td>
</tr>
<tr>
<td></td>
<td>b. Either foot</td>
</tr>
<tr>
<td>4. Apply pressure to tilt up</td>
<td>5a. Against other side of coupling</td>
</tr>
<tr>
<td>coupling</td>
<td>b. Maintaining balance</td>
</tr>
<tr>
<td>5. Position other foot</td>
<td>6a. One hand directly behind coupling</td>
</tr>
<tr>
<td></td>
<td>b. Other hand on coupling swivel</td>
</tr>
<tr>
<td></td>
<td>c. Grasping firmly</td>
</tr>
<tr>
<td>6. Pick up female coupling</td>
<td>7a. Checking gasket, threads, and shape</td>
</tr>
<tr>
<td></td>
<td>b. Looking for obstructions</td>
</tr>
<tr>
<td>7. Inspect couplings</td>
<td>8a. Aligning Higbee indicator</td>
</tr>
<tr>
<td>8. Align couplings</td>
<td>9a. Twisting counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until click</td>
</tr>
<tr>
<td>9. Set the threads</td>
<td>10a. Connecting couplings</td>
</tr>
<tr>
<td>10. Turn swivel clockwise</td>
<td>b. With thumb</td>
</tr>
<tr>
<td></td>
<td>c. Hands tight</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>11. Position connection</td>
<td>11a. On the ground</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. With hoseline flat</td>
</tr>
<tr>
<td></td>
<td>d. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO COUPLE HOSELINE, ONE-PERSON, OVER-THE-HIP METHOD

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9

**BEHAVIORAL OBJECTIVE:**

- **Condition:** Sufficient hoseline with male and female couplings and appropriate personal protective equipment
- **Behavior:** The student will demonstrate how to couple hoseline using the one-person, over-the-hip method
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Two lengths of 2½" hoseline with male and female couplings
- Appropriate personal protective equipment

**REFERENCES:**
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

**PREPARATION:** Maintaining a constant supply of water to extinguish a fire can be critical. If you must extend hoseline or replace a hoseline during active fire fighting you should be able to couple hoseline automatically. If you fail to perform during an emergency it could mean personal embarrassment or worse, loss of life or property.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Sections outstretched</td>
</tr>
<tr>
<td></td>
<td>b. Male and female couplings facing each other</td>
</tr>
<tr>
<td>2. Position yourself</td>
<td>2a. Standing</td>
</tr>
<tr>
<td></td>
<td>b. Alongside female coupling</td>
</tr>
<tr>
<td></td>
<td>c. Feet well apart for balance</td>
</tr>
<tr>
<td>3. Pick up female coupling</td>
<td>3a. With one hand</td>
</tr>
<tr>
<td></td>
<td>b. Directly behind coupling</td>
</tr>
<tr>
<td></td>
<td>c. Firmly</td>
</tr>
<tr>
<td>4. Pick up male coupling</td>
<td>4a. With the other hand</td>
</tr>
<tr>
<td></td>
<td>b. Directly behind coupling</td>
</tr>
<tr>
<td>5. Inspect couplings</td>
<td>5a. Gasket</td>
</tr>
<tr>
<td></td>
<td>b. Threads</td>
</tr>
<tr>
<td></td>
<td>c. Shape</td>
</tr>
<tr>
<td></td>
<td>d. Obstructions</td>
</tr>
<tr>
<td>6. Position female coupling</td>
<td>6a. Hoseline straight behind body</td>
</tr>
<tr>
<td></td>
<td>b. Knee closest to hoseline slightly bent</td>
</tr>
<tr>
<td></td>
<td>c. Hoseline pulled across upper leg (by female coupling)</td>
</tr>
<tr>
<td></td>
<td>d. Palm up</td>
</tr>
<tr>
<td></td>
<td>e. Coupling hanging downward</td>
</tr>
<tr>
<td>7. Position male coupling</td>
<td>7a. Pulling toward the female coupling</td>
</tr>
<tr>
<td></td>
<td>b. Aligning the male and female couplings</td>
</tr>
<tr>
<td></td>
<td>c. Utilizing the Higbee cut and indicator</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8. Set the threads</td>
<td>8a. Bringing couplings together</td>
</tr>
<tr>
<td></td>
<td>b. Turning the female swivel counterclockwise until a click is heard</td>
</tr>
<tr>
<td>9. Connect the couplings</td>
<td>9a. Turning the female swivel clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Aligning flat sides of hoseline</td>
</tr>
<tr>
<td></td>
<td>c. Tighten couplings</td>
</tr>
<tr>
<td>10. Place couplings on ground</td>
<td>10a. Gently</td>
</tr>
<tr>
<td></td>
<td>b. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO UNCOUPLE A TIGHT COUPLING, ONE-PERSON, KNEE-PRESS METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

**Condition:** Sufficient hoseline with male and female couplings and appropriate personal protective equipment

**Behavior:** The student will uncouple a tight coupling using the one-person, knee-press method

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Two lengths of 2½" hoseline with male and female couplings
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

If you come upon a coupling that is stubborn or too tight, you will need two spanners to uncouple the connection. Under normal circumstances, you have only one spanner. To look for another would cost valuable time -- you may be inside a building or a considerable distance from apparatus. For these reasons and others, it will be of value to learn how to break a tight coupling without the aid of spanners.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grasp hoseline</td>
<td>1a. Behind female coupling</td>
</tr>
<tr>
<td></td>
<td>b. Either hand</td>
</tr>
<tr>
<td>2. Stand coupling</td>
<td>2a. On male end</td>
</tr>
<tr>
<td></td>
<td>b. Vertically</td>
</tr>
<tr>
<td>3. Bend hoseline</td>
<td>3a. Close to the male coupling</td>
</tr>
<tr>
<td>4. Position yourself properly</td>
<td>4a. Feet well apart for balance</td>
</tr>
<tr>
<td>5. Place knee on coupling</td>
<td>5a. On top of female coupling</td>
</tr>
<tr>
<td>6. Apply pressure</td>
<td>6a. Downward</td>
</tr>
<tr>
<td></td>
<td>b. Keeping thigh vertical with the coupling</td>
</tr>
<tr>
<td></td>
<td>c. Applying body weight to connection</td>
</tr>
<tr>
<td>7. Uncouple coupling</td>
<td>7a. Quickly</td>
</tr>
<tr>
<td></td>
<td>b. Snapping swivel counterclockwise</td>
</tr>
<tr>
<td></td>
<td>c. To loosen connection</td>
</tr>
<tr>
<td>8. Lay couplings down</td>
<td>8a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Without damage</td>
</tr>
<tr>
<td></td>
<td>c. Gently</td>
</tr>
<tr>
<td></td>
<td>d. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO UNCOUPLE A TIGHT COUPLING, TWO-PERSON, STIFF-ARM METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with male and female couplings and appropriate personal protective equipment

Behavior: The students will uncouple a tight coupling using the two-person, stiff-arm method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Two lengths of 2½" hoseline with male and female couplings
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: If you come upon a coupling that is stubborn or too tight, you will need two spanners to uncouple the connection. Under normal circumstances, you have only one spanner. To look for another would cost valuable time -- you may be inside a building or a considerable distance from apparatus. For these reasons and others, it will be of value to learn how to break a tight coupling without the aid of spanners.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position yourselves</td>
<td>1a. Facing each other</td>
</tr>
<tr>
<td>2. Position feet</td>
<td>2a. Feet well apart for balance</td>
</tr>
<tr>
<td></td>
<td>b. Not straddling hoseline</td>
</tr>
<tr>
<td>3. Grasp couplings</td>
<td>3a. With both hands</td>
</tr>
<tr>
<td></td>
<td>b. Arms stiff and straight</td>
</tr>
<tr>
<td></td>
<td>c. Grip tightly</td>
</tr>
<tr>
<td>4. Lean away</td>
<td>4a. Opposite direction of turn</td>
</tr>
<tr>
<td>5. Uncouple couplings</td>
<td>5a. Using weight of bodies</td>
</tr>
<tr>
<td></td>
<td>b. Quickly</td>
</tr>
<tr>
<td></td>
<td>c. Snapping swivel counterclockwise</td>
</tr>
<tr>
<td></td>
<td>d. To loosen connection</td>
</tr>
<tr>
<td>6. Position fittings</td>
<td>6a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Without damage</td>
</tr>
<tr>
<td></td>
<td>c. Gently</td>
</tr>
<tr>
<td></td>
<td>d. Safely</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ATTACH A NOZZLE TO A HOSELINE, ONE-PERSON, TILT METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with male coupling, one fog nozzle with corresponding threads, and appropriate personal protective equipment

Behavior: The student will attach a nozzle to a hoseline using the one-person, tilt method

Standard: Completing all operations within _________ according to the job breakdown

MATERIALS NEEDED:

• Job breakdown
• Length of 2½” hoseline with male coupling
• Fog nozzle
• Appropriate personal protective equipment

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
• Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

The effective use of fire nozzles in conjunction with fire hoseline is essential in fire fighting. You may be in a position where you must attach a nozzle to a hoseline to quickly attack and knock down a fire. If you are not proficient with this task, greater fire loss could occur.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Outstretched</td>
</tr>
<tr>
<td>2. Hold nozzle</td>
<td>2a. With both hands</td>
</tr>
</tbody>
</table>
| 3. Position yourself        | 3a. Standing  
|                              |   b. Facing the male coupling                                              |
|                              |   c. One foot near male coupling                                           |
| 4. Step on hoseline         | 4a. Either foot  
|                              |   b. Directly behind male coupling                                         |
|                              |   c. Applying pressure to tilt coupling upward                             |
| 5. Inspect nozzle           | 5a. Checking for gasket, threads, and obstructions                          |
| 6. Align nozzle             | 6a. With male coupling  
|                              |   b. Bring couplings together                                              |
|                              |   c. Aligning Higbee indicator                                             |
| 7. Set threads              | 7a. Twisting counterclockwise                                              |
|                              |   b. Until click                                                           |
| 8. Connect nozzle           | 8a. Turning clockwise  
|                              |   b. Until hand tight                                                      |
| 9. Position nozzle          | 9a. On ground  
|                              |   b. Gently                                                                |
|                              |   c. Safely                                                                |
APPLICATION:
The student will practice performing the operations in the job breakdown while under
supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the
instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our
next session.
TOPIC: HOW TO ATTACH A NOZZLE TO A HOSELINE, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with male coupling, one fog nozzle with corresponding threads, and appropriate personal protective equipment

Behavior: The students will attach a nozzle to a hoseline using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Length of 2½” hoseline with male coupling
- Fog nozzle
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Converting nozzles to hoselines can seem mundane and quite basic. However, during a fire situation when life and property are at stake is when you want to be as proficient as possible in performing this task in a quick and efficient manner.
## FIRE FIGHTER I

### OPERATIONS

<table>
<thead>
<tr>
<th>Operations</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Position hoseline and nozzle   | 1a. On ground  
|                                   | b. Near each other |
| 2. Position fire fighters         | 2a. Standing  
|                                   | b. Facing each other  
|                                   | c. Feet apart for balance |
| 3. Fire Fighter #1 grasps nozzle  | 3a. Both hands  
|                                   | b. Firmly |
| 4. Fire Fighter #2 grasps male coupling | 4a. Both hands  
|                                   | b. Firmly  
|                                   | c. Elbows bent  
|                                   | d. Directly behind coupling |
| 5. Fire Fighter #2 inspect couplings | 5a. Male threads  
|                                   | b. Gasket, swivel, and threads |
| 6. Fire Fighter #1 sets threads   | 6a. Brining nozzle to male coupling  
|                                   | b. Aligning Higbee indicators  
|                                   | c. Fire fighter with male coupling looking away |
| 7. Fire Fighter #1 connects nozzle | 7a. To coupling  
|                                   | b. Turning counterclockwise  
|                                   | c. Until click  
|                                   | d. Turning clockwise  
|                                   | e. Until hand tight  
<p>|                                   | f. Fire fighter with male coupling looking away |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Fire Fighter #2 positions connection</td>
<td>8a. Gently placing on ground</td>
</tr>
<tr>
<td></td>
<td>b. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO SIAMESE TWO LINES INTO ONE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.2 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline, a siamese fitting, and appropriate personal protective equipment

Behavior: The student will connect two parallel lines into a single hoseline using a siamese fitting

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Three lengths of 2½" hoseline
- Siamese fitting
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 3

PREPARATION:

To overcome friction loss and deliver large volumes of water over a long distance, it is common practice to lay two or more parallel hoselines and then join them into one. The task is commonly performed with siamese fittings.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out hoselines</td>
<td>1a. Two hoselines from same direction</td>
</tr>
<tr>
<td></td>
<td>b. Male ends together</td>
</tr>
<tr>
<td></td>
<td>c. One hoseline with female end near male ends of other hoseline</td>
</tr>
<tr>
<td>2. Obtain and check siamese</td>
<td>2a. Threads</td>
</tr>
<tr>
<td></td>
<td>b. Gaskets</td>
</tr>
<tr>
<td>3. Connect siamese</td>
<td>3a. To one supply side line</td>
</tr>
<tr>
<td></td>
<td>b. Foot tilt or other approved method</td>
</tr>
<tr>
<td></td>
<td>c. Hand tight</td>
</tr>
<tr>
<td>4. Connect siamese</td>
<td>4a. To second supply line</td>
</tr>
<tr>
<td></td>
<td>b. Foot tilt or other approved method</td>
</tr>
<tr>
<td></td>
<td>c. Keeping first hoseline out of the way while connecting</td>
</tr>
<tr>
<td></td>
<td>d. Hand tight</td>
</tr>
<tr>
<td>5. Connect siamese</td>
<td>5a. To single discharge line</td>
</tr>
<tr>
<td></td>
<td>b. Foot tilt or other approval method</td>
</tr>
<tr>
<td></td>
<td>c. Keeping supply lines between arms and body over knees</td>
</tr>
<tr>
<td></td>
<td>d. Attaching female coupling with free hand</td>
</tr>
<tr>
<td></td>
<td>e. Hand tight</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO WYE HOSE LINES TOGETHER

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-3.2 and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** Sufficient hose line, a gated wye, and appropriate personal protective equipment
- **Behavior:** The student will wye one line into two lines
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- One length of 2½" hose line
- Two lengths of 1½" hose line
- 2½"-1½" gated wye
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**PREPARATION:**

Certain occasions make it desirable to divide a hose line into two or more hose lines on the fireground. Various types of wye connections are available that will allow you to do this, the most common being the 2½"-1½" gated wye. This appliance is used to divide a 2½" hose line into two easily handled 1½" hose lines.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out hoselines</td>
<td>1a. 1½&quot; hoselines parallel in front of 2½&quot; hoseline</td>
</tr>
<tr>
<td>2. Check gated wye</td>
<td>2a. Threads</td>
</tr>
<tr>
<td></td>
<td>b. Gaskets</td>
</tr>
<tr>
<td></td>
<td>c. Noting position of gates</td>
</tr>
<tr>
<td>3. Attach gated wye</td>
<td>3a. To 2½&quot; hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Foot tilt or other approved method</td>
</tr>
<tr>
<td></td>
<td>c. Hand tight</td>
</tr>
<tr>
<td>4. Attach 1½&quot; hoselines</td>
<td>4a. To gated wye</td>
</tr>
<tr>
<td></td>
<td>4b. Foot tilt or other approved method</td>
</tr>
<tr>
<td></td>
<td>b. Foot tilt will raise wye enough to connect 1½&quot; line</td>
</tr>
<tr>
<td>5. Position gate valves</td>
<td>5a. To desired opened or closed position</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF THE HOSE CLAMP

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-3.2 and SBFS

**BEHAVIORAL OBJECTIVE:**

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of the hose clamp by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Hose clamp tool
- One section of hoseline

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

**PREPARATION:** If a hoseline ruptures or is charged before having a nozzle or appliance attached, you must be able to quickly shut down the line. One method available to you is using a hose clamp.
I. CHARACTERISTICS

A. Allows a hoseline to be shut down at a point other than the engine discharge gate or hydrant valve

   1. Extending hoselines
   2. Broken or ruptured line
   3. Prior to connecting supply line to pump intake
   4. Replacing a burst section of hose line

B. Allows control of a supply line

C. Compresses hose line between two surfaces to stop or prevent flow

II. FUNCTION

A. Place on hose line no further than 5 feet from coupling on the incoming water side

B. The hose clamp should be placed on the hose line so that if the hose rolls it does not roll onto the quick release handle

C. Never stand over the handle when applying or releasing clamp
   1. The handle could swing upward and injure the fire fighter
SUMMARY:

Hose clamp tools are designed to shut off and control the water flow in a hoseline.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO OPERATE A HOSE CLAMP

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.2

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline connected to a water source under pressure, a hose clamp tool, and appropriate personal protective equipment

Behavior: The student will shut-off the water flow using the hose clamp tool

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 2½" hoseline connected to a water source under pressure
- Hose clamp tool
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 3

PREPARATION: The effective use of hoselines is the very foundation of a fire fighter's work. It is critical that you comprehend and perform all hoseline work automatically and with precision. It would be unforgivable for a fire fighting effort to fail because someone could not shut-off the water flow to extend a hoseline.
### Placement Procedure

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hose clamp</td>
<td>1a. If supply line to engine company, at least 20 feet to rear of apparatus</td>
</tr>
<tr>
<td></td>
<td>b. All other lines, not closer than 5 feet to a coupling</td>
</tr>
<tr>
<td></td>
<td>c. On supply side of coupling</td>
</tr>
<tr>
<td>2. Stand to side of hoseline</td>
<td>2a. Facing hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Right shoulder toward supply source</td>
</tr>
<tr>
<td>3. Open and hold hose clamp</td>
<td>3a. Either hand</td>
</tr>
<tr>
<td>4. Lift hoseline</td>
<td>4a. With other hand</td>
</tr>
<tr>
<td></td>
<td>b. Off ground</td>
</tr>
<tr>
<td></td>
<td>c. High enough to place hose clamp on hoseline</td>
</tr>
<tr>
<td>5. Position hose clamp</td>
<td>5a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. So that hoseline is centered in jaws of hose clamp</td>
</tr>
<tr>
<td></td>
<td>c. Position so natural roll of a charged line will not roll and release hose clamp</td>
</tr>
<tr>
<td>6. Close hose clamp</td>
<td>6a. Slowly applying steady pressure</td>
</tr>
<tr>
<td></td>
<td>b. Assuring hoseline remains centered in jaws</td>
</tr>
<tr>
<td>7. Confirm hose clamp</td>
<td>7a. Is locked</td>
</tr>
<tr>
<td></td>
<td>b. Tugging upward on handle</td>
</tr>
</tbody>
</table>
## REMOVAL PROCEDURE

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stand in safe position</td>
<td>1a. Opposite direction of hose clamp travel when opened</td>
</tr>
<tr>
<td>2. Open hose clamp</td>
<td>2a. Slowly releasing pressure</td>
</tr>
<tr>
<td>3. Remove hose clamp</td>
<td>b. Not over hose clamp handle</td>
</tr>
</tbody>
</table>

Stand in safe position:
- Opposite direction of hose clamp travel when opened
- Not over hose clamp handle

Open hose clamp:
- Slowly releasing pressure
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF THE SPANNER WRENCH

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of the spanner wrench by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: It is important that the fire fighter understands the multiple use of the spanner wrench. Used correctly, it can assist in fast and efficient completion of fireground operations.
# How would you tighten hose couplings using the spanner wrench?

## I. TIGHTENING OR LOOSENING HOSE COUPLINGS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>One spanner wrench on lug of each coupling</td>
</tr>
<tr>
<td>B.</td>
<td>Rotate wrenches in opposite direction</td>
</tr>
<tr>
<td>C.</td>
<td>Swivel moves clockwise when facing open butt of male to tighten</td>
</tr>
<tr>
<td>D.</td>
<td>Swivel moves counterclockwise when facing open butt of male when loosening</td>
</tr>
</tbody>
</table>

## II. OPENING AND CLOSING GAS METER VALVES

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Place slotted end over gas meter valve</td>
</tr>
<tr>
<td>B.</td>
<td>Turn valve so handle is at right angle to piping to close</td>
</tr>
</tbody>
</table>

## III. PRYING OPEN DOORS AND WINDOWS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Place chisel end between window frame and edge</td>
</tr>
<tr>
<td>B.</td>
<td>Pry against side that is not mobile</td>
</tr>
<tr>
<td>C.</td>
<td>Watch out for glass breakage</td>
</tr>
</tbody>
</table>

## IV. DOOR STOP

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Place chisel end under door</td>
</tr>
<tr>
<td>B.</td>
<td>Hold door solid and push under door until snug</td>
</tr>
</tbody>
</table>

How is the spanner wrench used in opening and closing gas valves?

How would you open doors and windows with a spanner wrench?

Can the spanner wrench be used as a doorstop?
**SUMMARY:**

Simple tasks on the fireground become difficult if fire fighters are unprepared in their skills. The spanner wrench is a simple tool, commonly found on the fireground. It is capable of performing may essential functions such as prying open doors and windows and opening and closing gas meter valves.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF THE HOSE ROLLER

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-3.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of the hose roller by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 and Hose Practices, IFSTA, Seventh Edition

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Hose roller
- Sections of hoseline

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION:

Many times, it becomes necessary to hoist hoselines aloft. The hose roller becomes an essential part of the process. The hose roller prevents damage to the hoseline from sharp surfaces such as windowsills and building edges. If the purpose and use of the tool is unknown, the operation can consume considerable time and energy.
# CHARACTERISTICS

A. Provides a surface over which hoseline or rope can be pulled without damage due to chaffing or when dragged over sharp surfaces

# FUNCTION

A. Designed to fit over a 90° angled corner
   1. Longest side on horizontal plane

B. Secured with a rope
   1. Attached to long side of hoseline hoist tool

C. Consists of metal frame that fits over window sill or roof edge
   1. Contains two or more rollers over which rope or hoseline is pulled

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. CHARACTERISTICS</td>
<td></td>
</tr>
<tr>
<td>II. FUNCTION</td>
<td>How is a hose roller secured in place?</td>
</tr>
</tbody>
</table>
SUMMARY:

The hose roller is used to hoist hoseline or rope aloft to reduce the possibility of cutting or damaging the rope or hoseline. A fire attack can be severely hampered if a section of hoseline needs to be replaced because it was damaged by a sharp edge. The hose roller is not often used but needs to be remembered for some situations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF HOSE RAMPS AND BRIDGES

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of hose ramps and bridges by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Example of a hose ramp or bridge

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION: Although a simple piece of equipment, the hose ramp or bridge may become an essential part of the fireground operation. Without it, you may not be able to get fire apparatus into an area of the fireground where access is needed, or you may force closure of evacuation routes. In addition, the use of hose ramps or bridges may prevent hoseline failure, or prevent unnecessary damage to hoseline in areas where vehicles and equipment need to access. Hoseline failure may cause a loss of water supply, or injury to people.
## I. CHARACTERISTICS AND FUNCTIONS

A. An essential part of the fireground

B. Designed to protect hoselines and couplings

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ramp elevates vehicle tires up and over the hoseline</td>
</tr>
<tr>
<td>2.</td>
<td>Notch at midsection cradles the hoseline</td>
</tr>
<tr>
<td>3.</td>
<td>Damage from an auto running over a hoseline is greater on uncharged hoselines than charged hoselines</td>
</tr>
<tr>
<td>4.</td>
<td>Prevents unsafe pressure surges at the nozzle</td>
</tr>
</tbody>
</table>

## II. CONSTRUCTION

A. Various materials

1. Metal fabricated
2. Rubber
3. Wood

B. Crude examples can be manufactured from 2"x4" and 4"x4" lumber
SUMMARY:

Hose bridges are designed so that automobiles and fire apparatus can be moved over hoselines without damaging hoseline. Failure to use hose ramps or bridges over hoselines that cross access or evacuation routes may hinder the fireground operations. In addition, lives and property may be jeopardized.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF CHAFING BLOCKS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of chafing blocks by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials Of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials • Examples of chafing blocks


PREPARATION: Hoselines are an important part of any water delivery system. Like other equipment, it must be used and maintained properly. By properly using chafing blocks, you can prevent a great deal of the damage that might otherwise occur to hoselines during fireground operations.
I. CHARACTERISTICS AND FUNCTIONS

A. Designed to fit around or under the hoseline

1. Fit snugly around hoseline
   a) Clamps
   b) Straps
2. Fit under hoseline
   a) Pads
   b) Flat blocks

B. Prevent rubbing of hoseline

1. Due to vibration of engine operations
2. Intake hoselines most common problem

C. Manufactured using a variety of materials

1. Wood
2. Leather
3. Old tires
4. Alternate materials
   a) Cover or wrap with a tarp or salvage cover
   b) Wrap a rag tightly around the hoseline
II. SAFETY CONSIDERATIONS

A. Loss of water supply
   1. Delay in operation
   2. Loss of property

B. Injury to people
   1. Apparatus operator
   2. Public or bystanders

What are the safety issues if a supply line failure occurs?
**SUMMARY:**

Chafing blocks are designed to fit around or under hoselines, to prevent hoseline failure, or to prevent unnecessary damage at points where vibrations are likely to cause damage. Hoseline failure may cause a loss of water supply or injury to people.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials Of Fire Fighting, IFSTA, Fourth Edition*, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: \hspace{1cm} BASIC HOSE LOADS AND FINISHES

TIME FRAME: \hspace{1cm} 1:00

LEVEL of INSTRUCTION: \hspace{1cm} Level II

AUTHORITY: \hspace{1cm} 1997 NFPA 1001 3-3.7, 3-3.9, and 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: \hspace{1cm} A written test

Behavior: \hspace{1cm} The student will confirm a knowledge of the characteristics of basic hose loads and finishes by completing the written test

Standard: \hspace{1cm} With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Hose Practices, IFSTA, Seventh Edition

PREPARATION:
It is vitally important to be aware of how hoseline is loaded on the fire engine. Apparatus hose loads are designed so that the engine can carry out any of the required fire attack or water supply evolutions. It may seem to be a very simple and insignificant task, but if not performed properly, there can be dangerous consequences on the fireground. Imagine arriving on the scene of a structure fire. Your engine company is requested to lay a supply line. As the hoseline pays out of the hose bed, becomes tangled and pulls all the hoseline out. This prevents you from getting water to the fire, causing fireground operations to become completely chaotic. Also, not having a supply line could affect rescue operations for a trapped victim. All fire fighters need to clearly understand the hose loads used by their department and they must be very proficient in loading and deploying the hose loads.
### I. HOSE BED

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the most common name used for the hose compartment?</td>
<td>What is the most common name used for the hose compartment?</td>
</tr>
</tbody>
</table>

**A. Vary in size and shape**

**B. Sometimes built for specific needs**

**C. Most have open slats in the bottom**

1. Enables air to circulate around the hoseline
2. Helps to prevent mildew and rot of woven-jacket hoseline

**D. Front versus rear end of hose bed**

1. Front end is toward the front of the apparatus
2. Rear end is toward the rear of the apparatus

**E. Hose bed divider (separator)**

1. Usually made of sheet metal
2. Allows bed to hold two or more separate loads of hoseline

**F. Split hose bed**

1. Allows loading hoseline for both forward and reverse lays
2. Allows for two or more sizes of hoseline
3. Allows for equal diameter hoseline to be loaded the same way (both forward or both reverse lay hose loads) for versatile operations
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Split bed may be connected for a single long hose lay</td>
<td></td>
</tr>
<tr>
<td>b) Allows for concurrent laying of parallel hoselines</td>
<td></td>
</tr>
</tbody>
</table>

**What are two advantages of equal diameter hoseline loaded the same way in a split hose bed?**

**II. HOSE LOAD FINISH**

A. Description

1. Arrangement of hoseline usually connected to and placed on top of a hose load
2. Can be quickly pulled at the beginning of a forward or reverse lay
3. Increases the versatility of the hose load

B. Categories

1. Reverse lay load finish

a) Provides a working line at the fire scene
b) Expedites making a full or partial strip of hoseline and equipment
c) Entire length of hoseline needed to reach structure from street can be pulled in one motion

**What is a hose load finish?**

**What is the purpose of the reverse lay load finish?**

**What is the primary advantage of the reverse lay load finish?**
### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>d)</strong></td>
<td>Designed so one person can pull entire finish from hose bed</td>
</tr>
<tr>
<td><strong>e)</strong></td>
<td>Gated wye preferred over hose clamp to provide better control of incoming water</td>
</tr>
<tr>
<td><strong>f)</strong></td>
<td>Disconnect and remove finish before laying underlying hoseline for supply line</td>
</tr>
<tr>
<td><strong>g)</strong></td>
<td>Three types of reverse lay hose load finishes (elaborate)</td>
</tr>
<tr>
<td></td>
<td>1) Cisco</td>
</tr>
<tr>
<td></td>
<td>2) Reverse horseshoe</td>
</tr>
<tr>
<td></td>
<td>3) Skid load</td>
</tr>
<tr>
<td><strong>h)</strong></td>
<td>Forward lay finish for reverse lay hose load</td>
</tr>
</tbody>
</table>

### APPLICATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Why is the gated wye most often used for the reverse lay load finish instead of a hose clamp?</td>
<td></td>
</tr>
<tr>
<td>What is the disadvantage of a reverse lay load finish when the underlying hoseline is needed for a supply line instead of an attack line?</td>
<td></td>
</tr>
<tr>
<td>How would you finish a reverse lay hose load so that it could also be used for a forward hose lay?</td>
<td></td>
</tr>
</tbody>
</table>

1) Couple double female adapter at end of hoseline
2) Strap together 50 feet of hoseline with a hydrant wrench
How is this main advantage of this load finish over the more elaborate reverse hose lay load finishes?

3) Finish does not need to be removed before either forward or reverse lay

2. Forward lay load finish

a) Provide additional hoseline to reach from place where pumper starts forward lay to the water source for hydrant connection

b) Speeds the pulling of hoseline for hydrant supply operation

c) Not as elaborate as finish for reverse lay

d) Needed when a pumper cannot easily access a hydrant

1) Hydrant set back on narrow drive within apartment complex

2) Vehicles or other obstructions limit direct access to hydrant

e) Forward lay hose load finish methods

1) Donut roll attached to end of supply hoseline
## III. SUPPLY LINE LOADS

### A. Basic load choices

1. Accordion
2. Horseshoe
3. Flat
4. Combination of these loads

### B. Setting up hose load for forward lay

1. Place male coupling in hose bed first
2. Female coupling leaves hose bed first when hoseline is laid

### C. Setting up hose load for reverse lay

a) Place female coupling in hose bed first
b) Male coupling leaves hose bed first when hoseline is laid
### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D.</td>
<td>Layer of hoseline in a hose load referred to as a &quot;tier&quot;</td>
</tr>
<tr>
<td>E.</td>
<td>Each fold at end of hose bed often referred to as a &quot;flake&quot;</td>
</tr>
<tr>
<td>F.</td>
<td>Folds often staggered when loaded to prevent accordion effect of hoseline</td>
</tr>
<tr>
<td></td>
<td>1. Each alternating fold slightly shorter or longer than previous fold</td>
</tr>
<tr>
<td></td>
<td>2. Technique for flat load differs from accordion and horseshoe loads</td>
</tr>
<tr>
<td>G.</td>
<td>&quot;Dutchman&quot; sometimes used in hose loads</td>
</tr>
</tbody>
</table>

### APPLICATION

In a hose load, what is a layer of hoseline referred to as?

What is a Dutchman and what purposes does it serve?

1. Short fold or reverse bend in hoseline
2. Serves two purposes  
   a) Changes direction of coupling 
   b) Changes location of coupling 
3. Prevents coupling from turning or flipping in hose bed

### IV. ACCORDION LOAD

A. Derives name from appearance after loading 
B. Laid progressively on edge in equal length folds 
   1. Folds lie adjacent to each other 

What are the advantages?

C. Advantages of accordion load 
   1. Easy to load 
   2. Allows for aeration of hoseline in bed if damp
3. Simple design
4. Only requires 2-3 people to load
   a) Though 4 is best
5. Completed in a matter of minutes
6. Shoulder carries easily taken from load
   a) Pick up a number of folds
   b) Place folds on shoulder

What are the disadvantages of the accordion load?

D. Disadvantages of accordion load
1. Hoseline folds contain sharp bends at both ends
   a) Requires periodic reload of hoseline if not used regularly
   b) Periodically relocating bends within each length to prevent damage to lining
2. Hoseline tends to wear along its edges due to combined effect of two factors
   a) Vibration caused by apparatus motion
   b) Weight of the layered hoseline on itself

Why is the accordion load not recommended LDH?

3. Not recommended for LDH
   a) Remaining folds in bed fall over into flat position as hoseline lays out
   b) Could cause folds to become entangled
V. HORSESHOE LOAD

A. Derives its name from appearance after loading
B. Loaded on edge
   1. Hoseline laid around perimeter of hose bed
   2. U-shaped configuration
   3. Each length laid progressively from outside of bed toward inside
   4. Last length at center of horseshoe

C. Advantages
   1. Primary advantage of fewer sharp bends than accordion or flat loads
   2. Allows aeration of hoseline in bed if damp

D. Disadvantages
   1. Hoseline may lay out wavy or snakelike in the street
      a) While hoseline is pulled alternately from one side of bed, then other side
      b) Most often occurs from wide hose beds
   2. Folds for shoulder carry not as easily obtained as an accordion load
      a) Two people required to make shoulder folds for carry
   3. Promotes wear on edges of hoseline

What is the primary advantage of the horseshoe load?

What are the disadvantages of the horseshoe load?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Not recommended for LDH</td>
<td>Why is this load not recommended for LDH?</td>
</tr>
<tr>
<td>a) Remaining folds in bed fall over into flat position as hoseline lays out</td>
<td></td>
</tr>
<tr>
<td>b) Could cause folds to become entangled</td>
<td></td>
</tr>
</tbody>
</table>

VI. FLAT LOAD

A. Hoseline laid flat rather than on edge

B. Advantages
   1. Easiest to load
   2. Suitable for any size supply line
   3. Best method for loading LDH
   4. Less subject to wear from apparatus wear during travel

C. Disadvantages
   1. Hoseline folds contain sharp bends at both ends
      a) Requires periodic reload of hoseline if not used regularly
      b) Periodically relocating bends within each length to prevent damage to lining

   How does the flat load differ from the accordion and horseshoe loads?

   What are the advantages of a flat load?

   What are the disadvantages of a flat load?
2. Does not permit good aeration of hoseline in bed if damp
3. Two people required to make folds for shoulder carries

VII. PRECONNECTED HOSE LOADS FOR ATTACK LINES

A. Preconnected hoselines
   1. Primary lines used for fire attack by most fire departments
   2. Connected to a discharge valve
   3. Placed in an area other than main hose bed

4. Generally range from 50-250 feet in length

5. Places where preconnected attack lines can be carried
   a) Longitudinal beds
   b) Raised trays
   c) Transverse (crosslay) beds
   d) Tailboard compartments
   e) Side compartments or bins
   f) Front bumper wells
   g) Reels
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Preconnected hose loads</td>
<td></td>
</tr>
<tr>
<td>1. Preconnected flat load</td>
<td>How does the preconnected flat load differ from the supply hose flat load?</td>
</tr>
<tr>
<td>a) Adaptable for varying widths of hose beds</td>
<td></td>
</tr>
<tr>
<td>b) Often used in transverse hose beds</td>
<td></td>
</tr>
<tr>
<td>c) Similar to flat load for larger supply line with two exceptions</td>
<td>Why are pull loops placed at regular intervals within the preconnected flat load?</td>
</tr>
<tr>
<td>1) Hoseline is preconnected</td>
<td></td>
</tr>
<tr>
<td>2) Loops provided to aid in pulling load from bed</td>
<td></td>
</tr>
<tr>
<td>d) Pull loops placed at regular intervals within load</td>
<td>What two factors most affect the number of pull loops and the intervals at which they are placed?</td>
</tr>
<tr>
<td>1) Allows equal portions of load to be pulled from bed</td>
<td></td>
</tr>
<tr>
<td>2) Number of loops and placement intervals dependent upon two factors</td>
<td></td>
</tr>
<tr>
<td>- Size of hoseline</td>
<td></td>
</tr>
<tr>
<td>- Total length of hoseline</td>
<td></td>
</tr>
</tbody>
</table>
### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Triple layer load</strong></td>
<td><strong>e) Three layers must be completely removed from bed before leading in nozzle end of hoseline</strong></td>
</tr>
<tr>
<td>a) Load begins with hoseline folded in three layers</td>
<td>1) Each layer could be as long as 50 feet</td>
</tr>
<tr>
<td>b) Three folds laid into bed in an &quot;S-shaped&quot; fashion</td>
<td>2) Can be a problem if other apparatus are parked at rear end of hose bed</td>
</tr>
<tr>
<td>c) Designed to be pulled by one person</td>
<td></td>
</tr>
<tr>
<td>d) Can be used for all sizes of attack lines</td>
<td></td>
</tr>
</tbody>
</table>

### APPLICATION

How many people are needed to pull hoseline from a preconnected flat load?

- **e) Pulled by one person, but longer lengths may require two people**

What size hoseline is the triple layer load most intended for?

- **1) Often preferred for larger lines too cumbersome for shoulder carries**
- **2) Usually 2½" diameter hoseline**

What is a disadvantage of the triple layer load?

- **e) Three layers must be completely removed from bed before leading in nozzle end of hoseline**

3. **Minuteman load**

- **a) Designed to be pulled and advanced by one person**
What is the primary advantage of the minuteman load?

b) Advantages

1) Carried on shoulder, completely clear of ground, preventing snags on obstacles
2) Pays off shoulder as fire fighter advances toward fire
3) Well suited for narrow bed

What are the disadvantages?

c) Disadvantages

1) Can be awkward to carry when wearing a SCBA
2) If loaded as single stack, may collapse on shoulder if not held tightly in place

4. Booster line reels

a) Preconnected hoseline usually carried coiled upon reels

b) May be mounted several places

1) Some mounted above fire pump and behind apparatus cab

- Provides hoseline to be unrolled from either side of apparatus
2) Other reels mounted on front bumper or in rear compartment

c) Available in hand and power-operated reels

What is gained by placing a booster line reel in this location?
d) Noncollapsible hoseline most often used
   1) Loaded one layer at a time in an even manner
      • Allows maximum amount to be loaded
      • Provides easiest removal
   2) Usually 1" hoseline

What is the greatest limitation to the advancement of hoseline from a booster reel?

VIII. HOSE LOADING GUIDELINES
   A. Coupling hoseline

1. Check gaskets and swivel before connecting hoseline

Before coupling hoseline, what should you check the female coupling for?

2. Keep flat sides of hoseline in same plane

To keep hoseline lengths flat, what should check while the hoseline is being coupled?

3. Alignment of lugs
   a) Not important for standard threaded couplings

When is the alignment of lugs on a coupling a factor?
b) Usually a factor for quick-connect or Storz type couplings

4. Coupling tightness

   a) Hand tight when two sections of hoseline are connected
   b) Do not use wrenches or undue force
   c) Adapters/appliances coupled to hoseline in load finish

B. Loading hoseline

   1. Remove wrinkles from fire hoseline
      a) When it must be bent to form a loop in hose bed

How tight should two sections of hoseline be coupled?

When an adapter, such as a double-female fitting, is attached to the end of a hose load as a finish for versatility and it is intended for rapid removal, how tight should it be coupled to the hoseline?

1) Adapter intended for quick removal should be looser than hand tight
   - Some departments use term "finger tight"
   - Snug enough that fitting can be loosened by force of finger pushing against lug

2) Sometimes reducers on LDH are "finger-tight"

3) Gated wye is usually hand tight
### PRESENTATION

b) Performed by pressing with fingers so inside of bend is smoothly folded

### APPLICATION

What hose load technique should you use to prevent couplings from turning or flipping in the hose bed?

2. Use "Dutchman" so couplings don't turn when pulled from bed

3. Load LDH so that couplings will not pass each other or turn over when deployed

### APPLICATION

What are two ways that couplings may be loaded in a hose bed without passing each other or turning in hose bed when deployed?

a) All couplings may be placed at front of bed, or

b) Couplings may be staggered from front to rear of bed

4. Do not pack hoseline too tightly

### APPLICATION

What happens if hoseline is packed too tightly when loaded into the hose bed?

a) Puts excess pressure on folds of hoseline

1) Causing couplings to snag when hoseline pays out
b) Hoseline should be loose enough to allow a hand to be easily inserted between folds
SUMMARY:

A well-trained engine crew should be able to perform any fire attack or water supply evolution quickly and efficiently. Part of this efficiency is how the crew trains and performs, while the design and layout of the hose bed, the type of hoseline, and its couplings determine the other parts. Although the loading of hoseline on fire apparatus is not an emergency operation, it is a vital operation that must be done correctly. When fire hoseline is needed at a fire, the proper hoseline load permits efficient and effective operations. Regardless of the intended purpose of the hose load, time and care taken during the loading of hoseline will be repaid many times over when pulling the hose loads off during an incident.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO MAKE THE ACCORDION LOAD, THREE-PERSON METHOD

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Four lengths of hoseline, an appropriate hose bed, and appropriate personal protective equipment

Behavior: The students will load four lengths of hoseline into a hose bed using the accordion load, three-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Four 50 foot lengths of 2½" or 3" hoseline
- Appropriate hose bed
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Essentials of Fire Fighting Student Application, IFSTA, Fourth Edition, Lesson 12A, Job Sheet 12A-B

PREPARATION: The accordion load is an effective load for extending hoselines up staircases and/or shoulder loading hoseline. If the hoseline is loaded improperly, it may be impossible to rapidly accomplish these tasks. An improperly placed coupling or poor transition to the next tier below may spell disaster. Three fire fighters are usually used to load the hoseline.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pick up coupling</td>
<td>1a. Male coupling for a forward-loaded bed</td>
</tr>
<tr>
<td></td>
<td>b. Female coupling for a reverse-loaded bed</td>
</tr>
<tr>
<td>2. Place coupling</td>
<td>2a. In any corner of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Near hose bed divider</td>
</tr>
<tr>
<td></td>
<td>c. Usually center of hose bed divider</td>
</tr>
<tr>
<td></td>
<td>d. Usually in rear of apparatus</td>
</tr>
<tr>
<td>3. Stand hoseline</td>
<td>3a. On edge in hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Starting from coupling</td>
</tr>
<tr>
<td></td>
<td>c. In a front to back or back to front manner</td>
</tr>
<tr>
<td>4. Make fold (loop)</td>
<td>4a. At front or rear of apparatus hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Folds (loops) may be staggered</td>
</tr>
<tr>
<td></td>
<td>c. Making a tight fold (loop)</td>
</tr>
<tr>
<td>5. Place hoseline</td>
<td>5a. Back on itself</td>
</tr>
<tr>
<td></td>
<td>b. To opposite bed</td>
</tr>
<tr>
<td></td>
<td>c. Flat side to flat side</td>
</tr>
<tr>
<td></td>
<td>d. On edge</td>
</tr>
<tr>
<td>6. Continue until a coupling is reached</td>
<td>6a. Back and forth</td>
</tr>
<tr>
<td></td>
<td>b. Packing hoseline tightly and neatly</td>
</tr>
<tr>
<td>7. Stagger couplings</td>
<td>7a. In hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Fully utilizing hose bed</td>
</tr>
<tr>
<td></td>
<td>c. Allowing easy removal of hoseline</td>
</tr>
<tr>
<td></td>
<td>d. Preventing couplings from touching or interfering with folds</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 8. Use Dutchman, short fold, or reverse bend | 8a. To position coupling for proper exit, if necessary  
b. So coupling will pull straight out without having to turn around |
| 9. Rise to the next tier | 9a. Gradually  
b. When the other side of the hose bed is reached  
c. From front to rear continuing to load hoseline across in the opposite direction  
d. From the rear to front passing hoseline around rear, down the side and back to initial starting point, one tier above |
| 10. Continue to load hoseline | 10a. By the same method  
b. Until all hoseline is loaded |
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO MAKE THE FLAT LOAD, TWO-PERSON METHOD

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-5.4

**BEHAVIORAL OBJECTIVE:**

- **Condition:** Four lengths of hoseline, appropriate hose bed, and appropriate personal protective equipment

- **Behavior:** The students will load four lengths of hoseline into a hose bed using the two-person, flat load method

- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Four 50 foot lengths of 2½" or 3" hoseline
- Appropriate hose bed
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**PREPARATION:** The flat load is an easy load for a single person to perform. It flakes out easily and makes efficient utilization of the hose bed. However, if loaded improperly, it may not make full use of the hose bed and may be difficult to pull out.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
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<td>1. Pick up coupling</td>
<td>1a. Male coupling for a forward-loaded bed</td>
</tr>
<tr>
<td></td>
<td>1b. Female coupling for a reverse-loaded bed</td>
</tr>
<tr>
<td>2. Place coupling</td>
<td>2a. In any corner of hose bed</td>
</tr>
<tr>
<td></td>
<td>2b. Near hose bed divider</td>
</tr>
<tr>
<td></td>
<td>2c. Usually center hose bed divider</td>
</tr>
<tr>
<td></td>
<td>2d. Usually in rear of apparatus</td>
</tr>
<tr>
<td>3. Lay hoseline</td>
<td>3a. Flat in hose bed</td>
</tr>
<tr>
<td></td>
<td>3b. Starting from coupling</td>
</tr>
<tr>
<td></td>
<td>3c. In a front to back or back to front manner</td>
</tr>
<tr>
<td></td>
<td>3d. Flat parallel to the hose bed or divider</td>
</tr>
<tr>
<td>4. Make folds</td>
<td>4a. At front and rear of hose bed</td>
</tr>
<tr>
<td></td>
<td>4b. Staggered</td>
</tr>
<tr>
<td></td>
<td>4c. Laying side by side</td>
</tr>
<tr>
<td></td>
<td>4d. Making a tight fold (loops)</td>
</tr>
<tr>
<td>5. Place hoseline</td>
<td>5a. Back on itself</td>
</tr>
<tr>
<td></td>
<td>5b. Until hoseline is at approximate midpoint of hose bed</td>
</tr>
<tr>
<td>6. Lay hoseline</td>
<td>6a. In a slight diagonal order</td>
</tr>
<tr>
<td></td>
<td>6b. To the rear of the apparatus</td>
</tr>
<tr>
<td></td>
<td>6c. So next flake will lay alongside the first</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 7. Place hoseline | 7a. Back on itself  
|  | b. To front of apparatus  
|  | c. Over diagonal section  
| 8. Make each succeeding flake in the same manner | 8a. Same length on each tier  
| 9. Stagger couplings | 9a. In hose bed  
|  | b. Fully utilizing hose bed  
|  | c. Preventing couplings from touching or interfering with folds  
| 10. Use Dutchman, short fold or reverse bend | 10a. To position couplings for proper exit, if necessary  
|  | b. So coupling will pull straight out without having to flip over  
| 11. Place hoseline | 11a. Back on itself  
|  | b. When other side of the hose bed is reached  
|  | c. To start the next tier  
|  | d. Staggering each tier  
|  | e. Approximately 4 inches from front and back  
| 12. Continue to load hoseline | 12a. By the same method  
|  | b. Until all hoseline is loaded  
|  | c. Until complement is reached |
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE THE HORSESHOE LOAD, TWO-PERSON METHOD

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Four lengths of hoseline, an appropriate hose bed, and appropriate personal protective equipment

Behavior: The students will load four lengths of hoseline into a hose bed using the two-person, horseshoe load

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Four 50 foot lengths of 2½" or 3" hoseline
- Appropriate hose bed
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: The horseshoe load places fewer bends in the hoseline than the accordion or flat loads, but the flakes are considerably longer and are unequal in length. However, the horseshoe load is very effective for rapidly working hoselines into operation or for dragging hoseline on a street. If loaded improperly, it may be very difficult to pull from the apparatus.
<table>
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<tr>
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</tr>
</thead>
<tbody>
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<td>1a. Male coupling for a forward-loaded bed</td>
</tr>
<tr>
<td></td>
<td>1b. Female coupling for a reverse-loaded bed</td>
</tr>
<tr>
<td>2. Place coupling</td>
<td>2a. In any corner of the hose bed</td>
</tr>
<tr>
<td></td>
<td>2b. Near hose bed divider</td>
</tr>
<tr>
<td></td>
<td>2c. Usually center hose bed divider</td>
</tr>
<tr>
<td></td>
<td>2d. Usually in rear of apparatus</td>
</tr>
<tr>
<td>3. Stand hoseline</td>
<td>3a. On edge in hose bed</td>
</tr>
<tr>
<td></td>
<td>3b. Starting from coupling</td>
</tr>
<tr>
<td></td>
<td>3c. With horseshoe opening to the rear of apparatus</td>
</tr>
<tr>
<td></td>
<td>3d. Continuing around hose bed to the other side</td>
</tr>
<tr>
<td>4. Fold hoseline</td>
<td>4a. Back on itself</td>
</tr>
<tr>
<td></td>
<td>4b. Towards the front of apparatus</td>
</tr>
<tr>
<td></td>
<td>4c. Folds may be staggered</td>
</tr>
<tr>
<td></td>
<td>4d. Making a tight fold (loop)</td>
</tr>
<tr>
<td>5. Continue to load hoseline</td>
<td>5a. Toward the center</td>
</tr>
<tr>
<td></td>
<td>5b. In horseshoe fashion</td>
</tr>
<tr>
<td></td>
<td>5c. Until coupling is reached</td>
</tr>
<tr>
<td>6. Stagger couplings</td>
<td>6a. In the hose bed</td>
</tr>
<tr>
<td></td>
<td>6b. Fully utilizing hose bed</td>
</tr>
<tr>
<td></td>
<td>6c. Allowing easy removal of hoseline</td>
</tr>
<tr>
<td></td>
<td>6d. Preventing couplings from touching or interfering with folds</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 7. Use Dutchman, short fold, or reverse bend | 7a. To position couplings for proper exit, if necessary  
7b. So couplings will pull straight out without having to turn around |
| 8. Continue to load hoseline       | 8a. Until the tier is filled  
8b. Loading snugly but not too tight |
| 9. Bring hoseline                  | 9a. Up to next tier |

**METHOD 1**

<table>
<thead>
<tr>
<th>NUM.</th>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 10.  | Raise hoseline                    | 10a. In center on last flake towards front of apparatus  
10b. To lay flat on the tier |
| 11.  | Extend                            | 11a. To a front corner  
11b. At corner place back on edge |
| 12.  | Place hoseline                    | 12a. Back on edge |
| 13.  | Resume loading                    | 13a. In horseshoe fashion |
| 14.  | Continue to load hoseline         | 14a. By the same method on the next tier  
14b. Until all hoseline is loaded  
14c. Until the complement is reached  
14d. Until the hose bed is full |

**METHOD 2**

<table>
<thead>
<tr>
<th>NUM.</th>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 10.  | Bring hoseline                    | 10a. In center of last flake  
10b. Out of rear of apparatus |
| 11.  | Fold hoseline                     | 11a. Around the ends of one-half of the same tier  
11b. Either side to hose bed wall or divider |
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Place hoseline</td>
<td>12a. Between the tier and side of the bed</td>
</tr>
<tr>
<td>13. Pull snugly</td>
<td></td>
</tr>
<tr>
<td>14. Form a short fold</td>
<td>14a. Approximately 2 feet down the side of the bed, which is folded back</td>
</tr>
<tr>
<td></td>
<td>toward the bed wall</td>
</tr>
<tr>
<td></td>
<td>b. <strong>NOT</strong> the center of the bed</td>
</tr>
<tr>
<td>15. Gradually raise</td>
<td>15a. To the next tier</td>
</tr>
<tr>
<td>16. Continue to load hoseline</td>
<td>16a. By the same method on the next tier</td>
</tr>
<tr>
<td></td>
<td>b. Until all hoseline is loaded</td>
</tr>
<tr>
<td></td>
<td>c. Until the complement is reached</td>
</tr>
<tr>
<td></td>
<td>d. Until the hose bed is full</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** PROCEDURES FOR LOADING LARGE DIAMETER HOSE

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-5.4

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the procedures for loading large diameter hose by completing the written test

*Standard:* With a minimum 80% accuracy according to the information contained in the *Hose Practices*, IFSTA, Seventh Edition, Chapter 5

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- *Essentials of Fire Fighting*, IFSTA, Fourth Edition
- *Hose Practices*, IFSTA, Seventh Edition

**PREPARATION:**

With reduced personnel on engine companies and an ever increasing need to provide large fire flows or make long hose lays (over 600 feet), many fire departments are using large diameter hose (LDH). LDH offers a number of advantages over smaller diameter rubber-lined hoses. Synthetic or large diameter rubber-covered hoses can be reloaded wet, allowing apparatus to be placed back in service in less time.

LDH can be loaded on fire apparatus in one of two methods, depending on apparatus configuration. If the apparatus is equipped with a hose reel for LDH, it may be rolled up. If the apparatus only has a hose bed, the LDH will be loaded in the flat load. It is essential for safe deployment of large diameter hose that fire fighters understand and practice the proper techniques for loading hoseline to prevent potential accidents or injuries during hose lay operations.
I. METHODS FOR LOADING LDH ONTO A FIRE APPARATUS

A. Two methods
   1. Flat hose load
   2. Hose reel load

B. Flat hose load

1. Advantages
   a) Easiest hose load method
   b) Best way to load LDH
   c) Less subject to wear from apparatus vibration
   d) Prevents edge chafing
   e) Uses all bed space
   f) Allows hoseline to pay out easily
   g) Allows easier coupling positioning

2. Disadvantages
   a) Hoseline folds contain sharp bends at both ends
   b) Hoseline must be reloaded periodically to relieve stress on hoseline bends
   c) If air is trapped in LDH, the hoseline will set higher in the hose bed

What are the two recommended ways to load LDH?

What are the advantages of the flat hose load?

What are the disadvantages of the flat hose load?
### C. Hose reel load

1. Usually limited to apparatus designated as a hose "wagon"
   a) Primary mission to lay supply line for other apparatus

2. Hydraulically powered reel mounted on rear of apparatus

3. Advantages
   a) No folds/bends in the hoseline
   b) Does not require periodic reload

4. Disadvantages
   a) Only one line can be laid at a time unless multiple reels are mounted on the apparatus body
   b) Travel vibration causes hoseline to work loose
      1) Hangs loosely under the reel
      2) Causes reel to hang up when hoseline is laid

### II. TRAPPED AIR IN LDH

A. Proper draining techniques
   1. Drainage any water out of the lower end while folding over or capping the upper end
      a) Uses the water removal as a kind of vacuum to collapse the hoseline
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) When hoseline is almost drained, fold the other end of the hoseline over</td>
<td>When the hoseline is nearly drained, how do you keep the hoseline from filling with air before being loaded on the apparatus?</td>
</tr>
<tr>
<td>c) If on a flat area, the upwind end should be folded over first</td>
<td>If there is no obvious grade, which end of the hoseline should be folded over or capped first and why?</td>
</tr>
<tr>
<td>1) Prevents wind from filling hoseline with air as it drains</td>
<td></td>
</tr>
<tr>
<td>2. Use a hose wringer to expel air</td>
<td>If no hose wringer is available, what alternative can you use to help remove any residual air?</td>
</tr>
<tr>
<td>3. If no hose wringer, leave a small amount of water in the hoseline to help move any residual air out of the hoseline as hoseline is loaded</td>
<td>If hoseline will not be loaded back into the hose bed (or reel) on the fire scene, what technique should be used to remove air from the hoseline?</td>
</tr>
<tr>
<td>4. Roll hoseline for reload at station</td>
<td></td>
</tr>
</tbody>
</table>
### B. Use hose loading table for rolled hoseline at the station

1. Hoseline from the incident may be rolled up and brought back to the fire station  

What can be used to unrolled hoseline without getting air into the hoseline while it is loaded onto a fire apparatus?

2. Hoseline placed on a hose loading table  
   a) Top of table rotates  
   b) Hoseline unrolled from table as it is loaded onto apparatus hose bed (or hose reel)

### III. COUPLING PLACEMENT PRINCIPLES FOR FLAT HOSE LOAD OF LDH

#### A. Load couplings to pay out straight

1. Avoid becoming lodged or stuck between hose bed and bed cover  
2. Avoid flipping over the top of the hose bed safety grab bar

Why is it important for the couplings to come straight out of the hose bed?

3. Use a Dutchman technique when loading hoseline

What hose load technique should be used to prevent hoseline from flipping in the hose bed during a hose lay operation?
What is a Dutchman?

What is the purpose of a Dutchman?

Why is it important to load LDH in a manner that does not allow couplings to pass each other?

What advantage is gained by loading all couplings at the front of the hose bed?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What are the disadvantages of loading all couplings at the front of the hose bed?</td>
</tr>
</tbody>
</table>

3) Disadvantages
   - Sharp bends behind most of the couplings weaken hoseline over time
   - Couplings that get placed side-by-side could catch on each other if not adjusted properly

b) LDH couplings staggered throughout load
   1) Only first coupling placed at front of hose bed, in corner
   2) Next coupling placed as close to the front of the hose bed, but short of first coupling
   3) Each successive coupling
      - Placed as far forward as possible in the hose bed
      - Cannot pass the previous coupling
   4) Adjustments in loading hoseline necessary to keep load from getting too high
      - Hoseline tends to get higher at couplings when hoseline crosses over top of coupling
      - After each coupling is loaded, next fold of hoseline for that tier (and possibly the next tier) should stop short of coupling
5) Advantages
- Fewer sharp bends in hoseline near couplings
- None of the couplings contact or pass other couplings

6) Disadvantages
- Couplings spread out through load may make load higher in some areas of bed
- Needs frequent adjustments while loading

What advantage is gained by loading LDH in this manner?

What are the disadvantages of this method?

What is the best way to prevent an accordion effect at the front and rear ends of the hose bed?

IV. PREVENTING ACCORDION EFFECT AT ENDS OF HOSE BED
A. Stagger hoseline folds at each end
   1. First tier of hoseline loaded
      a) All the way forward to the front of the hose bed
      b) 8-10 inches short of the rear end of the hose bed
2. Second tier of hoseline loaded  
   a) 8-10 inches short from the front end of the first tier  
   b) All the way to the rear edge of the hose bed  
3. All successive tiers of hoseline alternated  
   a) Odd tiers same as first  
   b) Even tiers same as second

B. Short folds on tiers  
   1. Noticeably reduces accordion effect  
   2. 8-10 inches provides enough of a gap for grasping "long" folds with gloved hands  
   3. Helps reduce sharp bends in the folds on the "long" ends of each tier

V. LOADING LDH FROM THE GROUND  
   A. Loading hoseline while apparatus moving

   1. Assignment of personnel  
      a) One person at rear "buzzer" to signal driver when to move and stop apparatus  
      b) Person(s) in hose bed to load  
      c) Persons on ground to feed hoseline up to person(s) in hose bed
2. **Straddling LDH technique**
   a) Driving slowly forward and progressively loading LDH

   1) **Do not** drive onto hoseline
   2) Ensure adequate clearance between underside of apparatus and hoseline couplings
      - Crown in road
      - Vehicle axle differential clearance from road
   3) Ensure adequate slack so hoseline not taut under vehicle

   b) Driving slowly backward and progressively loading LDH

   1) Less chance of vehicle driving onto hoseline or couplings catching under the apparatus

   2) Can be dangerous for fire fighters, especially at night
      - Driver cannot see fire fighters or obstacles

2. **Driving alongside LDH technique**
   a) Most desirable method

   What precautions must be taken to protect the hoseline from damage using this technique?

   Why is this technique potentially dangerous for fire fighters?
### Why is driving alongside LDH the most desirable method?

- **b)** Driver can see road and hoseline
- **c)** Safest technique for both fire fighters and equipment

### Loading hoseline when apparatus parked

1. May be required for quint apparatus

   - **a)** Aerial apparatus must be raised to access hose bed
   - **b)** Quint must NOT be driven while aerial raised
   - **c)** Quint option for loading LDH

2. At station, utilize hose loading table

### Why must a quint apparatus be parked to load LDH in the hose bed?

- **a)** Aerial apparatus must be raised to access hose bed
- **b)** Quint must NOT be driven while aerial raised
- **c)** Quint option for loading LDH

### If quint apparatus and an engine apparatus are assigned to the same station, what option may be available for reloading LDH on the scene faster?

1) Load LDH directly from engine hose bed to quint hose bed

2) Engine can then drive along LDH and load quint LDH onto engine

### If LDH will be loaded back at the station, what tool can be used to help, if available?

- **2.** At station, utilize hose loading table
<table>
<thead>
<tr>
<th></th>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>On scene, two options</td>
<td>What are two options for loading hoseline on scene when apparatus must be parked?</td>
</tr>
<tr>
<td></td>
<td>a) Drag hoseline to hose bed and load</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Roll hoseline, carry to engine, unroll, and load</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Large diameter hose can be loaded flat or carried on specially designed reels. Proper draining techniques need to be followed to remove all air and water from the hoseline before loading in the hose bed. Coupling placement and reducing the accordion effect are essential for safe hose lay out operations, allowing the hoseline and couplings to pay out cleanly. Large diameter hose may be loaded onto moving or parked apparatus. Moving apparatus requires more precautions and proper placement of personnel for safety during the loading operations. Large diameter hose load operations are time-consuming and personnel-intensive to perform, but the real benefit comes when the apparatus performs hose lay operations safely and efficiently, without complications.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Hose Practices*, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
HOW TO LOAD LARGE DIAMETER HOSE ON A REEL

0:15

Level II

1997 NFPA 1001 3-5.4

Condition: Large diameter hose, hose reel, and appropriate personal protective equipment

Behavior: The student will load 100-feet of LDH on a reel

Standard: Completing all operations within __________ according to the job breakdown

• Job breakdown
• 100 feet of large diameter hose
• Hose reel
• Appropriate personal protective equipment

• Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
• Hose Practices, IFSTA, Seventh Edition, Chapter 5

With reduced personnel on engine companies and an every increasing need to provide a large fire flows, many fire departments are using large diameter hose. With proper training of personnel, large diameter hose can be cost effective, time efficient and provide adequate fire flows. Large diameter hose is stored in several configurations; one of which is on a reel.
## FIRE FIGHTER I

### OPERATIONS

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place coupling</td>
<td>1a. On reel</td>
</tr>
<tr>
<td>2. Hand rotate wheel</td>
<td>2a. To start loading</td>
</tr>
<tr>
<td>3. Activate power-wind switch</td>
<td>b. First wrap over coupling</td>
</tr>
<tr>
<td>4. Load hoseline</td>
<td>4a. Progressively across reel</td>
</tr>
<tr>
<td>5. Set hose reel brake</td>
<td>b. Avoid stacking couplings</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO FLAT LOAD LARGE DIAMETER HOSE, THREE-PERSON METHOD

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-5.4

**BEHAVIORAL OBJECTIVE:**

**Condition:** Six lengths of large diameter hose flaked out on the ground, appropriate hose bed, and appropriate personal protective equipment

**Behavior:** The students will flat load a large diameter hose, three-person method

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Six 50-foot lengths of large diameter hose
- Appropriate hose bed
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**PREPARATION:** LDH must be properly loaded to deploy safely and efficiently. By practicing the basic flat load of LDH, the fire fighter will be able to apply these basic concepts to longer LDH loads.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position fire fighters</td>
<td>1a. One at rear end of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. One at front end of hose bed</td>
</tr>
<tr>
<td></td>
<td>c. One on the ground to feed hoseline into hose bed</td>
</tr>
<tr>
<td>2. Place coupling</td>
<td>2a. In hose bed</td>
</tr>
<tr>
<td></td>
<td>b. At cab end</td>
</tr>
<tr>
<td></td>
<td>c. Either corner</td>
</tr>
<tr>
<td>3. Lay first length of hoseline</td>
<td>3a. In hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Against the hose bed divider or wall</td>
</tr>
<tr>
<td>4. Fold hoseline</td>
<td>4a. Back on itself</td>
</tr>
<tr>
<td></td>
<td>b. 8-10 inches from rear end of hose bed</td>
</tr>
<tr>
<td>5. Lay hoseline</td>
<td>5a. On top of previous length</td>
</tr>
<tr>
<td></td>
<td>b. To front of hose bed</td>
</tr>
<tr>
<td>6. Fold hoseline</td>
<td>6a. 6 inches short of first coupling</td>
</tr>
<tr>
<td>7. Lay hoseline</td>
<td>7a. Back to rear of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Angling hoseline</td>
</tr>
<tr>
<td></td>
<td>c. Making rear fold adjacent to previous fold</td>
</tr>
<tr>
<td>8. Fold hoseline</td>
<td>8a. 8-10 inches from rear end of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Even with first fold</td>
</tr>
<tr>
<td>9. Lay hoseline</td>
<td>9a. To front of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Parallel to previous fold</td>
</tr>
<tr>
<td>10. Fold hoseline</td>
<td>10a. At forward most end of hose bed</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11. Continue laying hoseline</td>
<td>11a. Flat</td>
</tr>
<tr>
<td></td>
<td>b. Progressively across bed</td>
</tr>
<tr>
<td></td>
<td>c. Parallel to sides of hose bed when laid back-to-front</td>
</tr>
<tr>
<td></td>
<td>d. Angling hoseline adjacent to previous fold when laid front-to-back</td>
</tr>
<tr>
<td></td>
<td>e. Until first tier is full</td>
</tr>
<tr>
<td>12. Make folds</td>
<td>12a. At forward most end of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. 8-10 inches from rear end of hose bed</td>
</tr>
<tr>
<td></td>
<td>c. Folds side-by-side at each end</td>
</tr>
<tr>
<td></td>
<td>d. Neat and even</td>
</tr>
<tr>
<td></td>
<td>e. Until first tier is full</td>
</tr>
<tr>
<td>13. Start second tier</td>
<td>13a. With rear end fold equal to rear edge of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Parallel with sides of hose bed</td>
</tr>
<tr>
<td>15. Fold hoseline</td>
<td>15a. 8-10 inches from front end of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. In same manner as first tier</td>
</tr>
<tr>
<td></td>
<td>c. Until next coupling is loaded</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>17. Place second coupling</td>
<td>17a. In hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Far to forward end</td>
</tr>
<tr>
<td></td>
<td>c. Using a dutchman, short fold or reverse bend</td>
</tr>
<tr>
<td></td>
<td>d. Staggered short of first coupling</td>
</tr>
<tr>
<td></td>
<td>e. In position to pull out straight</td>
</tr>
<tr>
<td>18. Continue laying hoseline</td>
<td>18a. Flat</td>
</tr>
<tr>
<td></td>
<td>b. Progressively across bed</td>
</tr>
<tr>
<td></td>
<td>c. Parallel to sides of hose bed when laid back-to-front</td>
</tr>
<tr>
<td></td>
<td>d. Angling hoseline adjacent to previous fold when laid front-to-back</td>
</tr>
<tr>
<td></td>
<td>e. Until second tier is full</td>
</tr>
<tr>
<td>19. Make folds</td>
<td>19a. At rear-most edge of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. 8-10 inches from front end of hose bed</td>
</tr>
<tr>
<td></td>
<td>c. Folds side-by-side at each end</td>
</tr>
<tr>
<td></td>
<td>d. Neat and even</td>
</tr>
<tr>
<td></td>
<td>e. Until second tier is full</td>
</tr>
<tr>
<td>20. Start third tier</td>
<td>20a. With rear end fold 8-10 inches from rear end of hose bed</td>
</tr>
<tr>
<td></td>
<td>b. Equal to first tier &quot;short&quot; loop</td>
</tr>
<tr>
<td></td>
<td>b. Parallel with sides of hose bed</td>
</tr>
<tr>
<td>22. Fold hoseline</td>
<td>22a. At forward most end of hose bed</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 23. Continue laying third tier | 23a. In the same manner as the first tier  
|                             | b. Flat  
|                             | c. Progressively across bed  
|                             | d. Parallel to sides of hose bed when laid back-to-front  
|                             | e. Angling hoseline adjacent to previous fold when laid front-to-back  
|                             | f. Until third tier is full  
| 24. Make third tier folds   | 24a. 8-10 inches from rear end of hose bed  
|                             | b. Approximately 6 inches to rear of second coupling  
|                             | c. At forward-most end of hose bed  
|                             | d. Side-by-side at each end  
|                             | e. Neat and even  
|                             | f. Until third tier is full  
| 25. Adjust third coupling   | 25a. In hose bed  
|                             | b. Far to forward end  
|                             | c. Using a dutchman  
|                             | d. Staggered short of second coupling  
|                             | e. In position to pull out straight  
| 26. Start fourth tier       | 26a. With rear end fold equal to rear edge of hose bed  
| 27. Lay hoseline            | 27a. Back upon itself  
|                             | b. Parallel with sides of hose bed  
<p>| 28. Fold hoseline           | 28a. Approximately 6 inches to rear of third coupling |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 29. Continue laying hoseline | 29a. Of fourth tier  
    b. Flat  
    c. Progressively across bed  
    d. Parallel to sides of hose bed when laid back-to-front  
    e. Angling hoseline adjacent to previous fold when laid front-to-back  
    f. Until fourth tier is full |
| 30. Make folds | 30a. At rear-most edge of hose bed  
    b. 8-10 inches from front end of hose bed  
    c. Folds side-by-side at each end  
    d. Neat and even  
    e. Until fourth tier is full |
| 31. Load subsequent tiers | 31a. Staggering couplings as described  
    b. Keeping couplings from passing each other  
    c. Staggering the folds of each tier  
    d. Making adjustments of folds near couplings as needed |
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: TYPES OF SUPPLY LINE HOSE LAYS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the different types of supply hose lays by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: There are three basic hose lays for supply lines: forward lay, reverse lay, and split lay. Your comprehension of each method will provide a fundamental base for all fireground supply line evolutions.
I. **FORWARD LAY**

A. Refers to the apparatus stopping first at the water source to drop off a supply line and then laying the supply line to the fire

B. Advantages
   1. Apparatus remains at the scene
      a) Tools, hoseline, and equipment are available if needed
   2. Pump operator stays at the scene
      a) Better visualization of the incident
      b) Can react quicker to necessary changes

C. Disadvantages
   1. Second engine is necessary to pump the water source if there is not adequate pressure or volume from the water source

D. Operational procedures
   1. Apparatus stops at the water source
   2. Fire fighter secures supply line to water source
      a) By wrapping hoseline to water source
   3. Fire fighter signals operator of apparatus to proceed, apparatus proceeds to the fire

II. **REVERSE LAY**

A. Refers to the apparatus stopping first at the fire to drop off personnel, hoseline, and equipment and then laying the supply line to the hydrant

What is a forward lay?

What are the advantages and disadvantages of a forward lay?

What is a reverse lay?
What are the advantages and disadvantages of a reverse lay?

B. Advantages
1. Commits less equipment to the incident
2. Most expedient way to lay hoseline if the apparatus that lays the hoseline must stay at the water source
   a) Drafting or boosting hydrant pressure to the supply line

C. Disadvantages
1. Essential fire fighting equipment, including attack line must be left at the incident before laying the supply line
   a) This operation slows down the initial attack on the fire
2. The pump operator for the incident is located away from the incident
   a) Most of the time, cannot see the incident

D. Operational procedures
1. Apparatus stopping at the fire
   a) Personnel and equipment necessary for extinguishing fire is removed from apparatus
   b) Supply line is removed from apparatus and secured by
      1) Footing hoseline
      2) Tying hoseline with a rope or nylon strap

What are the procedures for making a reverse lay?
2. Fire fighter signals operator of apparatus to proceed, apparatus proceeds to the fire

### III. SPLIT LAY

A. Refers to two apparatus making the supply line hose lay
   1. First apparatus laying its line from a point or intersection to the fire
   2. Second apparatus laying its line to the water source

B. Advantages
   1. On narrow driveways, the first-in apparatus can start the lay at the beginning of the driveway at the road intersection and lay the supply line to the fire
   2. The second apparatus in would continue the lay to the hydrant and pump the hydrant
      a) This works particularly well on long hose lays that require more supply line than one apparatus carries

C. Disadvantage
   1. Takes two apparatus

D. Operational procedures
   1. First apparatus stops at intersection or driveway and secures supply line
   2. First apparatus then lays the supply line to the fire

What is a split lay?

When would a split lay be used?

What are the procedures for making a split lay?
3. Second apparatus connects to supply line left at intersection or driveway by first apparatus and continues the lay to the water source

What are the common names for a split lay?

E. Other common names
1. Driveway lay
2. Alley lay
3. "T" or "L" lay

IV. SAFETY PRECAUTIONS WHEN LAYING HOSELINE

A. At the water source
1. Uneven surfaces
2. Slippery surfaces
3. Look before stepping
4. Pull hoseline with legs, not back
5. Shrubs, bushes, manholes, potholes, etc.

B. While apparatus is laying hoseline to the fire
1. Keep eyes on apparatus while apparatus is moving
2. Stay clear of moving apparatus at all times

C. At fire scene
1. Make sure apparatus is fully stopped
2. Wait for officers command to dismount
**SUMMARY:**

The forward, reverse, and split lay supply line hose lays provide the basis of all fireground operations. Your ability to understand each evolution is essential.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: HOW TO MAKE A HYDRANT CONNECTION

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9, 3-3.12, and 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A fire engine equipped with a soft intake hoseline or supply line, hydrant, hydrant wrench, and appropriate personal protective equipment

Behavior: The student will make a hydrant connection

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Engine equipped with a soft intake hoseline or supply line
- Hydrant
- Hydrant wrench
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 1

PREPARATION: When lines are laid from fire to hydrant or if the pump spots next to the hydrant, it will be necessary to connect the pump to the hydrant. This lay can be used when it is necessary to pump large volumes of water, such as supplying master streams and/or pumping to multiple hand lines.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove hydrant cap</td>
<td>1a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Using jerky motion if cap is stuck</td>
</tr>
<tr>
<td>2. Inspect hydrant</td>
<td>2a. For damaged threads</td>
</tr>
<tr>
<td></td>
<td>b. Looking for debris inside the outlet</td>
</tr>
<tr>
<td>3. Place hydrant</td>
<td>3a. On hydrant valve</td>
</tr>
<tr>
<td></td>
<td>b. Valve stem opposite hydrant connection</td>
</tr>
<tr>
<td>4. Turn hydrant wrench</td>
<td>4a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. To open hydrant</td>
</tr>
<tr>
<td></td>
<td>c. Removing dirt and debris</td>
</tr>
<tr>
<td></td>
<td>d. Until water flows clear</td>
</tr>
<tr>
<td>5. Turn hydrant wrench</td>
<td>5a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until water flow stops</td>
</tr>
<tr>
<td>6. Obtain intake hoseline</td>
<td>6a. From running board</td>
</tr>
<tr>
<td></td>
<td>b. From hose lay</td>
</tr>
<tr>
<td>7. Connect hoseline to hydrant</td>
<td>7a. Turning coupling clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until tight</td>
</tr>
<tr>
<td>8. Open hydrant</td>
<td>8a. Turning counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. After receiving signal</td>
</tr>
<tr>
<td></td>
<td>c. Slowly</td>
</tr>
<tr>
<td></td>
<td>d. Until hoseline is full</td>
</tr>
<tr>
<td>9. Tighten connections</td>
<td>9a. That leak</td>
</tr>
<tr>
<td></td>
<td>b. Using hydrant wrench (rubber mallet or spanner)</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO PERFORM A HORSESHOE SHOULDER CARRY

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

- **Condition:** Sufficient hoseline and appropriate personal protective equipment
- **Behavior:** The student will perform a horseshoe shoulder carry
- **Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 50 feet of 2½" hoseline
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Many hours have been spent searching for methods of carrying hoselines from one location to another. In order for it to be done properly and safely, we have developed a uniform method in the horseshoe shoulder carry.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Straight line</td>
</tr>
<tr>
<td></td>
<td>b. Laying flat</td>
</tr>
<tr>
<td></td>
<td>c. Couplings laid down gently</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Either end of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Facing opposite end</td>
</tr>
<tr>
<td></td>
<td>c. To one side</td>
</tr>
<tr>
<td>3. Pick up and hold coupling</td>
<td>3a. At waist level</td>
</tr>
<tr>
<td></td>
<td>b. Either hand</td>
</tr>
<tr>
<td>4. Advance</td>
<td>4a. To opposite coupling</td>
</tr>
<tr>
<td>5. Lay hoseline down</td>
<td>5a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Even with, or within 1 foot from coupling</td>
</tr>
<tr>
<td></td>
<td>c. Coupling laid down gently</td>
</tr>
<tr>
<td>6. Pick up hoseline</td>
<td>6a. At center of loop</td>
</tr>
<tr>
<td>7. Advance</td>
<td>7a. Back to couplings</td>
</tr>
<tr>
<td></td>
<td>b. Hoseline between couplings</td>
</tr>
<tr>
<td></td>
<td>c. Loop laid down even with couplings</td>
</tr>
<tr>
<td>8. Fold hoseline</td>
<td>8a. At center of folded hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Turning on edge</td>
</tr>
<tr>
<td></td>
<td>c. Palms down on hoseline</td>
</tr>
<tr>
<td></td>
<td>d. One foot against hoseline as pivot point</td>
</tr>
<tr>
<td></td>
<td>e. Other foot as balance point</td>
</tr>
<tr>
<td>9. Swing folded hoseline end</td>
<td>9a. Even with couplings</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>10. Shoulder hoseline</td>
<td>10a. Kneeling on knee closest to hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Grasping center of fold</td>
</tr>
<tr>
<td></td>
<td>c. Raising all layers to shoulder</td>
</tr>
<tr>
<td></td>
<td>d. Couplings on bottom</td>
</tr>
<tr>
<td></td>
<td>e. Couplings in front</td>
</tr>
<tr>
<td>11. Stand</td>
<td>11a. Lifting your legs not your back</td>
</tr>
<tr>
<td>12. Carry hoseline</td>
<td>12a. 20 feet</td>
</tr>
<tr>
<td>13. Unload flake</td>
<td>13a. From your shoulder</td>
</tr>
<tr>
<td></td>
<td>b. Grasping hoseline just behind couplings</td>
</tr>
<tr>
<td></td>
<td>c. Flipping hoseline off shoulder</td>
</tr>
<tr>
<td></td>
<td>d. Retaining grasp on couplings</td>
</tr>
<tr>
<td>14. Place couplings</td>
<td>14a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO PERFORM AN ACCORDION SHOULDER CARRY

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.4

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline and appropriate personal protective equipment

Behavior: The student will perform an accordion shoulder carry

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 50-100 feet of 2½” hoseline
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hoseline Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Many hours have been spent searching for methods of carrying fire hoseline from one location to another. In order for it to be done properly and safely, the fire service has developed a uniform method in the accordion shoulder carry.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Position hoseline | 1a. Facing hose bed  
| | b. Grasping nozzle or coupling |
| 2. Take position | 2a. Grasping with both hands the number of folds needed to make up that portion of the shoulder load |
| 3. Pick up and shoulder load | 3a. Pulling folds  
| | b. About one-third of the way out of the bed  
| | c. Twisting folds  
| | d. Into an upright position  
| | e. Turning pivoting into the folds  
| | f. Placing on top of the shoulder |
| 4. Advance forward | 4a. Grasping bundle  
| | b. Tightly  
| | c. With both hands  
| | d. Stepping away from the apparatus  
| | e. Pulling shoulder load completely out of bed  
| | f. Advancing hoseline to the desired location  
| | g. Dropping a fold as necessary |
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO LOAD AND CARRY A WORKING LINE

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9

**BEHAVIORAL OBJECTIVE:**

**Condition:** Three lengths of hoseline with attached nozzle and appropriate personal protective equipment

**Behavior:** The student will load and carry a working line

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Three 50-100 foot lengths of 2½" hoseline with attached nozzle
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

**PREPARATION:**

The advancement of a working line to a desired location for operation must be done correctly and quickly. Fire fighters must operate as a team and communicate with each other. It is imperative that all fire fighters do this operation correctly. Time is a critical factor on the fireground and cannot be wasted on ineffective hose evolutions.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Take position               | 1a. On ground  
|                                | b. Facing hose bed                                                         |
| 2. Grasp nozzle or male coupling | 2a. Coupling against front of body  
|                                | b. Coupling or nozzle facing down  
|                                | c. Chest high                                                              |
| 3. Load hoseline                | 3a. On shoulder  
|                                | b. Flat  
|                                | c. Fold behind knee  
|                                | d. Fold front at waist  
|                                | e. Continue folding front and rear of body until section of hoseline is loaded |
| 4. Uncouple hoseline            | 4a. Counterclockwise  
| 5. Place coupling               | 5a. Of hoseline not shoulder loaded into hose bed  
| 6. Grasp coupling               | 6a. Of last section shoulder loaded  
| 7. Proceed to destination       | 7a. Hoseline must payoff of shoulder to rear  

**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO PERFORM THE DRAIN AND CARRY

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

**Condition:** Two lengths of hoseline with male and female couplings and appropriate personal protective equipment

**Behavior:** The student will perform the drain and carry

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Two 50-foot lengths of 2½" hoseline with male and female couplings
- Appropriate personal protective equipment

REFERENCES:

PREPARATION: It frequently becomes necessary to drain water from a section of hoseline and to carry it a reasonable distance. Draining the hoseline is one task and preparing it to be carried is another. The following technique is a way by which both tasks can be performed at the same time for an accordion shoulder carry. The hoseline does not necessarily need to be in a straight line, but sharp bends make it difficult to load.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prepare hoseline</td>
<td>1a. Couplings disconnected</td>
</tr>
<tr>
<td></td>
<td>1b. Sharp bends removed</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. At male end</td>
</tr>
<tr>
<td></td>
<td>2b. Facing female end</td>
</tr>
<tr>
<td>3. Pick up hoseline</td>
<td>3a. With either hand</td>
</tr>
<tr>
<td>4. Place hoseline</td>
<td>4a. Over shoulder</td>
</tr>
<tr>
<td></td>
<td>4b. Male coupling on back</td>
</tr>
<tr>
<td></td>
<td>4c. At waist level</td>
</tr>
<tr>
<td>5. Fold hoseline</td>
<td>5a. With both hands</td>
</tr>
<tr>
<td></td>
<td>5b. Holding hoseline in front of body</td>
</tr>
<tr>
<td></td>
<td>5c. At knee level</td>
</tr>
<tr>
<td>6. Walk forward</td>
<td>6a. Slowly to opposite end</td>
</tr>
<tr>
<td></td>
<td>6b. Forming loop in front of body</td>
</tr>
<tr>
<td></td>
<td>6c. Gathered loop over same shoulder</td>
</tr>
<tr>
<td></td>
<td>6d. Forming new loop in rear</td>
</tr>
<tr>
<td></td>
<td>6e. Loops knee high front and rear</td>
</tr>
<tr>
<td></td>
<td>6f. Coupling will remain in front</td>
</tr>
<tr>
<td>7. Grasp hoseline</td>
<td>7a. With both hands</td>
</tr>
<tr>
<td></td>
<td>7b. In front</td>
</tr>
<tr>
<td>8. Carry to desired location</td>
<td>8a. At a predetermined point</td>
</tr>
<tr>
<td>9. Lay hoseline down</td>
<td>9a. On ground</td>
</tr>
<tr>
<td></td>
<td>9b. Gently</td>
</tr>
<tr>
<td></td>
<td>9c. Safely</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOpIC: HOW TO ADVANCE THE NOZZLE END OF A HOSELINE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle and appropriate personal protective equipment

Behavior: The student will advance the nozzle end of a hoseline

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle
- Appropriate personal protective equipment

REFERENCES:
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

Once hoselines have been laid out and connected for fire fighting, they must be advanced into final position for applying water on the fire. This task is best accomplished before the hoseline is charged because water adds considerable weight and makes the lines less maneuverable.

There are several ways for one person to advance an uncharged hoseline with a nozzle attached. In most cases, one method is as good as another is, but the important thing to remember is that the nozzle should be secured so that it will not be dropped. This means that hoseline should not be advanced by simply holding onto the nozzle and walking forward, because the hoseline could snag and pull the nozzle from the hands.
## OPERATIONS | KEY POINTS
---|---

### METHOD ONE
1. Drape hoseline
   - Over shoulder
   - Nozzle in front
2. Hold nozzle
   - On opposite side of body
   - To increase stability

### METHOD TWO
1. Grasp nozzle
   - Attached to hoseline
   - Hoseline behind body
   - Nozzle pointing forward
2. Drape hoseline
   - Across body
   - To opposite shoulder
3. Hang nozzle
   - Over opposite shoulder
   - Allowing hands to be free from holding hoseline
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE AN UNCHARGED 2½" HOSELINE WITH ATTACHED NOZZLE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle and appropriate personal protective equipment

Behavior: The student will advance an uncharged hoseline with attached nozzle

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: Once hoselines have been laid out and connected for fire fighting, they must be advanced into final position for applying water on the fire. This is best accomplished before the hoseline is charged because water adds considerable weight and makes the line less maneuverable.
## How To Advance An Uncharged 2½" Hoseline With Attached Nozzle

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out hoseline</td>
<td>1a. With nozzle attached</td>
</tr>
<tr>
<td></td>
<td>b. Straight</td>
</tr>
<tr>
<td>2. Place hoseline and nozzle</td>
<td>2a. Over shoulder</td>
</tr>
<tr>
<td></td>
<td>b. Nozzle in front</td>
</tr>
<tr>
<td></td>
<td>c. At hip level</td>
</tr>
<tr>
<td></td>
<td>d. Secured in the fire fighter's hand</td>
</tr>
<tr>
<td>3. Position hoseline</td>
<td>3a. Diagonally across chest</td>
</tr>
<tr>
<td></td>
<td>b. Hoseline extends past opposite hip</td>
</tr>
<tr>
<td>4. Extend hoseline</td>
<td>4a. To desired position</td>
</tr>
</tbody>
</table>

---

**Operations**

1. Lay out the hoseline.
2. Place the hoseline and nozzle.
3. Position the hoseline.
4. Extend the hoseline.

**Key Points**

1. With nozzle attached.
2. Over shoulder.
3. Diagonally across chest.
4. To desired position.
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE A CHARGED HOSELINE INTO A STRUCTURE, TWO-PERSON METHOD

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A fire engine equipped with a charged hoseline and nozzle, appropriate personal protective equipment, and a suitable structure

Behavior: The students will advance a charged hoseline into a structure using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Fire engine equipped with charged hoseline and nozzle (minimum 150-feet of 1½" hoseline)
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: In order to attack and extinguish fires in structures, it is necessary to advance or stretch hoses from the engine to the seat of the fire. For maximum safety, it is necessary that a fire fighter be alert to the dangers of back draft, flashover, and building collapse as well.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deploy hoseline</td>
<td>b. To point of entry</td>
</tr>
<tr>
<td></td>
<td>c. Using appropriate hoseline pull</td>
</tr>
<tr>
<td>2. Flake hoseline</td>
<td>2a. So it can be easily used</td>
</tr>
<tr>
<td></td>
<td>b. In line with direction of travel</td>
</tr>
<tr>
<td>3. Charge hoseline</td>
<td>3a. Signaling engine operator to charge the hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Bleeding air from nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Appropriate pattern selected (30° or less)</td>
</tr>
<tr>
<td>4. Check door</td>
<td>4a. With ungloved hand or wrist</td>
</tr>
<tr>
<td></td>
<td>b. Starting at bottom of door and moving up</td>
</tr>
<tr>
<td>5. Check for back draft conditions</td>
<td>5a. Door is hot</td>
</tr>
<tr>
<td></td>
<td>b. Smoke &quot;puffing&quot; in and out</td>
</tr>
<tr>
<td></td>
<td>c. Notify officer of situation</td>
</tr>
<tr>
<td>6. Activate safety devices</td>
<td>6a. SCBA</td>
</tr>
<tr>
<td></td>
<td>b. Personal alarm device</td>
</tr>
<tr>
<td>7. Open door</td>
<td>7a. Standing to side as partner forces door open</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td>8. Enter structure</td>
<td>8a. Two-person minimum</td>
</tr>
<tr>
<td></td>
<td>b. Advancing hoseline</td>
</tr>
<tr>
<td></td>
<td>c. Keeping low</td>
</tr>
<tr>
<td></td>
<td>d. Using short bursts of water to cool ceiling if extreme heat condition exists to prevent flashover</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9. Check attic</td>
<td>9a. If attic involvement is suspected or if no extreme thermal layer exists upon entry</td>
</tr>
<tr>
<td>10. Advance hoseline</td>
<td>10a. To seat of fire</td>
</tr>
<tr>
<td>11. Extinguish simulated fire</td>
<td>11a. At base</td>
</tr>
<tr>
<td>12. Check for extension</td>
<td>12a. Attic first</td>
</tr>
<tr>
<td></td>
<td>b. Other five sides of the structure</td>
</tr>
<tr>
<td>13. Perform primary search</td>
<td>13a. Notifying IC of primary knockdown and extension of fire</td>
</tr>
<tr>
<td></td>
<td>b. In rooms closest and above origin</td>
</tr>
<tr>
<td></td>
<td>c. Notifying IC when primary search is completed</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE A 2½" HOSELINE UP A STAIRWAY, THREE-PERSON

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle, appropriate personal protective equipment, and a suitable structure with a stairway

Behavior: The students will advance a 2½" hoseline up a stairway

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle
- Appropriate personal protective equipment
- Suitable structure with a stairway

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Essentials of Fire Fighting Student Applications, IFSTA, Lesson 12B, Job Sheet 12B-11
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Advancing a hoseline in a stairway presents several problems. For example, just dragging hoseline on flat, level ground is extremely tiring. When it comes to advancing hoseline around obstacles, it is almost impossible. The shoulder carry is effective in this operation. Since the hoseline is carried into position and fed out as needed, a minimum of staffing is required.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place hose bundles</td>
<td>1a. On either shoulder</td>
</tr>
<tr>
<td></td>
<td>b. Facing nozzle and placing hoseline on same shoulder</td>
</tr>
<tr>
<td></td>
<td>c. Fire fighters spaced every 15-25 feet</td>
</tr>
<tr>
<td></td>
<td>d. Hoseline should payoff from the top of the bundle</td>
</tr>
<tr>
<td>2. Advance in stairway</td>
<td>2a. Maintaining spacing at 15-25 feet</td>
</tr>
<tr>
<td></td>
<td>b. Can go up or down depending on situation</td>
</tr>
<tr>
<td></td>
<td>c. When hoseline from pumper becomes taut, it will payoff the shoulder of the last fire fighter</td>
</tr>
<tr>
<td></td>
<td>d. As the hoseline pays off the shoulder, the fire fighters can assume their stationary positions at critical points</td>
</tr>
<tr>
<td>3. Lay hoseline on stairway</td>
<td>3a. Against an outside wall</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding sharp bends and kinks</td>
</tr>
<tr>
<td>4. Advance hoseline</td>
<td>4a. To one floor above working floor</td>
</tr>
<tr>
<td>5. Loop hoseline</td>
<td>5a. In stairway</td>
</tr>
<tr>
<td>6. Lay hoseline</td>
<td>6a. Down stairway</td>
</tr>
<tr>
<td></td>
<td>b. Against an outside wall</td>
</tr>
<tr>
<td></td>
<td>c. To working floor</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>7. Advance and assist</td>
<td>7a. Last fire fighter</td>
</tr>
<tr>
<td></td>
<td>b. Nozzle person</td>
</tr>
<tr>
<td></td>
<td>c. After hoseline supply is depleted</td>
</tr>
<tr>
<td></td>
<td>d. Removing kinks</td>
</tr>
<tr>
<td></td>
<td>e. Moving hoseline to an outside wall of stairway</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE A 2½" HOSELINE UP AN EXTERIOR STAIRWAY USING A PIKE POLE, THREE-FOUR PERSON

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with male and female couplings and attached nozzle, a pike pole, hose strap, appropriate personal protective equipment, and a suitable structure with an exterior stairway

Behavior: The students will advance a hoseline up an exterior stairway using a pike pole

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 150 feet of 2½" hoseline with male and female couplings and attached nozzle
- Pike pole
- Hose strap
- Appropriate personal protective equipment
- Suitable structure with an exterior stairway

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Hoselines are sometimes advanced by passing them upward alongside stairways of fire escapes. The same methods would apply if fire fighters were stationed at windows or on ladders. The hoseline will become heavier as it is raised higher. Teamwork, therefore, becomes very important. The use of a pike pole can assist with this effort.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Take positions</td>
<td>1a. Equally spaced</td>
</tr>
<tr>
<td></td>
<td>b. From bottom to top of stairs</td>
</tr>
<tr>
<td></td>
<td>c. One on each landing minimum</td>
</tr>
<tr>
<td>2. Fold nozzle</td>
<td>2a. Back on hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Approximately 2 feet</td>
</tr>
<tr>
<td>3. Attach hose strap</td>
<td>3a. To hoseline</td>
</tr>
<tr>
<td></td>
<td>b. At fold behind nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Pulled snug</td>
</tr>
<tr>
<td></td>
<td>d. Keeping nozzle on outside away from building</td>
</tr>
<tr>
<td>4. Lift hoseline</td>
<td>4a. With pike pole</td>
</tr>
<tr>
<td></td>
<td>b. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>c. Pike hooked in rope strap</td>
</tr>
<tr>
<td></td>
<td>d. Handle of pike pole extended to next fire fighter</td>
</tr>
<tr>
<td>5. Pass the pike pole</td>
<td>5a. Upwards</td>
</tr>
<tr>
<td></td>
<td>b. Person-to-person</td>
</tr>
<tr>
<td></td>
<td>c. Continuing to feed hoseline upward</td>
</tr>
<tr>
<td></td>
<td>d. Keeping nozzle on outside away from building</td>
</tr>
<tr>
<td></td>
<td>e. Working together as a team</td>
</tr>
<tr>
<td></td>
<td>f. Until sufficient hoseline is at upper level</td>
</tr>
<tr>
<td>6. Leave hose strap</td>
<td>6a. On the hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Last fire fighter to receive pike pole</td>
</tr>
<tr>
<td></td>
<td>c. To aid the nozzle person in advancing the hoseline</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7. Secure the hoseline</td>
<td>7a. Along stairway</td>
</tr>
<tr>
<td></td>
<td>b. With hose strap</td>
</tr>
<tr>
<td></td>
<td>c. Not allowing hoseline to hang unsupported</td>
</tr>
<tr>
<td></td>
<td>d. Supporting hoseline below couplings to relieve strain whenever possible</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE A 2½" HOSELINE DOWN A STAIRWAY, THREE-FOUR PERSON

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle, appropriate personal protective equipment, and a suitable structure with a stairway

Behavior: The students will advance a hoseline down a stairway

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED: • Job breakdown
• 150 feet of 2½" hoseline with attached nozzle
• Appropriate personal protective equipment
• Suitable structure with a stairway

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
• Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Advancing hoseline down a stairway presents several problems. For example, just dragging hoseline on flat level ground is extremely tiring. When it comes to advancing hoseline around obstacles, it is almost impossible. The shoulder carry is effective in this operation. Since the hoseline is carried into position and fed out as needed, a minimum of staffing is required.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Place hose bundles | 1a. On either shoulder  
b. Fire fighters facing nozzle and placing hoseline on same shoulder  
c. Fire fighters spaced every 15-25 feet  
d. Hoseline should payoff from the top of the bundle |
| 2. Advance down stairway | 2a. Maintaining spacing at 15-25 feet  
b. When hoseline from pumper becomes taut, it will payoff the shoulder of the last fire fighter  
c. As the hoseline payoff the shoulder, fire fighters can assume their stationary positions at critical points |
| 3. Lay hoseline on stairway | 3a. Against an outside wall  
b. Avoiding sharp bends and kinks |
| 4. Last person advances and assists nozzle person | 4a. After hoseline supply is depleted  
b. Removing kinks  
c. Moving hoseline to an outside wall of stairway |
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** HOW TO CONNECT A HOSELINE TO AN UPPER FLOOR STANDPIPE AND ADVANCE THE LINE, TWO-PERSON METHOD

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9

**BEHAVIORAL OBJECTIVE:**

**Condition:** Sufficient hoseline with attached nozzle, a reducer, spanner, adaptor (if required), adjunct tools and equipment as needed, appropriate personal protective equipment, and a suitable structure with a standpipe

**Behavior:** The students will connect a hoseline to an upper floor standpipe and advance the line

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- 150 feet of 1½"-2½" hoseline with attached nozzle
- Reducer
- Spanner
- Adaptor (if required)
- Adjunct tools and equipment as needed
- Appropriate personal protective equipment
- Suitable structure with a standpipe

**REFERENCES:**

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**PREPARATION:** Attacking fires on floors aboveground would be extremely difficult without the use of standpipes. While hoselines could be stretched up stairways or ladders, oftentimes it is much faster and more practical to utilize standpipe systems for water supply.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fire Fighter #1 obtains hoseline</td>
<td>1a. Hose pack or bundle&lt;br&gt;b. Shoulder load with nozzle</td>
</tr>
<tr>
<td>2. Fire Fighter #2 obtains tools</td>
<td>2a. Reducer, spanner&lt;br&gt;b. Forcible entry tools</td>
</tr>
<tr>
<td>3. Fire Fighter #1 advances to landing</td>
<td>3a. Between the fire floor and the standpipe</td>
</tr>
<tr>
<td>4. Fire Fighter #2 advances to standpipe</td>
<td>4a. On floor below fire floor</td>
</tr>
<tr>
<td>5. Fire Fighter #2 removes protection cap on</td>
<td>5a. Checking to see if valve is closed first&lt;br&gt;b. Checking for debris in</td>
</tr>
<tr>
<td>standpipe</td>
<td>outlet</td>
</tr>
<tr>
<td>6. Fire Fighter #1 hands wye</td>
<td>6a. To Fire Fighter #2</td>
</tr>
<tr>
<td>7. Fire Fighter #2 connects to standpipe</td>
<td>7a. Using reducer if required</td>
</tr>
<tr>
<td>8. Fire Fighter #1 advances to fire floor</td>
<td>8a. Flaking out hoseline&lt;br&gt;b. Removing kinks&lt;br&gt;c. Extra hoseline should</td>
</tr>
<tr>
<td></td>
<td>be taken up stairway, if possible</td>
</tr>
<tr>
<td>9. Fire Fighter #1 calls for water</td>
<td>9a. Making sure nozzle is closed</td>
</tr>
<tr>
<td>10. Fire Fighter #2 opens standpipe valve</td>
<td>10a. Anchoring nozzle as hoseline expands&lt;br&gt;b. Removing kinks after full</td>
</tr>
<tr>
<td>11. Fire Fighter #1 checks door</td>
<td>11a. Feeling with back of hand&lt;br&gt;b. Checking to see if locked</td>
</tr>
<tr>
<td>12. Fire Fighter #2 opens door</td>
<td>12a. Carefully&lt;br&gt;b. From one side</td>
</tr>
<tr>
<td>13. Both fire fighters proceed to the</td>
<td>13a. Safely</td>
</tr>
<tr>
<td>simulated fire</td>
<td></td>
</tr>
</tbody>
</table>
**APPLICATION:**

The students will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The students will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE AN UNCHARGED 2½" HOSELINE UP AN EXTENSION LADDER AND INTO A WINDOW, THREE-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle, an extension ladder, hose strap, appropriate personal protective equipment, and a suitable structure

Behavior: The students will advance an uncharged hoseline up an extension ladder and into a window

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle
- Extension ladder
- Hose strap
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

In order to attack and extinguish fires in structures, it is necessary to advance or stretch hoselines from the engine to the seat of the fire. When stairways are blocked preventing them from being used as escape routes for occupants, it is necessary to use ladders to reach the fire through a window.
# How To Advance An Uncharged 2½" Hoseline Up An Extension Ladder And Into A Window, Three-Person Method

## Key Points

<table>
<thead>
<tr>
<th>Operations</th>
<th>Key Points</th>
</tr>
</thead>
</table>
| 1. Fire fighters take positions | 1a. On same side of hoseline  
|                                | b. Facing nozzle  
|                                | c. 10-15 feet apart |
| 2. Place hoseline              | 2a. Over shoulder  
|                                | b. Nozzle person first  
|                                | c. All others to follow, same shoulder |
| 3. Advance hoseline            | 3a. Allowing hoseline to hang in front to knee level  
|                                | b. 10-15 feet between each fire fighter |
| 4. Climb ladder                | 4a. Nozzle person first  
|                                | b. Keeping hoseline to one side of feet  
|                                | c. Using both hands for climbing  
|                                | d. Maintaining separation, or one person per ladder section |
| 5. Nozzle person lays nozzle down | 5a. In window  
|                                | b. Before entering |
| 6. Nozzle person enters window |                                                                 |
| 7. Fire fighters lock in       | b. Leg lock  
|                                | c. Leaving hands free |
| 8. Feed hoseline               | 8a. To nozzle person  
|                                | b. By fire fighters on the ladder  
<p>|                                | c. Until nozzle person has advanced to desired location (or signals to stop) within the structure |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 9. Secure hose line | 9a. To ladder  
|               | b. To top of rung  
|               | c. Hose line in middle of ladder  
|               | d. With hose strap  |
| 10. Advance   | 10a. Up the ladder  
|               | b. Fire fighter nearest top of ladder to backup nozzle person |
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADVANCE A CHARGED 2½" HOSELINE UP AN EXTENSION LADDER AND INTO A WINDOW, FOUR-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle, an extension ladder, hose strap, appropriate personal protective equipment, and a suitable structure

Behavior: The students will advance a charged hoseline up an extension ladder and into a window using the four-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 150-feet of 2½" hoseline with attached nozzle
- Extension ladder
- Hose strap
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Fires in structures may make it necessary to advance or stretch hoselines. When stairways are blocked preventing their use as escape routes for occupants of the building, it will be necessary to use ladders to reach the fire, usually through a window. A charged hoseline, however, presents several safety considerations due to weight and control problems.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Fire fighters take positions | 1a. Additional fire fighter footing the ladder  
                                       b. All on same side of hoseline |
| 2. Fire fighters climb ladder | 2a. Nozzle person first  
                                       b. Others to follow  
                                       c. Using both hands for climbing  
                                       d. 10 feet between fire fighters |
| 3. Fire fighters lock in | 3a. After nozzle person reaches window  
                                       b. Leg lock or Class I safety harness  
                                       c. Leaving hands free |
| 4. Nozzle person signals for hoseline | |
| 5. Feed hoseline | 5a. Up the ladder  
                                       b. Laying hoseline on rungs to one side of the ladder  
                                       c. Grasping hoseline, not nozzle bale  
                                       d. Nozzle bale remaining in off position  
                                       e. Hand-over-hand  
                                       f. Until reaching nozzle person |
| 6. Nozzle person signals to stop feed | |
| 7. Nozzle person lays nozzle | 7a. Inside window  
                                       b. Across window sill |
<p>| 8. Nozzle person enters window | 8a. Releasing leg lock or Class I safety harness |
| 9. Nozzle person signals for hoseline | |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Feed hoseline</td>
<td>10a. Up the ladder</td>
</tr>
<tr>
<td></td>
<td>b. Laying hoseline on rungs to one side of the ladder</td>
</tr>
<tr>
<td></td>
<td>c. Grasping hoseline, not nozzle bale</td>
</tr>
<tr>
<td></td>
<td>d. Nozzle bale remaining in off position</td>
</tr>
<tr>
<td></td>
<td>e. Hand-over-hand</td>
</tr>
<tr>
<td>11. Nozzle person signals to stop feed</td>
<td></td>
</tr>
<tr>
<td>12. Fire fighters advance up ladder</td>
<td>12a. Maintaining appropriate separation</td>
</tr>
<tr>
<td>13. Fire fighters lock in</td>
<td>13a. When back-up fire fighter reaches window</td>
</tr>
<tr>
<td></td>
<td>b. Leg lock or Class I safety harness</td>
</tr>
<tr>
<td>14. Backup fire fighter enters window</td>
<td>14a. When nozzle person gives signal</td>
</tr>
<tr>
<td></td>
<td>b. Releasing leg lock or Class I safety harness</td>
</tr>
<tr>
<td></td>
<td>c. Removing additional hoseline as needed from below</td>
</tr>
<tr>
<td>15. Nozzle person signals for hoseline</td>
<td></td>
</tr>
<tr>
<td>16. Feed hoseline</td>
<td>16a. Up the ladder</td>
</tr>
<tr>
<td></td>
<td>b. Laying hoseline on rungs to one side of the ladder</td>
</tr>
<tr>
<td></td>
<td>c. Grasping hoseline, not nozzle bale</td>
</tr>
<tr>
<td></td>
<td>d. Nozzle bale remaining in off position</td>
</tr>
<tr>
<td></td>
<td>e. Hand-over-hand</td>
</tr>
<tr>
<td>17. Nozzle person signals to stop feed</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 18. Fire fighters on ladder secure hoseline | 18a. To rungs  
b. Along inside of beam  
c. In several places  
d. With hose strap |
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO EXTEND A CHARGED 2¼" HOSELINE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A fire engine, sufficient hoseline with attached nozzle, a spare section of hoseline, hose clamp, and appropriate personal protective equipment

Behavior: The student will extend a charged 2¼" hoseline 50 feet

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Fire engine
- 150-feet of charged 2¼" hoseline with attached nozzle
- Spare section of 2¼" hoseline
- Hose clamp
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: During fire fighting operations, it may become necessary to extend charged hoselines. Extending hoselines in an orderly and efficient manner will facilitate fire fighting operations and reduce losses. This procedure will also work for other size hoselines. Remember this must be done quickly so the water source is not interrupted for an extended period of time.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Obtain uncharged hoseline</td>
<td>1a. From apparatus</td>
</tr>
<tr>
<td>2. Obtain hose clamp</td>
<td>2a. From apparatus</td>
</tr>
<tr>
<td>3. Charge hoseline</td>
<td>3a.</td>
</tr>
<tr>
<td>4. Apply hose clamp</td>
<td>4a. To charged hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Three feet behind nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Hoseline in center of clamp</td>
</tr>
<tr>
<td>5. Clamp off line</td>
<td>5a. Completely</td>
</tr>
<tr>
<td>6. Open nozzle</td>
<td>6a. Relieving pressure</td>
</tr>
<tr>
<td>7. Remove nozzle</td>
<td>7a. Completely</td>
</tr>
<tr>
<td>8. Add new section of hoseline</td>
<td>8a. To male coupling of existing hoseline</td>
</tr>
<tr>
<td>9. Reattach nozzle</td>
<td>9a. Coupling to male</td>
</tr>
<tr>
<td></td>
<td>b. Hand tight</td>
</tr>
<tr>
<td></td>
<td>c. Ensuring nozzle is closed</td>
</tr>
<tr>
<td>10. Release hose clamp</td>
<td>10a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Fully</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
How to Reduce a Hoseline

**TOPIC:** HOW TO REDUCE A HOSELINE

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9

**BEHAVIORAL OBJECTIVE:**

- **Condition:** Various size hoselines, a reducer, gated wye, nozzles, and appropriate personal protective equipment
- **Behavior:** The student will reduce a 2½" hoseline to a 1½" hoseline using a reducer and a gated wye
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Length of 2½" hoseline
- Length of 1½" hoseline
- 2½" to 1½" reducer
- Gate wye
- 2½" nozzle
- 1½" nozzle
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**PREPARATION:**
Hoselines need to be reduced for a variety of reasons, most frequently because smaller hoselines are easier to handle. After fires are knocked down with larger hoselines, it is common practice to reduce to smaller hoselines for salvage and overhaul operations. The gated wye allows the option of adding another hoseline, if needed.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Shutdown line</td>
<td>1a. At source</td>
</tr>
<tr>
<td></td>
<td>b. Use a hose clamp if line cannot be shutdown at source</td>
</tr>
<tr>
<td>2. Open nozzle</td>
<td>2a. To relieve pressure</td>
</tr>
<tr>
<td>3. Remove nozzle</td>
<td>3a. Foot-tilt method</td>
</tr>
<tr>
<td>4. Attach reducer</td>
<td>4a. Foot-tilt method</td>
</tr>
<tr>
<td>5. Attach 1½” hoseline with attached nozzle</td>
<td>5a. Foot-tilt method</td>
</tr>
<tr>
<td></td>
<td>b. Nozzle closed</td>
</tr>
<tr>
<td>6. Charge hoseline</td>
<td>6a. At source</td>
</tr>
<tr>
<td>7. Open nozzle</td>
<td>7a. Checking for leaks</td>
</tr>
<tr>
<td>8. Close nozzle</td>
<td></td>
</tr>
<tr>
<td>9. Shutdown line</td>
<td>9a. At source</td>
</tr>
<tr>
<td></td>
<td>b. Use a hose clamp if line cannot be shutdown at source</td>
</tr>
<tr>
<td>10. Open nozzle</td>
<td>10a. To relieve pressure</td>
</tr>
<tr>
<td>11. Remove nozzle</td>
<td>11a. Foot-tilt method</td>
</tr>
<tr>
<td>12. Attach gated wye</td>
<td>12a. Foot-tilt method</td>
</tr>
<tr>
<td>13. Attach 1½” hoseline with attached nozzle</td>
<td>13a. Foot-tilt method</td>
</tr>
<tr>
<td></td>
<td>b. Nozzle closed</td>
</tr>
<tr>
<td>14. Charge hoseline</td>
<td>14a. At source</td>
</tr>
<tr>
<td>15. Open nozzle</td>
<td>15a. Checking for leaks</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
PROCEDURES FOR RETRIEVING A LOOSE HOSELINE

TIME FRAME:
0:30

LEVEL OF INSTRUCTION:
Level II

AUTHORITY:
1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the procedures for retrieving a loose hoseline by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION:
One of the most dangerous situations that a fire fighter can face is an open end, a broken line, or an unstaffed nozzle. The loose end will shift back-and-forth and up-and-down. The action the line will take is impossible to predetermine. Fire fighters and bystanders may be seriously injured should they be hit by the uncontrolled hoseline.
## SAFEST METHODS IN ORDER OF PRIORITY

A. Close a valve
   1. To shut-off flow of water

B. Clamp the hose with a hose clamp

C. Attempt a field clamp
   1. This may only reduce the action of the hose end
   2. May not shut-off the flow of water

## SAFETY CONSIDERATIONS

A. Wear personal protective equipment
   1. Face shield down

B. Fall across the loose line with body extended
   1. Approximately 30-40 feet from butt or nozzle

C. Begin to advance toward the loose end
   1. Sliding, crawling motion

D. Keep one arm fully extended in front of you as you advance

E. Keep head down
   1. To protect face

F. Extreme caution must be taken the last few feet to avoid serious injury
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>G. The whip of the line gets stronger the closer you get to the end</td>
<td>What will happen to the end of the hoseline as you get closer to it?</td>
</tr>
<tr>
<td>H. When the loose end is reached, pin the end to the ground</td>
<td>How long does the end of the hoseline need to be controlled?</td>
</tr>
<tr>
<td>1. Until the flow can be shut-off</td>
<td></td>
</tr>
<tr>
<td>I. This does not apply to LDH because of its size and weight when charged</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Remember to stop a loose line by attempting to shut-off at the source first and then attempting to cautiously crawl down the line. This information should not be taken lightly as a loose line is an extremely dangerous problem.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO REPLACE A SECTION OF HOSE IN A CHARGED 2½" HOSELINE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Five lengths of 2½" hoseline, a nozzle, hose clamp, water source, and appropriate personal protective equipment

Behavior: The student will replace a section of hose in a charged 2½" hoseline

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Five lengths of 2½" hoseline
- Nozzle
- Hose clamp
- Water source (hydrant or pumping apparatus)
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: When a section of hoseline is damaged or ruptured, the safest way to shut-off the hoseline is at the source. When there are multiple lines in operation from a single engine, the pump operator cannot see the entire hose lay and it may be difficult to immediately determine which pump discharge outlet is flowing to the damaged or ruptured hoseline. If fire fighters operating on the affected hoseline are unaware of the damage, they must be informed immediately, the line needs to be shutdown and the damaged hoseline needs to be replaced.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Apply hose clamp | 1a. To charged line  
| | b. 3-6 feet on supply side of coupling  
| | c. On hoseline section preceding damaged section |
| 2. Open nozzle bale | 2a. Relieving pressure |
| 3. Lay out replacement hoseline | 3a. Two new sections of 2½" hoseline  
| | b. Coupled together as one continuous length  
| | c. Within reach |
| 4. Disconnect damaged hoseline | 4a. At both ends of hoseline |
| 5. Remove damaged hoseline |  |
| 6. Connect replacement hoseline | 6a. At both ends of hoseline  
| | b. Coupled hand tight |
| 7. Close nozzle bale | 7a. Before charging hoseline |
| 8. Remove hose clamp | 8a. Slowly releasing pressure on hoseline  
| | b. Completely |
| 9. Open nozzle bale | 9a. Slowly  
| | b. To bleed out air from hoseline |
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: SELECTION AND USE OF FIRE STREAMS

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the selection and use of fire streams by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 13

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Stream Practices, IFSTA, Seventh Edition

PREPARATION: The fire fighter needs to understand the characteristics of fire streams to effectively extinguish fires and reduce property damage. The fire fighter needs to understand influences that affect water delivery. Delivery of water is only a small part of the fire fighter's job. The amount of water, the form it is delivered in, and the fire situation are all basic reasons for selecting a fire stream. These come together to make fire streams essential to a quick, rapid knockdown.
I. FIRE STREAM DEFINED
   A. A stream of water as it leaves the nozzle until it reaches the desired point
   B. A perfect fire stream cannot be clearly defined because there are many different extinguishing needs
   C. Fire streams are intended to reduce fire temperature and protect personnel and exposures
      1. The stream may look good from behind the nozzle but may not be hitting the desired area

II. EXTINGUISHMENT PROPERTIES OF WATER
   A. Steam production
      1. Expands at 212°F, 1700:1
      2. Causes water to absorb more heat faster, cooling burning fuels
      3. Displaces hot gases, smoke, and other products of combustion
         a) Decreasing the chance of flashover or rollover
         b) In some cases, it displaces oxygen and smotheres the fire

III. INFLUENCES ON FIRE STREAMS
   A. Pressure gain
      1. Large hose line
         a) Less friction

How often do you see a good-looking master stream on a magazine that is overshooting or undershooting the fire?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>

2. Elevation  
   a) Pumping below the eye of the pump  
   b) For every foot of elevation below the eye of the pump, .434 psi is gained

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Elevation</td>
</tr>
</tbody>
</table>
|  | a) Pumping above the eye of the pump  
   b) For every foot of elevation above the eye of the pump, .434 psi is lost

3. Broken hoseline

4. Ineffective pump operations  
   a) Poor water supply  
   b) Mechanical problems  
   c) Hydraulic calculations error

5. Obstructions  
   a) In pump  
   b) In hoseline  
   c) In water mains

6. Friction loss  
   a) Rough lined or old hoseline  
   b) Damaged couplings

How does elevation affect your fire stream when fighting fire on the third floor of a building?

What can cause pressure loss in hoselines?
c) Kinks or bends in hoseline

d) Adapters and appliances

What influences can air have on a fire stream as it leaves the nozzle?

C. In the air
   1. Velocity
   2. Gravity
   3. Wind
   4. Friction
   5. Air resistance

What influences the water traveling through the nozzle?

D. As it leaves the nozzle
   1. Pressure
   2. Nozzle design
   3. Nozzle adjustment
   4. Condition of nozzles

What is a water hammer?

IV. WATER HAMMER
   A. When the flow of water through the hoseline or pipe is suddenly stopped, the resulting surge is referred to as a water hammer
      1. Often heard as a distinct sharp clank, much like a hammer striking a pipe
      2. Causes a change in direction of energy and multiplies the energy many times
FIRE FIGHTER I

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. The sudden surge of water or energy could cause the fire fighter to lose control of the hose line</td>
<td>How can a water hammer hurt a fire fighter?</td>
</tr>
<tr>
<td>4. Water hammers can cause damage to</td>
<td>What equipment is susceptible to damage by water hammers?</td>
</tr>
<tr>
<td>a) Pumps</td>
<td></td>
</tr>
<tr>
<td>b) Hoselines</td>
<td></td>
</tr>
<tr>
<td>c) Water mains</td>
<td></td>
</tr>
<tr>
<td>d) Couplings</td>
<td></td>
</tr>
<tr>
<td>e) Hydrants</td>
<td></td>
</tr>
<tr>
<td>B. Operate nozzles, valves, hydrants, and clamps slowly to prevent water hammer</td>
<td></td>
</tr>
</tbody>
</table>

V. FIRE STREAMS

A. Choices facing a fire fighter when selecting fire streams
   1. Size of hose line
   2. Fire stream pattern or nozzle setting
B. Size
   1. Size refers to the volume of water flowing per minute
### 2. Low volume streams
- a) Discharges 40 gpm or less
- b) Booster lines
- c) 1" hoselines

### 3. Handline streams
- a) 40-350 gpm
- b) 1½" and 1¾" lines
- c) 2½" and 3" lines

### 4. Master streams
- a) 350 gpm and greater
- b) Ladder pipes
- c) Monitors
- d) Deck guns, turrets
- e) Deluge sets

### C. Types
1. The type, pattern, or shape of the water column that is applied to the fire will depend on the purpose of that hoseline

- a) Solid
- b) Fog
- c) Broken

---

What is the difference between a low volume stream and master stream?

What size of hoseline is used for hand line streams?

What are the categories for different type of fire streams?
NOTE: All nozzles fall into one of these categories.

VI. SIZE OF HOSELINES

A. The larger the hoseline, the larger the volume of water that can be delivered onto the fire
   1. Larger hoseline provides fire fighters with the ability to handle large volumes of fire
      a) "Big fire, big water"

B. Size considerations
   1. Speed of deployment
   2. Need for mobility
   3. Number of personnel available to handle the hoseline are all factors

C. Larger hoselines
   1. More water available
   2. Less friction loss
   3. Weighs more and has greater nozzle reaction
   4. Generally take longer to place into operation than smaller lines

NOTE: The line you select should take into account all the factors listed above.

D. Your decision should provide the largest amount of water that you and the crew can handle quickly enough to achieve the incident objectives

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE: All nozzles fall into one of these categories.</td>
<td></td>
</tr>
<tr>
<td>VI. SIZE OF HOSELINES</td>
<td></td>
</tr>
<tr>
<td>A. The larger the hoseline, the larger the volume of water that can be delivered onto the fire</td>
<td></td>
</tr>
<tr>
<td>1. Larger hoseline provides fire fighters with the ability to handle large volumes of fire</td>
<td></td>
</tr>
<tr>
<td>a) &quot;Big fire, big water&quot;</td>
<td>Why would a fire fighter use a 1¾&quot; hoseline versus a 2½&quot; hoseline?</td>
</tr>
<tr>
<td>B. Size considerations</td>
<td>What would be the advantage and disadvantage of using large hoselines?</td>
</tr>
<tr>
<td>1. Speed of deployment</td>
<td></td>
</tr>
<tr>
<td>2. Need for mobility</td>
<td></td>
</tr>
<tr>
<td>3. Number of personnel available to handle the hoseline are all factors</td>
<td></td>
</tr>
<tr>
<td>C. Larger hoselines</td>
<td></td>
</tr>
<tr>
<td>1. More water available</td>
<td></td>
</tr>
<tr>
<td>2. Less friction loss</td>
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</tr>
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<td>3. Weighs more and has greater nozzle reaction</td>
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</tr>
<tr>
<td>4. Generally take longer to place into operation than smaller lines</td>
<td></td>
</tr>
<tr>
<td>NOTE: The line you select should take into account all the factors listed above.</td>
<td></td>
</tr>
<tr>
<td>D. Your decision should provide the largest amount of water that you and the crew can handle quickly enough to achieve the incident objectives</td>
<td></td>
</tr>
</tbody>
</table>
## VII. FIRE FLOW

A. Fire flow is the amount of water used for extinguishments

B. To be effective water must absorb more heat than is being generated by fire
   1. Absorption is considered adequate when the fire is controlled in 30 seconds

C. Stop application when
   1. Fire is knocked down
   2. Flames are no longer visible
   3. Steam is cooler
   4. Flames become out of reach

D. Other considerations
   1. Structural collapse
      
      a) Water weight can add tremendous weight and cause structural collapse
         1) Consider that a 600 gpm flow adds 5,000 pounds of water every minute

E. Do not hesitate to use master streams when indicated
   1. Ensure that personnel are not using hand lines in the structure at the same time
   2. Establish adequate supply lines for operation
   3. Make sure streams are an adequate distance away from the collapse zone
4. Once master streams have been used, an assessment of the building's integrity should be conducted before allowing hand lines to return to the building

How can a master stream collapse a building?

5. The weight of the large volumes of water from master streams have caused some buildings to collapse

What would you use for a small fire confined to area of origin?

A. Small fire confined to materials in area of origin
   1. Short bursts from straight stream
   2. Use minimum water to effect extinguishment

B. Large volume of fire in an enclosed room or space, direct attack cannot be made
   1. Requires an indirect or combination attack
   2. Wide fog pattern distributing water equally throughout room
   3. Creates steam and cools atmosphere
   4. Destroys thermal balance by cooling elevated atmosphere

C. Fire impinging on adjacent exposures
   1. Wide fog pattern to dissipate heat convection from involved material
   2. Stream should be placed between fire and exposure to be protected

What would you use for a large volume fire in an enclosed room?
### Would you consider putting an exposure line into a window that has flame to help the interior crews?

**3.** Do not put exposure line into a window with crews inside, it would destroy thermal balance possibly injuring attack crews

### Fire deep in a structure or far away from nozzle

**D.** Fire deep in a structure or far away from nozzle

1. **Straight stream to obtain as much reach or distance as possible**

### Should a straight stream be used to extinguish an electrical equipment fire?

**E.** Fire in energized electrical equipment

1. **Wide fog patterns only to disperse water molecules and reduce distance electricity will be conducted through fire stream**

2. **When using fire streams, wide fog patterns are better for Class C fires than a straight stream**

### What are the safe options to apply water to Class C fires?

**3.** It is best to de-energize what is burning and treat as Class A or Class B fire

a) **If it is not possible to de-energize, consider a Class C fire extinguisher**

### What is the best way to extinguish an energized electrical fire?

**NOTE:** Refer to fire extinguishers and extinguishing Class C fires.
### IX. ATTACK METHODS

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Direct</strong></td>
<td>What is a direct attack fire stream?</td>
</tr>
<tr>
<td>1. Water directly applied to flame</td>
<td>What would be an indirect attack?</td>
</tr>
<tr>
<td>2. Straight shot at the base of the fire</td>
<td></td>
</tr>
<tr>
<td><strong>B. Indirect</strong></td>
<td></td>
</tr>
<tr>
<td>1. Fog stream</td>
<td></td>
</tr>
<tr>
<td>2. Water deflected off the ceiling or a wall</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

It is important to understand the influences and characteristics of fire streams to effectively put out fires and maintain adequate safety for personnel. Pulling the right line in an emergency can make all the difference to the people you serve.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 13 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO USE A BOOSTER LINE

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A fire engine equipped with a booster line and attached nozzle, and appropriate personal protective equipment

Behavior: The student will use a booster line

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Fire engine equipped with a booster line and attached nozzle
- Appropriate personal protective equipment

REFERENCES:
- Hose Practices, IFSTA, Seventh Edition, Chapter 4

PREPARATION: Booster lines are used in various capacities throughout the country. They are easy to use because they are stored on a reel that is connected directly to the pump. Historically, they have been used on car fires, trash bin fires, overhaul, and outdoor fires in grass and light brush. As with any hoseline, there is a safe manner and an unsafe manner of operating the booster line. Because this small line is taken for granted, safe operations must be stressed constantly.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Release tension brake, if applicable | 1a. Next to hose reel edge  
b. Turning counterclockwise |
| 2. Grasp booster line               | 2a. With both hands                                                          |
| 3. Place nozzle over shoulder        | 3a. Pulling down onto chest  
b. Holding firmly with both hands |
| 4. Pull booster line                 | 4a. From reel  
b. Leaning forward into pull  
c. Clearing apparatus  
d. Watching your step  
e. Being cautious of pulling over sharp objects  
f. 25-50 feet |
| 5. Turn towards objective           |                                                                            |
| 6. Adjust booster line               | 6a. Over shoulder  
b. Nozzle at waist  
c. Both hands on booster line |
| 7. Extend booster line               | b. Maintaining balance  
c. Leaning forward into pull  
d. Watching for obstacles  
e. 25-50 feet |
| 8. Operate nozzle                   | 8a. Grasping line firmly  
b. Preparing for nozzle reaction  
c. Maintaining balance |
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Prepare to reel-in booster line</td>
<td>9a. With pressure in booster line</td>
</tr>
<tr>
<td></td>
<td>b. To avoid collapse</td>
</tr>
<tr>
<td></td>
<td>c. Holding booster line against hose roller guide</td>
</tr>
<tr>
<td></td>
<td>d. Positioning body so switch can be depressed</td>
</tr>
<tr>
<td>10. Reel-in booster line</td>
<td>10a. Depressing switch</td>
</tr>
<tr>
<td></td>
<td>b. Wiping line off with rag</td>
</tr>
<tr>
<td></td>
<td>c. Keeping tension on line against rollers</td>
</tr>
<tr>
<td></td>
<td>d. Keeping line even and in layers</td>
</tr>
<tr>
<td></td>
<td>e. Watching for couplings</td>
</tr>
<tr>
<td>11. Set tension brake, if applicable</td>
<td>11a. Next to hose reel edge</td>
</tr>
<tr>
<td></td>
<td>b. Turning clockwise</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPERATE A MEDIUM-SIZE ATTACK LINE, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient hoseline with attached nozzle and connected to a water source, hose strap, and appropriate personal protective equipment

Behavior: The students will operate a medium-size attack line, two-person method

Standard: Completing all operations within _________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 150 feet of 1½" or 1¾" hoseline with attached nozzle and connected to a water source
- Hose strap
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: A hoseline and nozzle must be kept under control at all times. The two-person method of handling a nozzle should be used whenever possible. It provides a greater degree of safety to the fire fighter and allows for mobility and speed of attack.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Both fire fighters take position | 1a. Same side of hoseline  
| | b. Facing nozzle |
| 2. Nozzle person picks up nozzle | 2a. One hand on nozzle  
| | b. Other hand comfortable distance from nozzle  
| | c. Palm up  
| | d. Using legs to lift |
| 3. Nozzle person positions nozzle | 3a. Close to body  
| | b. Under arm  
| | c. Across the hip  
| | d. Hoseline at waist height  
| | e. Using hose strap, if available  
| | f. Feet spread for balance  
| | g. Nozzle hand on ball of nozzle |
| 4. Hose person picks up hoseline | 4a. Arm's length behind nozzle person  
| | b. Same side of hoseline  
| | c. Grasping hoseline forward  
| | d. Palm down  
| | e. Other palm up  
<p>| | f. Hoseline at hip level |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 5. Hose person positions hoseline | 5a. Against hip  
  b. Adjusting elevation to keep pressure off nozzle person  
  c. Using hose strap, if available  
  d. Feet spread for balance  
  e. Hoseline 20 feet straight behind nozzle person |
| 6. Advance hoseline | 6a. Both fire fighters  
  b. One third of hoseline length to form a loop  
  c. Pulling with shoulder and legs |
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPERATE A LARGE-SIZE ATTACK LINE, ONE-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient large-size hoseline with attached nozzle and connected to a water source, hose strap, and appropriate personal protective equipment

Behavior: The student will operate a large-size attack line, one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle and connected to a water source
- Hose strap
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: Whenever a large-size attack line is used, it is recommended that a minimum of two, and preferably three fire fighters, be employed to handle a charged 2½" hoseline. However, at times it may be necessary for one fire fighter to operate a 2½" hoseline alone. This lesson will prepare you for that time when you have to handle a 2½" hoseline by yourself.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Form loop</td>
<td>1a. In hoseline</td>
</tr>
<tr>
<td></td>
<td>b. 25 feet immediately behind nozzle</td>
</tr>
<tr>
<td>2. Cross loop</td>
<td>2a. Pulling nozzle beneath loop</td>
</tr>
<tr>
<td></td>
<td>b. Loop approximately 2 feet behind nozzle</td>
</tr>
<tr>
<td>3. Tie hoseline</td>
<td>3a. At crossover of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Using hose strap</td>
</tr>
<tr>
<td>4. Sit on hoseline and direct stream</td>
<td>4a. At crossover of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Both hands on nozzle</td>
</tr>
<tr>
<td>5. Direct stream</td>
<td>5a. Opening nozzle slowly</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPERATE A LARGE-SIZE ATTACK LINE, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient large-size hoseline with attached nozzle and connected to a water source, hose strap, and appropriate personal protective equipment

Behavior: The students will operate a large-size attack line, two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle and connected to a water source
- Hose strap
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: It is recommended to have two fire fighters as a minimum to handle a large-size attack line. Even with two fire fighters, moving a charged section of 2½" hoseline can be extremely difficult and tiring. The nozzle reaction can be very fierce, all movements of the nozzle should be in a controlled manner. The use of a hose strap can be beneficial in controlling the hoseline. It is very important for all fire fighters to be familiar with this operation and be able to work together as a team.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Both fire fighters take position</td>
<td>1a. Same side of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Facing nozzle</td>
</tr>
<tr>
<td>2. Nozzle person picks up nozzle</td>
<td>2a. One hand on nozzle</td>
</tr>
<tr>
<td></td>
<td>b. Other hand comfortable distance from nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Palm up</td>
</tr>
<tr>
<td></td>
<td>d. Using legs to lift</td>
</tr>
<tr>
<td>3. Nozzle person positions nozzle</td>
<td>3a. Close to body</td>
</tr>
<tr>
<td></td>
<td>b. Across the hip</td>
</tr>
<tr>
<td></td>
<td>c. Hoseline at weight height</td>
</tr>
<tr>
<td></td>
<td>d. Using hose strap, if available</td>
</tr>
<tr>
<td></td>
<td>e. Feet spread for balance</td>
</tr>
<tr>
<td></td>
<td>f. Nozzle hand on ball of nozzle</td>
</tr>
<tr>
<td>4. Hose person picks up hoseline</td>
<td>4a. Arm's length behind nozzle person</td>
</tr>
<tr>
<td></td>
<td>b. Same side of hoseline</td>
</tr>
<tr>
<td></td>
<td>c. Grasping hoseline one hand</td>
</tr>
<tr>
<td></td>
<td>d. Palm up</td>
</tr>
<tr>
<td></td>
<td>e. Other palm down</td>
</tr>
<tr>
<td></td>
<td>f. Hoseline at hip level</td>
</tr>
<tr>
<td>5. Hose person positions hoseline</td>
<td>5a. Against hip</td>
</tr>
<tr>
<td></td>
<td>b. Adjusting hoseline elevation to keep pressure off nozzle person</td>
</tr>
<tr>
<td></td>
<td>c. Using hose strap, if available</td>
</tr>
<tr>
<td></td>
<td>d. Feet spread for balance</td>
</tr>
<tr>
<td>6. Advance hoseline</td>
<td>6a. Both fire fighters</td>
</tr>
</tbody>
</table>
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPERATE A LARGE-SIZE ATTACK LINE, THREE-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: Sufficient large-size hoseline with attached nozzle and connected to a water source, hose strap, and appropriate personal protective equipment

Behavior: The students will operate a large-size attack line using the three-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 150 feet of 2½" hoseline with attached nozzle and connected to a water source
- Hose strap
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: The three-person method is the preferred method of handling 2½" attack lines. It can be maneuvered safely in a manner that is fast, accurate, and safe. One person works and controls the nozzle, the other two people serve as anchors and advance the hoseline. Work closely with each other on this evolution, for teamwork is a must.
## OPERATIONS

<table>
<thead>
<tr>
<th>Operation</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Fire fighters take position</strong></td>
<td>1a. Same side of hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Facing nozzle</td>
</tr>
<tr>
<td><strong>2. Nozzle person pick up nozzle</strong></td>
<td>2a. One hand on nozzle</td>
</tr>
<tr>
<td></td>
<td>b. Other hand comfortable distance from nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Palm up</td>
</tr>
<tr>
<td></td>
<td>d. Using legs to lift</td>
</tr>
<tr>
<td><strong>3. Nozzle person positions nozzle</strong></td>
<td>3a. Hoseline close to body</td>
</tr>
<tr>
<td></td>
<td>b. Across the hip</td>
</tr>
<tr>
<td></td>
<td>c. Hoseline at waist height</td>
</tr>
<tr>
<td></td>
<td>d. Use hose strap, if available</td>
</tr>
<tr>
<td></td>
<td>e. Feet spread for balance</td>
</tr>
<tr>
<td></td>
<td>f. Nozzle hand on ball of nozzle</td>
</tr>
<tr>
<td><strong>4. Hose person picks up hoseline</strong></td>
<td>4a. Arm's length behind nozzle person</td>
</tr>
<tr>
<td></td>
<td>b. On same side of hoseline</td>
</tr>
<tr>
<td></td>
<td>c. One palm up</td>
</tr>
<tr>
<td></td>
<td>d. Other palm down</td>
</tr>
<tr>
<td></td>
<td>e. Hoseline at hip level</td>
</tr>
<tr>
<td><strong>5. Third person positions hoseline</strong></td>
<td>5a. Held against hip</td>
</tr>
<tr>
<td></td>
<td>b. Adjusting hoseline elevation to keep pressure off nozzle person</td>
</tr>
<tr>
<td></td>
<td>c. Feet spread for balance</td>
</tr>
<tr>
<td><strong>6. Third person anchors hoseline</strong></td>
<td>6a. Same side of hoseline as other two fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. 6-8 feet from hose person</td>
</tr>
<tr>
<td></td>
<td>c. Using hose strap, if possible</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>7. Advance hoseline</td>
<td>7a. One-third of hoseline length to form a loop</td>
</tr>
<tr>
<td></td>
<td>b. Pulling with shoulder and legs</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** HOW TO OPERATE A CHARGED 2½" HOSELINE FROM A LADDER

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.9

**BEHAVIORAL OBJECTIVE:**

**Condition:** Sufficient hoseline with male and female couplings and attached nozzle, a hose strap, ladder, appropriate personal protective equipment, and a suitable structure

**Behavior:** The student will operate a charged 2½" hoseline from a ladder

**Standard:** Completing all operations within _________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- 150 feet of 2½" hoseline with male and female couplings and attached nozzle
- Hose strap
- Ladder
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

**PREPARATION:** At times, it is necessary to operate hoselines from ladders to fight fire or effectively mitigate a hazardous situation. This operation must be done properly and safely in order to be effective.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Extending above window</td>
</tr>
<tr>
<td></td>
<td>b. Front of window</td>
</tr>
<tr>
<td>2. Position hoseline</td>
<td>2a. In center of ladder</td>
</tr>
<tr>
<td>3. Position nozzle</td>
<td>3a. Through rungs</td>
</tr>
<tr>
<td></td>
<td>b. At least 1 foot</td>
</tr>
<tr>
<td>4. Secure hoseline</td>
<td>4a. To ladder</td>
</tr>
<tr>
<td></td>
<td>b. With hose strap</td>
</tr>
<tr>
<td>5. Lock in</td>
<td>5a. To ladder</td>
</tr>
<tr>
<td></td>
<td>b. Using leg lock</td>
</tr>
<tr>
<td></td>
<td>c. Leaving hands free</td>
</tr>
<tr>
<td>6. Operate nozzle</td>
<td>6a. Opening slowly to reduce the effect of nozzle reaction</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF MASTER STREAM APPLIANCES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of master stream appliances by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Streams Practices, IFSTA, Seventh Edition

PREPARATION: Master stream appliances are by definition "fire streams that are too large to be controlled without mechanical aid." When a fire has progressed to the point where handlines are ineffective, you may be called upon to place a fixed or master stream appliance into service.
I. MASTER STREAMS

A. A master stream is a fire stream that is too large to be controlled without mechanical aid

B. May be either solid or fog and is produced by special nozzles
   1. Solid master streams are usually operated at 80 psi
   2. Fog master streams are usually operated at 100 psi

C. Flows
   1. Commonly range at 350-1,000 gpm
   2. Some may flow in excess of 2,000 gpm

What would you consider as a master stream?

D. Used when handlines are ineffective
   1. For greater reach
   2. For greater fire flows
   3. Magnitude of fire
   4. Heat is so intense that fire fighters cannot approach close enough
   5. Situation is too dangerous for fire fighters to approach
      a) Pressurized vessel storage (LPG, etc.)

What is an example of a very large flow?

When and why would you need to use master stream devices?
### Characteristics And Functions Of Master Stream Appliances

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Hazardous materials</td>
<td>What would be a major concern with hazardous materials while using master streams?</td>
</tr>
</tbody>
</table>

1) Stream control
2) Control of runoff
3) Collection and disposal of contaminated runoff

c) Structural collapse possible

E. Most have some means of moving in either a vertical or horizontal plane or both

F. Friction loss may be assumed as some fixed figure
   1. 10 or 25 psi
   2. Depending on type and manufacturer

G. The effectiveness of any fire stream is tied directly to the mobility of the stream
   1. In recent years, efforts have been made to make master streams
      a) More portable
      b) Lighter, more mobile
      c) Able to flow more water
      d) Remote controlled in some cases
II. MASTER STREAMS ARE DIVIDED INTO FOUR MAIN GROUPS

A. Turret pipe
   1. Mounted permanently on the deck of the apparatus
   2. Connected directly to the pump
   3. Sometimes called a deck gun or deck pipe

B. Monitor
   1. Master stream device whose stream direction can be changed while water is being discharged
   2. There are three basic types
      a) Fixed monitor
         1) Permanently mounted
      b) Portable monitor
         1) Can be carried to where it is needed
      c) Combination monitor
         1) Mounted on the apparatus where it can be used as a turret
         2) Must be able to be removed and used as a portable monitor wherever needed

C. Deluge set
   1. Composed of a short section of larger diameter hoseline
   2. With a large nozzle
3. Supported at the discharge end by a tripod
4. There is a siamese connection at the supply end
5. The direction and angle of the stream cannot be changed while discharging water
6. Many portable monitors are *improperly* referred to as deluge sets
   a) The difference is portable monitors use metal piping instead of hoseline

D. Ladder pipe
   1. Master stream device attached to the rungs of an aerial ladder
      a) Permanently mounted
      b) Or removable for storage
   2. Supplied by
      a) Large diameter hose
      b) Metal piping

What are some ways to control the flow of a master stream?

III. CONTROLLING THE MASTER STREAM
   A. The direction and angle of a turret pipe, monitor, and ladder pipe master stream can be changed by the use of a number of available mechanisms
      1. Gears
      2. Pulleys
      3. Chains
      4. Electric motors
      5. Hydraulics
      6. Pneumatics
      7. Manual
IV. MASTER STREAM SAFETY

A. Divided into three general areas
   1. Set-up
   2. Operation
   3. Shutdown and place on apparatus

   What are several safety considerations when setting up a master stream?

B. Set-up
   1. Get assistance while moving heavy master stream appliances
   2. Look where you are going before stepping off apparatus
   3. Use legs instead of back
   4. Avoid uneven surfaces
   5. Avoid slippery surfaces
   6. Avoid potholes
   7. Watch for nighttime obstacles
   8. Anticipate structural obstacles
   9. Attach master stream appliance to a solid, immovable object, if possible
  10. Drive a deadman stake for master stream appliance attachment, if time, surface, and need exist
  11. Anticipate wind and fire effects on fire stream
  12. Attach hoseline so that hoseline elongation will not move the master stream device
  13. Consider future fireground operations when selecting location
C. Operation

1. Monitor master stream device for movement
   a) Adjust stakes or attachment as necessary
   b) Watch for shifting from vibration

2. The master stream device should be manned if safe to do so by at least one fire fighter at all times and by two or more fire fighters, if available

3. Avoid moving stream side to side more than manufacturer's specifications
   a) Usually no more than 15° off center either way
   b) Shutdown and reposition, if necessary
   c) Move side-to-side slowly

NOTE: Be familiar with manufacturer's recommendations for each appliance taught.

4. Avoid moving stream up and down more than manufacturer's specifications
   a) Usually not lower than 10°
   b) Most have a safety catch to restrict the master stream device from lowering below a safe point
   c) The greatest reach of the stream will be at an angle of 32° to the earth's surface
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>d) Raise and lower slowly</td>
<td></td>
</tr>
<tr>
<td>5. Attempt to direct stream deep in the seat of the fire or as directed</td>
<td></td>
</tr>
<tr>
<td>6. Objects will be impacted by immense force, this effect should be taken into consideration</td>
<td></td>
</tr>
<tr>
<td>7. In multi-story operations, avoid placing large quantities of water on floors</td>
<td>What are some dangers of large quantities of water on multi-story operations?</td>
</tr>
<tr>
<td>a) May cause structural collapse</td>
<td></td>
</tr>
<tr>
<td>b) May cause further damage</td>
<td></td>
</tr>
<tr>
<td>8. Avoid overshooting or undershooting target</td>
<td>How can you assure the fire stream is going where you want it?</td>
</tr>
<tr>
<td>a) Have scout check effectiveness of stream</td>
<td></td>
</tr>
<tr>
<td>9. Shutdown as soon as operation is complete</td>
<td>What are some safety considerations while shutting down and placing master stream back on apparatus?</td>
</tr>
<tr>
<td>10. Avoid electrical equipment</td>
<td></td>
</tr>
<tr>
<td>a) Either energized or nonenergized</td>
<td></td>
</tr>
</tbody>
</table>

D. Shutdown

1. Fatigue
2. Get assistance
3. Shut master stream down **slowly**
4. Disconnect lines before moving
5. Use **legs**, not back
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Avoid slippery surfaces</td>
<td></td>
</tr>
<tr>
<td>7. Watch for nighttime obstructions</td>
<td></td>
</tr>
<tr>
<td>8. Clean before putting apparatus back in service</td>
<td></td>
</tr>
<tr>
<td>9. Check for debris in nozzle and appliance</td>
<td></td>
</tr>
<tr>
<td>10. Lubricate, if necessary</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Master stream appliances are very important tools on the fireground. Each has its own special purpose. Your immediate recognition of each one and its advantages is crucial to effective fireground operations. Because of their weight, large volume of water flowed, and nozzle reaction, they can be extremely unsafe if used improperly.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: HOW TO DEPLOY A PORTABLE MONITOR UNIT

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A portable monitor unit, monitor stand, spanner wrenches, pick-head axe, appropriate size and lengths of hoseline, and appropriate personal protective equipment

Behavior: The student will set up and use a portable monitor unit

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Portable monitor unit
- Monitor stand
- Two spanner wrenches
- One pick-head axe
- Appropriate size and lengths of hoseline
- Appropriate personal protective equipment

REFERENCES:

PREPARATION: The master stream is the "big gun" of the fire department. Master streams not only deliver large volumes of water, but they also have greater reach than hand-held streams. Flows commonly range from 300-1,000 gpm. Safety must be employed. Monitors have the potential for injury to fire fighting personnel due to the extreme nozzle reactions created, large volumes of water, and a lack of -offs on most models.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove tools</td>
<td>1a. From apparatus</td>
</tr>
<tr>
<td>2. Place tools</td>
<td>2a. At desired location</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td>3. Remove monitor unit and stand</td>
<td>3a. From apparatus</td>
</tr>
<tr>
<td></td>
<td>b. With assistance</td>
</tr>
<tr>
<td></td>
<td>c. Using proper lifting techniques</td>
</tr>
<tr>
<td>4. Place stand</td>
<td>4a. At desired location</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td>5. Place monitor unit</td>
<td>5a. In stand</td>
</tr>
<tr>
<td>6. Lock mechanism</td>
<td>6a. In place</td>
</tr>
<tr>
<td></td>
<td>b. Locking mechanism latched securely</td>
</tr>
<tr>
<td>7. Place monitor unit</td>
<td>7a. In proper position</td>
</tr>
<tr>
<td></td>
<td>b. Nozzle above the manufacturer's elevation safety stop before flowing water</td>
</tr>
<tr>
<td></td>
<td>c. May have female swivels facing the fire or female swivels facing away from the fire and tip facing the fire, depending on the manufacturer's recommendations</td>
</tr>
<tr>
<td>8. Secure monitor stand</td>
<td>8a. In asphalt or other soft surface (if available)</td>
</tr>
<tr>
<td></td>
<td>b. With pick-head axe</td>
</tr>
<tr>
<td></td>
<td>c. Deep enough to secure stand pins</td>
</tr>
<tr>
<td>9. Place monitor stand pins</td>
<td>9a. In surface</td>
</tr>
<tr>
<td></td>
<td>b. To prevent movement of monitor while in use</td>
</tr>
<tr>
<td>10. Secure anchor hook</td>
<td>10a. When applicable</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>11. Extend hoselines</td>
<td>11a. From apparatus to monitor set up</td>
</tr>
<tr>
<td>12. Connect hoselines</td>
<td>12a. To monitor unit</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>13. Tighten swivel couplings</td>
<td>13a. Hand tight</td>
</tr>
<tr>
<td>14. Check tip size</td>
<td>14a. Proper for situation</td>
</tr>
<tr>
<td>15. Steady monitor</td>
<td>15a. Operator can safely abandon position if needed</td>
</tr>
<tr>
<td>16. Signal for water</td>
<td></td>
</tr>
<tr>
<td>17. Adjust direction of water flow</td>
<td>17a. Slow, deliberate manner</td>
</tr>
<tr>
<td></td>
<td>b. One fire fighter on monitor at all times</td>
</tr>
<tr>
<td></td>
<td>c. A second fire fighter directing the stream</td>
</tr>
<tr>
<td></td>
<td>d. Should be perpendicular to the hose stream</td>
</tr>
<tr>
<td></td>
<td>e. Never below 30° or manufacturer's recommendation unless it is mounted to apparatus as a deck gun</td>
</tr>
<tr>
<td>18. Maintain visual or radio contact</td>
<td>18a. With apparatus pumping to monitor</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

TOPIC: CHARACTERISTICS AND FUNCTIONS OF FOAM PRODUCING DEVICES

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7, 4-3.1, and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of foam producing devices by completing the written test


MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Stream Practices, IFSTA, Seventh Edition

PREPARATION: Fighting fires with foam not only requires the use of hoseline, nozzles, and water, but additionally requires equipment specifically designed to mix the foam concentrate with water and air. Without this special equipment, the foam will not perform as it should.
I. FOAM PROPORTIONING
   A. The term means to mix water with foam concentrate to form a solution

   B. Most fire fighting foams are mixed with 94.0-99.9% water
   C. Class A foams are 0.1-3.0%
   D. Class B foams are mixed at 3% or 6% depending on manufacture and flammable liquid on fire

II. FOUR METHODS FOAM CAN BE PROPORTIONED
   A. Induction
   B. Injection
   C. Batch-mixing
   D. Premixing

III. INDUCTION (EDUCTION)
   A. Drafts foam up the eductor into the water in the hoseline
   B. Uses the energy from passing water to pull up (draft) foam (venturi principle)
      1. In line eductors and nozzle eductors use this method
### IV. INJECTION

A. Uses an external pump or head pressure to force concentrate into water
   1. Common to engine mounted proportioners or fixed facilities

### V. BATCH-MIXING

A. The fastest way to mix concentrate
B. Batch-mixing puts the foam directly into the water tank on the apparatus
C. Usually only done with light water or Class A foams

D. Disadvantage
   1. Dangers involve pump cavitation when the water is not flowing and pump corrosion occurs, if not thoroughly cleaned out after the operation

### VI. PREMIXING

A. Used primarily for water extinguishers or vehicle mounted tank systems
B. Used from pressurized tanks for one time use or from a tank to a compressor
   1. A Class A compressed air backpack operates from this method

---

**How is foam injected into water?**

**What type of foam concentrate can be batch-mixed?**

**What is a disadvantage of batch mixing?**

**When is premixing used?**
VII. FOAM PROPORTIONERS AND FOAM DELIVERY DEVICES AND GENERATING SYSTEMS

A. Foam proportioners
   1. May be portable or apparatus mounted

   2. Operate on two basic principles
      a) Pressure from water stream flowing through orifice creates venturi that inducts foam concentrate into water stream
      b) Pressurized proportioning device injects foam concentrate into water stream at desired ratio

B. Portable foam proportioners
   1. The simplest, most common foam proportioning device, two basic types
      a) In-line foam eductors
         1) Attaches directly to pump panel discharge or at some point in hose lay
         2) Utilizes venturi action to draft concentrate
         3) Must follow manufacturer’s recommendations for inlet pressure and maximum hose lay between eductor and nozzle
         4) Simplest and least expensive

Under what two principles do foam proportioners operate?

Where does an in-line foam eductor attach?

How far can the nozzle be from the foam eductor?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Foam nozzle eductors</td>
<td>How does using a foam nozzle eductor compromise fire fighter's safety?</td>
</tr>
<tr>
<td>1) Eductor is built into the nozzle</td>
<td></td>
</tr>
<tr>
<td>2) Requires foam concentrate to be at nozzle</td>
<td></td>
</tr>
<tr>
<td>3) Utilizes venturi principle</td>
<td></td>
</tr>
<tr>
<td>4) Can compromise fire fighter safety, makes movement slow, may have to leave foam concentrate</td>
<td></td>
</tr>
<tr>
<td>2. Apparatus-mounted proportioners</td>
<td>When is an around-the-pump proportioner useful?</td>
</tr>
<tr>
<td>a) Installed in-line eductors</td>
<td></td>
</tr>
<tr>
<td>b) Around-the-pump proportioners</td>
<td></td>
</tr>
<tr>
<td>1) Automatic proportioner</td>
<td></td>
</tr>
<tr>
<td>2) Especially useful with low water pressure or no motor available for a separate foam concentrate pump</td>
<td></td>
</tr>
<tr>
<td>c) Balanced pressure proportioners</td>
<td></td>
</tr>
<tr>
<td>1) Automatically provides the proper concentrate/water solution over wide range of flows and pressures</td>
<td></td>
</tr>
<tr>
<td>C. Foam delivery devices</td>
<td>Before the foam solution is delivered to the fuel what must happen to it?</td>
</tr>
<tr>
<td>1. Once the foam concentrate and water create a foam solution, the foam solution must then be aerated and delivered to the surface of the fuel</td>
<td></td>
</tr>
</tbody>
</table>
a) There are many devices to accomplish this task

b) Foam nozzle eductors are considered a delivery system but were covered earlier

c) Hand-line nozzles, flows less than 350 gpm

<table>
<thead>
<tr>
<th>1) Smoothbore nozzles</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Limited to certain types of Class A foams</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Fog nozzles</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Breaks foam solution into tiny droplets</td>
</tr>
<tr>
<td>- Best application is AFFF and Class A foam</td>
</tr>
<tr>
<td>- May have foam application attachment making it an air-aspirating nozzle, increasing the expansion ratio</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3) Air-aspirating foam nozzles</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Most effective for generating low expansion foam, provides maximum foam expansion</td>
</tr>
<tr>
<td>- Inducts air into the foam solution by venturi</td>
</tr>
</tbody>
</table>

When can a smoothbore nozzle be used to deliver foam?

What is the most effective nozzle for generating low expansion foam?

When can a smoothbore nozzle be used to deliver foam?

What is the most effective nozzle for generating low expansion foam?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less reach than standard nozzle</td>
<td>What is a disadvantage of using and air-aspirating foam nozzle?</td>
</tr>
</tbody>
</table>

4) Foam sprinklers

- Found on foam deluge and foam water systems
- Utilize a venturi action to mix air into the foam making section
- Come in upright and pendant designs with deflectors designed to meet installation requirements

2. Medium and high-expansion foam generating devices

a) Produce a high-air-content, semi-stable foam

b) Medium-expansion foam, air content ranges from 20 parts air to 1 part foam solution (20:1) to 200 parts air to 1 part foam solution (200:1)

c) High-expansion foam, air content ranges from 200:1 to 1,000:1

- What sprinkler system utilizes foam sprinklers?

- What is the air content range for medium expansion foams?

- What is the air content range for high expansion foam?
**PRESENTATION**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>d)</strong></td>
<td>Two basic types of medium- and high-expansion foam generators</td>
</tr>
<tr>
<td></td>
<td>1) Water-aspirating type nozzle</td>
</tr>
<tr>
<td></td>
<td>• Similar to foam producing nozzles, except larger</td>
</tr>
<tr>
<td></td>
<td>• Back of nozzle is open to air flow</td>
</tr>
<tr>
<td></td>
<td>• Typically produce a lower air-volume foam than do mechanical blowers</td>
</tr>
<tr>
<td></td>
<td>2) Mechanical blower generator</td>
</tr>
</tbody>
</table>

**APPLICATION**

- What are the two types of medium and high-expansion foam generators?

- What does a mechanical generator look like?

- How is high-expansion foam applied?

- What are some techniques to apply foam?

**VIII. FOAM APPLICATION TECHNIQUES**

A. Roll on method and bank in

1. Aim the nozzle just ahead of the fire allowing the foam to roll on the flames
B. Bank down method and bounce off
   1. Hitting a wall behind or next to the fire so that the foam covers the flames

C. Rain down method and snowflake
   1. Sending a wide fog over the fire causing foam to gently fall over the flames

IX. FOAM HAZARDS

A. Foam hazards to fire fighters
   1. Mild corrosive
   2. Can be irritating to the eyes and skin
   3. Class B foams tend to be more corrosive than Class A foams
   4. Refer to manufacturer’s Material Safety Data Sheets

B. Foam hazards to the environment
   1. Left on the ground creates no hazard
      a) Bacteria neutralizes foam within minutes
   2. In waterways becomes a hazard
      a) Bacteria grows rapidly to neutralize foam and can deplete oxygen content in water and kill fish

Can foam be hazardous to you?

What can foam do if placed into a pond?
SUMMARY:

Foam can be a very effective fire fighting tool. Foam concentrate must be injected into the water stream and aerated to be effective. Foam eductors/proportioners accomplish this task and are used with a variety of nozzles. The application of the foam to the burning material is another essential task that must be accomplished safely and efficiently to be effective as an extinguishing agent.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: INSPECTION AND MAINTENANCE OF FOAM PRODUCING DEVICES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.2 and SBFS

BEHAVIORAL OBJECTIVE:

   Condition: A written test

   Behavior: The student will confirm a knowledge of the inspection and maintenance of foam producing devices by completing the written test


MATERIALS NEEDED:

   • Writing board with markers/erasers
   • Appropriate audiovisual equipment
   • Appropriate audiovisual materials
   • Examples of foam proportioning equipment

REFERENCES:

   • Essentials of Fire Fighting, IFSTA, Fourth Edition
   • Fire Stream Practices, IFSTA, Seventh Edition

PREPARATION: Foam application is often called for at some of the most spectacular incidents. Flammable liquids and hazardous materials are often involved in these incidents. When foam generators are needed, they are usually of critical importance. Their proper functioning is directly tied to effective maintenance and inspection.
I. INSPECTION AND MAINTENANCE
   A. Check ease of operation
   B. Check the gaskets
   C. Check for external damage
      1. Broken or cracked housing
      2. Damaged threads
      3. Damaged handles
   D. Check for internal damage and debris
   E. Check metering orifice

      1. Ensure metering orifice spins freely without buildup

   F. Flush completely
      1. Follow manufacturer's instructions
      2. Foam is very corrosive
   G. Should be thoroughly cleaned with soap and water, using a soft bristle brush after every use
   H. Replace or repair in accordance with manufacturer's recommendations and directions
   I. Check foam in tanks periodically to ensure it is not gelling
      1. Gel may harden in tank making system inoperable
   J. Don't mix different brands of foam unless it is being used immediately

What should the metering orifice be checked for?

Why is it important to clean and maintain your foam equipment?
SUMMARY:

Foam systems provide a very effective tool for fire fighters to use in every day and special situations. It is important for fire fighters to be familiar with the use and operation of foam equipment. Just as important, is the inspection and maintenance of the foam producing appliances. Because foam can be corrosive and not miscible in some applications, it is important to regularly maintain and inspect the equipment.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: TYPES OF LADDERS USED BY THE FIRE SERVICE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the types of ladders used by the fire service by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ground Ladders, IFSTA, Ninth Edition

PREPARATION: The ladder is a basic tool of the fire fighting profession. It is important that the fire fighter become familiar with the various types of ladders and their appropriate uses as fireground tools. During the fire fighter's career, the fire fighters' exposure and use of fire service ladders will be directly proportional to the size of their fire jurisdiction.
## Types Of Ladders Used By The Fire Service

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. SINGLE LADDER</strong></td>
<td></td>
</tr>
<tr>
<td>A. Primary advantage of the single or straight ladder</td>
<td></td>
</tr>
<tr>
<td>1. Can be quickly placed into service by a single fire fighter</td>
<td></td>
</tr>
<tr>
<td>2. Single section/single bed</td>
<td></td>
</tr>
<tr>
<td>3. Fixed length</td>
<td></td>
</tr>
<tr>
<td>a) Length vary from 6-32 feet</td>
<td></td>
</tr>
<tr>
<td>b) Most common lengths range from 12-24 feet</td>
<td></td>
</tr>
<tr>
<td><strong>II. ROOF LADDER</strong></td>
<td></td>
</tr>
<tr>
<td>A. Roof ladders are single ladders that have hooks attached to the tip end</td>
<td></td>
</tr>
<tr>
<td>B. Hooks are nested between the beams at the tip of the ladder</td>
<td></td>
</tr>
<tr>
<td>1. Used to anchor the ladder when it is used on a pitched roof</td>
<td></td>
</tr>
<tr>
<td>C. Lengths vary from 12-24 feet</td>
<td></td>
</tr>
<tr>
<td><strong>III. FOLDING LADDER (ATTIC LADDER)</strong></td>
<td></td>
</tr>
<tr>
<td>A. A special type of single ladder that have hinged rungs</td>
<td></td>
</tr>
<tr>
<td>1. Can be folded into a compact assembly with one beam resting against the other</td>
<td></td>
</tr>
<tr>
<td>B. Narrower when open than regular single ladders</td>
<td></td>
</tr>
<tr>
<td>C. Lengths range from 8-16 feet</td>
<td></td>
</tr>
<tr>
<td>D. Most common length is 10 feet</td>
<td></td>
</tr>
</tbody>
</table>

What is the difference between a straight ladder and a roof ladder?

What is another name for an attic ladder?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>
| **IV. EXTENSION LADDER**
   A. A ladder that has two or more sections
   B. Fly sections are manually raised and lowered by a halyard, or halyard and cable to permit length adjustment
   C. Preferred to by the fully extended length
   D. Lengths normally range from 12-35 feet
| What is the name of the ladder with two or more sections? |
| **V. POLE LADDERS (BANGOR LADDER)**
   A. Extension ladders that have staypoles added for stability
   B. Manufactured with 2-4 sections
   C. Lengths vary from 40-65 feet
   D. Most do not exceed 50 feet
| What is the basic difference between an extension ladder and a pole ladder? |
| **VI. COMBINATION LADDERS**
   A. Uses
      1. Step ladder
      2. Single or straight ladder
      3. Extension ladder
   B. Lengths range from 8-14 feet
   C. Most popular is the 10 foot model
| What are the three types of ladders that a combination ladder can be used as? |
### VII. LADDER REACH

<table>
<thead>
<tr>
<th><strong>A.</strong></th>
<th>The designated length of a ladder is derived from a measurement of the maximum extended length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. This is not the ladder's true reach</td>
</tr>
<tr>
<td><strong>B.</strong></td>
<td>Reach will be less than the designated length</td>
</tr>
<tr>
<td></td>
<td>1. Reach is the total length of a ladder from ground to tip when set at a 70° angle</td>
</tr>
<tr>
<td></td>
<td>2. NFPA allows ladders under 35 feet to reach 1 foot less than stated</td>
</tr>
</tbody>
</table>

What is the difference between ladder reach and the designated length of a ladder?
SUMMARY:

No single type of ground ladder meets all fire service needs. The number of types varies from five to seven depending on how one classifies variations of the two types. We have discussed six basic ladders in considerable detail. These are single, roof, folding, extension, pole, and combination. It is important that the fire fighter be thoroughly familiar with these ladders.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE GROUND LADDERS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and function of fire service ground ladders by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ground Ladders, IFSTA, Ninth Edition

PREPARATION: The ladder is a basic and important tool of the fire fighting profession. It is imperative that the fire fighter be familiar with a ladder's components and the correct terminology. This understanding is one of the first steps towards proper ladder uses.
I. LADDER CHARACTERISTICS AND TERMS

A. Major components

1. Beam
   a) One of two principal structural members of a ladder
      1) Exception is Pompier ladder with only one beam
      2) Some wooden ladders have a main beam and a truss beam
         • Truss beam has a smaller diameter and a slight curve
      b) Tie rods
         1) Bolts which pass through both rails at a truss block of a wooden ladder
   c) Two types
      1) Solid
      2) Truss
         • Also referred to as rails or side rails
         • Two lengthwise members of a trussed ladder beam
         • Separated by truss or separation blocks

2. Rungs
   a) Cross members which provide a handhold and foothold for climbing
   b) Extend from one beam to the other

3. Bed section
   a) Lowest and widest section of a ground ladder
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Fly section(s)</td>
<td>What is the fly section of the ladder?</td>
</tr>
<tr>
<td>a) Upper section of</td>
<td></td>
</tr>
<tr>
<td>1) Extension ladders</td>
<td></td>
</tr>
<tr>
<td>2) Pole (Bangor) ladders</td>
<td></td>
</tr>
<tr>
<td>3) Some combination ladders</td>
<td></td>
</tr>
<tr>
<td>B. Attachment components</td>
<td></td>
</tr>
<tr>
<td>1. Anchor (halyard)</td>
<td></td>
</tr>
<tr>
<td>a) Part of the ladder which the halyard is attached to</td>
<td></td>
</tr>
<tr>
<td>2. Dogs</td>
<td></td>
</tr>
<tr>
<td>a) Also known as pawls and locks</td>
<td></td>
</tr>
<tr>
<td>b) Devices which hold the fly sections at desired height during use</td>
<td></td>
</tr>
<tr>
<td>c) Found on all extension ladders</td>
<td></td>
</tr>
<tr>
<td>3. Guides</td>
<td>Are dogs found on all extension ladders?</td>
</tr>
<tr>
<td>a) Wood or metal strips on an extension ladder which guide the fly section while being raised</td>
<td></td>
</tr>
<tr>
<td>b) Sometimes in the form of slots or channels</td>
<td></td>
</tr>
<tr>
<td>4. Halyard</td>
<td></td>
</tr>
<tr>
<td>a) A rope or cable used for hoisting and lowering the fly section of an extension, ladder</td>
<td></td>
</tr>
</tbody>
</table>
5. **Cable (wire rope)**
   a) Used in place of halyard on three and four-section extension ladders
   b) Minimum 3/16-inch diameter (5mm)
   c) No splices allowed

6. **Butt**
   a) Also called heel or base
   b) Bottom end of the ladder
   c) The end which is placed on the ground
   d) Used as supporting surface when ladder is being raised

7. **Tip**
   a) Also called top
   b) The extreme top of the ladder

8. **Heel (butt spurs)**
   a) Metal safety plates or spurs attached to heel of a ground ladder to prevent slippage
   b) Different arrangements for wood, metal, and fiberglass ladders
   c) Protects the beams
   d) Most effective on soft surfaces

9. **Hooks**
   a) Curved, pointed metal devices at the tip of the roof ladder

---

What type of surface provides the best footing for butt spurs?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Generally used in pairs</td>
<td>d) Secures a ladder on a pitched roof</td>
</tr>
<tr>
<td>c) Fold outward from each beam 90°</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What is the purpose for the hooks on a roof ladder?</td>
</tr>
<tr>
<td>10. Protection plates</td>
<td></td>
</tr>
<tr>
<td>a) Plates fastened to a ladder</td>
<td></td>
</tr>
<tr>
<td>b) Prevents wear where the ladder comes in contact with mounting brackets</td>
<td></td>
</tr>
<tr>
<td>11. Pulley</td>
<td></td>
</tr>
<tr>
<td>a) Small grooved wheel through which the halyard is drawn</td>
<td></td>
</tr>
<tr>
<td>12. Safety shoes</td>
<td></td>
</tr>
<tr>
<td>a) Rubber or neoprene spike plates, usually of swivel type</td>
<td></td>
</tr>
<tr>
<td>b) Attached to heel of a ground ladder</td>
<td></td>
</tr>
<tr>
<td>13. Spurs</td>
<td></td>
</tr>
<tr>
<td>a) Metal points at the lower end of tormentor or stay poles</td>
<td></td>
</tr>
<tr>
<td>b) Butt spurs refer to metal plates or spurs at bottom of ground ladder</td>
<td></td>
</tr>
<tr>
<td>14. Toggle</td>
<td></td>
</tr>
<tr>
<td>a) A device by which a tormentor pole is attached to a ladder</td>
<td></td>
</tr>
<tr>
<td>15. Tormentor poles</td>
<td></td>
</tr>
<tr>
<td>a) The poles that are attached to long extension ladders</td>
<td></td>
</tr>
<tr>
<td>b) Also called stay poles</td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>16. Stops</td>
<td></td>
</tr>
<tr>
<td>a) Wood or metal pieces which prevent fly section from being extended too far</td>
<td></td>
</tr>
<tr>
<td>17. Tie rods</td>
<td></td>
</tr>
<tr>
<td>a) Metal rods running from one beam to the other</td>
<td></td>
</tr>
<tr>
<td>b) Found on wooden ladders</td>
<td></td>
</tr>
<tr>
<td>c) Used to secure beams together</td>
<td></td>
</tr>
<tr>
<td>18. Truss block</td>
<td></td>
</tr>
<tr>
<td>a) Separation pieces between the rails of a trussed ladder</td>
<td></td>
</tr>
<tr>
<td>b) Sometimes used to support rungs</td>
<td></td>
</tr>
<tr>
<td>19. Identification</td>
<td></td>
</tr>
<tr>
<td>a) Serial number</td>
<td></td>
</tr>
<tr>
<td>1) Each ladder bears a unique identification number</td>
<td></td>
</tr>
<tr>
<td>b) City inventory</td>
<td></td>
</tr>
<tr>
<td>1) Unique number for each ladder</td>
<td></td>
</tr>
<tr>
<td>c) Apparatus or assignment markings</td>
<td></td>
</tr>
<tr>
<td>1) Apparatus identification</td>
<td></td>
</tr>
<tr>
<td>2) May be color coded</td>
<td></td>
</tr>
<tr>
<td>3) Identifies length</td>
<td></td>
</tr>
<tr>
<td>20. Heat sensor label</td>
<td></td>
</tr>
<tr>
<td>a) A label affixed near the top of each section of the ladder</td>
<td></td>
</tr>
<tr>
<td>1) Turns color at a present temperature</td>
<td>What is the purpose of the tie rods?</td>
</tr>
</tbody>
</table>
2) Color change indicates the ladder has been exposed to excessive heat
   • Exposure to excessive heat requires testing

II. MEASUREMENT OF LADDER TERMINOLOGY

A. Angle of inclination
   1. Refers to the angle of an in-place ladder in relation to the horizontal
      2. Approximately 75°

B. Designated length
   1. Total extended length
   2. Length marked on ladder

C. Working length
   1. Total length at proper climbing angle

D. Inside width
   1. The distance measured from the inside of one beam to the inside of the opposite beam lock

E. Outside width
   1. The distance measured from the outside of one ladder beam to the outside of the opposite ladder beam

F. Maximum extended length
   1. The total length of an extension ladder or some combination ladders, when all fly sections are fully extended with the dogs (pawls) engaged

III. OPERATIONAL LADDER TERMINOLOGY

A. Bedded position - Definition #1
   1. Also called grounded
   2. Fully retracted position of an extension ladder

What is the recommended proper angle of inclination?
B. Bedded position - Definition #2
   1. Position in which the ladder is carried on the apparatus

C. Nesting
   1. Procedure whereby ladders of different sizes and/or types are racked partially within one another
   2. Reduces storage space
   3. Most common arrangement

D. Pivot
   1. Method used to turn ladder in vertical position by leaning on one beam

E. Retracted
   1. Another term for bedded position

F. Tying off
   1. Tying knot to secure excess halyard used to extend fly sections of a ladder
SUMMARY:

Fire service ground ladders are designed to perform varying functions. The specific task will determine which types of ladders are to be used. Although these functions are usually similar in different parts of the country, the nomenclature and trade terms may vary considerably. Because of these semantic variations, it is difficult to discuss ladder terms without first having an understanding of their meaning.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: LADDER DESIGN AND CONSTRUCTION

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of ladder design and construction by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in NFPA Standard #1931, NFPA, 1999 Edition, Chapters 2 and 3 or Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition
- NFPA Standard #1931, NFPA, 1999 Edition

PREPARATION: The ladder is a basic tool of the fire fighting profession. It is important that the fire fighter be familiar with ladder design and construction. This enables fire fighters to better understand the strengths and weaknesses of each specific ladder and how each is best used.
I. CONSTRUCTION

A. Manufacturers
   1. Many different manufacturers
      a) Duo-safety
      b) ALCO

B. Type of construction materials
   1. All materials used must be of premium grade

2. Wood constructed
   a) Clear straight-grained Douglas fir for beam construction
   b) Hickory is used for rungs
   c) Some white spruce is used

3. Metal constructed
   a) Aluminum
   b) Heat treated aluminum alloy

4. Fiberglass constructed
   a) Beams are fiberglass
   b) Remaining parts are aluminum alloy

5. Composite materials
   a) Truss beam construction
      1) Beams are wood
      2) Rungs are metal

II. DESIGN

A. Solid beam construction
B. Truss beam construction
C. Both meet same standards
D. Ladder components must withstand
   1. Overload (weight)
   2. Extreme temperatures
   3. Flame contact
   4. Structural collapse

E. Sometimes used for tasks other than what they were designed for
   1. Improvised sumps
   2. Trench rescue/shoring
   3. Chute
   4. Stokes
   5. Pedestrian barriers
   6. Ladder gin

F. Must be stronger and of higher quality workmanship than ladders built for public or commercial work

G. Ground ladders have lives depending on them, most frequently those of fire fighters

III. CERTIFICATION OF FIRE SERVICE LADDERS
   A. Manufactured according to standards
   B. Manufacturers are required to provide certification of testing
   C. Certification label affixed to the ladder
IV. DISADVANTAGES OF FIRE SERVICE LADDERS

A. Wooden ladders
   1. Suitable wood hard to find
   2. Wood shrinkage
   3. Wood splinters
   4. Require considerable maintenance
   5. Clear varnish required to prevent aging and deterioration
   6. Heavier than metal

B. Metal (aluminum alloy) ladders
   1. Conduct electricity
      a) Extreme caution is necessary whenever metal ladders are used near electrical power sources
   2. Fail when exposed to high heat
      a) 600°F or more
      b) Even short duration
   3. Become cold in the winter
   4. Become hot in the summer

C. Fiberglass ladders
   1. Dense manufactured material
   2. Relatively heavy
3. Chip and crack with severe impact
4. When overloaded, may suddenly crack and fail

V. METAL LADDERS VERSUS WOODEN LADDERS

A. Advantages of metal ladders
   1. In most lengths, metal ladders are lighter than wooden ladders
   2. Metal ladders are tougher so they show less wear and tear
   3. Metal ladder users are not subjected to splinters
   4. Metal ladders are easier to maintain
      a) Do not need to be sanded down
      b) Do not need to be refinished
      c) Less down time
   5. Longer service life
   6. Wooden ladders are subject to water absorption and dry rot

B. Disadvantages of metal ladders

1. Metal ladders are good conductors of electricity
   a) Extreme caution is necessary whenever metal ladders are used near electrical power sources
2. Metal ladders are subject to sudden failure when exposed to heat
   a) In excess of 600°F

What are the advantages of metal versus wood ladders?

What are disadvantages of metal ladders versus wood ladders?
1) The metal loses its strength when ladder cools

2) Does not regain strength when ladder cools

b) Even short duration

c) These temperatures are routinely encountered at fires, therefore, the following precaution is necessary

1) Any metal ladder subject either to direct flame contact or to heat high enough to cause water contacting ladder to sizzle or turn to steam, or which has a heat sensor that has changed color, should be removed from service and subjected to a hardness test

**NOTE:** For a description of hardness test, see Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 2, page 47.
SUMMARY:

The materials and the components of each fire service ladder type may vary. Each design and construction type has its benefits and disadvantages. Fire personnel must know these materials and components in order to properly apply ladders to fireground situations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read NFPA Standard #1931, NFPA, 1999 Edition, Chapters 2 and 3 or Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SELECTION METHODS FOR THE PROPER SIZE LADDER FOR DIFFERENT SITUATIONS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the selection methods for the proper size ladder for different situations by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ground Ladders, IFSTA, Ninth Edition

PREPARATION: A key factor in selecting the correct ladder for the job is the ability to make a good estimate of the length of a ladder required to reach various levels of windows or roofs. You will learn how to select the correct ladder for the job.
I. SELECTING THE CORRECT LADDER FOR THE JOB
   A. Knowledge of the length of a ladder to do the job
   B. The job or task that has to be accomplished

   1. Rescue
   2. Access to windows
   3. Access to the roof

II. FIGURING THE LENGTH
   A. Working rules
      1. Window
         a) Access
            1) 3-4 rungs into the window when window is wide enough
            2) If too narrow, place to side of the window
         b) Ventilation
            1) To side
            2) Upwind
      c) Rescue
         1) Tip at or just below window sill
      2. Roof
         a) Access
            1) Tip 5 rungs beyond the roof edge
            2) Provides footing and handhold for persons stepping on or off ladder
B. Building construction

1. Residential story average is 8-10 feet (2-3 meters) per story
   a) Distance from floor to window sill is about 3 feet (1 meter)

2. Commercial story average is 12 feet (4 meters) floor to floor
   a) Distance from floor to window sill is about 4 feet (1 meter)

C. Designated ladder length

1. Derived from a measure of the maximum extended length

2. Requirements
   a) Length of story x number of stories = subtotal
   b) Subtotal + handhold length + reach factor = total length needed

What ladder length is needed to reach the eaves of a two-story residence, assuming 8 feet per story?

c) Example
   Length of story: 8 ft
   Number of stories: x 2
   Subtotal: 16 ft
   Handhold length: + 4 ft
   Reach factor: + 1 ft
   TOTAL length needed: 21 ft
D. Ladder reach
   1. Ladders are set at approximately a 75° angle
   2. Reach will be less than the designated length

   Why is reach of a ladder different from length of a ladder?

   3. Reach is the total length of a ladder from ground to tip when set at a 75° angle
   4. Using NFPA guidelines, it is permissible for a ladder under 35 feet to reach 1 foot less than stated
      a) A 10-foot ladder may have a maximum reach of 9 feet

E. Proper climbing angle of ladders
   1. To determine the proper distance between the heel of the ladder and the building, divide the "used length" on the ladder by 4
   2. A working test to see if you have the ladder at the proper angle is to place the toes of your boots against the butt of the ladder
      a) Outstretched arms should reach ladder

   What is the proper climbing angle?
SUMMARY:

Only when all factors such as working rules, length of ladder and building construction are considered, can a fire fighter make a decision in selection the correct ladder size. Proper selection of a ladder is a basic and fundamental skill required of a fire fighter.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: LADDER SAFETY PRACTICES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: II

AUTHORITY: 1997 NFPA 1001 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of ladder safety practices by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ground Ladders, IFSTA, Ninth Edition

PREPARATION: Ladders are an extremely useful tool, but have a history of being improperly used on the fireground. When a fire fighter uses a ladder their safety and well-being depends on compliance with some general safety guidelines. The most common violations of these guidelines are overloading the ladder and improper climbing angles. Not following these safety guidelines has led to serious fire fighter injuries. This lesson is intended to give you an understanding of these basic safety guidelines and loading characteristics so that the chance of serious injury on the fireground is minimized.
# I. SAFETY GUIDELINES

A. There is no substitute for good common sense

B. Appropriate personal protective equipment
   1. Gloves
   2. Helmet
   3. Turnout coat
   4. Turnout pants
   5. Turnout boots

C. Use proper number of personnel
   1. Ladder carries
   2. Ladder raises

D. Use proper lifting techniques
   1. Back straight
   2. Lift with legs

# II. SAFETY CONSIDERATIONS

A. Positioning ladder

1. Check for overhead obstructions
   a) Trees
   b) Overhangs
   c) Wires
d) Be aware of power lines
   1) Metal ladders are good conductors
   2) Wood, fiberglass and composite ladder also conduct electricity when wet

2. Proper climbing angle
   a) 75° angle
   b) Used portion of ladder divided by 4
   c) Lower climbing angle = more stress on ladder and less stability

3. Location
   a) Do not relocate ladder position once it has been used
      1) Fire fighter escape route
      2) They will expect to find it where they left it

B. Footing
   1. When heeling inboard do not look up
   2. Wear appropriate personal protective equipment
   3. Foot ladder time ladder is used by personnel
### C. Climbing ladder

1. **Before climbing**
   - a) Check for proper 75° angle
   - b) Check ladder stability
   - c) Check that halyard is secure
   - d) Check that pawl (lock, dogs) are secure

2. **Climbing should be smooth and rhythmic**

3. **Use proper safety procedures when working off of ladder**
   - a) Leg lock-in
   - b) Safety belt
   - c) Hose strap
   - d) Rope hose tool

4. **Do not exceed load limits of ladder**
   - a) One person per section, maximum

### D. Load safety characteristics

1. **Ladders are designed to support a maximum weight**
   - a) [NFPA Standard #1932](#) regulates strength tests
## Loading Specifications

2. Loading specifications are based on proper angle and with the tip supported

### Estimating Total Weight Carried by a Ladder

3. Load is the total weight on the ladder
   - a) Personnel
   - b) Equipment
   - c) Charged hoselines

4. Maximum ladder loading
   - a) Folding
     - 1) 300 pounds
   - b) Single and roof
     - 1) 750 pounds
   - c) Extension and pole
     - 1) 750 pounds
   - d) Combination
     - 1) 750 pounds

### Using a Ladder during a Rescue

E. Using a ladder during a rescue
   - 1. Remove other loads
   - 2. Discontinue all other activities on that ladder
   - 3. Secure both the tip and butt
   - 4. Proper position
SUMMARY:

Safety and awareness of your surroundings should be a constant factor while using ladders. Your safety and the safety of those who use the ladder you place into service is relying on your judgment and careful attention to details contained within this lesson.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: METHODS OF IMPROVISING WITH GROUND LADDERS
TIME FRAME: 0:45
LEVEL of INSTRUCTION: Level II
AUTHORITY: 1997 NFPA 1001 3-3.5 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the methods of improvising with ground ladders by completing the written test


MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES: • Essentials of Firefighting, IFSTA, Fourth Edition, Chapter 9
• Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 5,
• Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

PREPARATION: Ground ladders must sometimes be used for purposes other that those that they were originally designed for. When using ground ladders for these alternative applications, considerable reliance is placed on the substantial safety factors that are built into fire service ground ladders. Since using a ground ladder in any way other than that recommended by the manufacturer places all liability for accidents and injuries on the user, it is important that fire fighters be proficient in carrying, raising, and climbing skills.
It is also essential that fire fighters understand the methods of improvising with ladders and the limitations of the ladders during this improvised use.
I. IMPROVISED FIREGROUND USE

A. Fire fighting operations

1. Rescue
   a) First priority in the allocation of
      1) Personnel
      2) Apparatus
      3) Equipment
      4) Communications
   b) Assisting conscious and physically able person down ground ladders
   c) Bringing unconscious persons down ground ladders
   d) Slide for lowering basket stretcher
   e) Support for lowering of an injured person using a ladder sling

2. Fire suppression
   a) Elevated handline fire streams
   b) Improvised cellar pipe
   c) Horizontal ventilation of windows

3. Fire suppression support
   a) Suction strainer support

What use of ground ladders get first priority?

Can you identify some improvised uses for fire suppression?

Describe some other improvised uses for supporting suppression operations.
b) Damming a stream for drafting

c) Ventilation
   1) Breaking windows with ladder tip
   2) Supporting smoke ejector in window or door

d) Bridging fences or walls

e) Above and below grade access

4. Property conservation
   a) Catch basins
   b) Water chutes

What other types of improvised uses are there with ground ladders?

II. OTHER IMPROVISED USES

NOTE: WARNING: Using a ground ladder in any way other than that recommended by the manufacturer places all liability for accidents and injuries completely on the user and such use is not recommended.

A. Ice rescue
   1. Well suited for the job
   2. Can reach the victim from a safe location
   3. Keeps the victim from sinking
   4. Can pull the victim to safety
   5. Example
      a) A mounted and inflated spare tire or other buoyant object can be lashed to the tip of the ladder for use on thin ice or open water
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>B. Bridging</td>
<td>What are some reasons that we use ladders for bridging?</td>
</tr>
<tr>
<td>1. Effective bridge between two points</td>
<td></td>
</tr>
<tr>
<td>2. Over collapsed or weakened floors</td>
<td></td>
</tr>
<tr>
<td>3. Over collapsed or weakened stairways</td>
<td></td>
</tr>
<tr>
<td>4. Used successfully to retrieve victims across shafts and alleys</td>
<td></td>
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<tr>
<td>C. Trench Rescue</td>
<td>How can a ladder be used during trench rescue?</td>
</tr>
<tr>
<td>1. Entering and exiting the trench</td>
<td></td>
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<tr>
<td>2. Shoring of trench sides</td>
<td></td>
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<tr>
<td>3. Protecting the trench during inclement weather</td>
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<tr>
<td>D. Hoisting Devices</td>
<td>What types of hoisting devices can be made using ground ladders?</td>
</tr>
<tr>
<td>1. Jib Arms</td>
<td></td>
</tr>
<tr>
<td>2. Gin poles</td>
<td></td>
</tr>
<tr>
<td>3. A-Frame</td>
<td></td>
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<tr>
<td>4. As support for block and tackle or Z-rig</td>
<td></td>
</tr>
</tbody>
</table>

### III. SAFETY CONSIDERATIONS

| A. Always have enough people to do the job | What should be done to insure that ladders are ready for any use? |
### Presentations

**What issues could compromise fireground safety when working with ladders?**

B. Fireground

1. Reassure and explain process to conscious victim to avoid panic
2. Tie-off hoselines for elevated streams and be aware of nozzle reaction
3. Watch for falling glass when venting windows with ground ladders

### Application

**What measure should be taken to insure ice rescuer safety?**

C. Ice rescue

1. Tie a rope to the shore end of the ladder
2. Rescuers should wear appropriate flotation and thermal protection
3. Attach lifelines to rescuers that must advance on to unstable ice

D. Bridging

1. Bedded extension ladder is the safest
2. Lash rung together

3. Five feet on each end for every ten feet of span
4. A plank over the rungs will distribute the load evenly
5. Safety lines while crossing bridge
SUMMARY:

The fire service has developed many improvised uses for ground ladders. You must understand that while using ground ladders in this way may be the only alternative you have to save a life, it also involves increased risk to personnel and equipment. Improvised use of ladders can be very risky and a thorough risk-versus-gain evaluation should be done before any of these methods are employed. Manufacturers of ground ladders do not encourage, endorse, condone, or sanction improvised use of their products.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:**
INSPECTION AND MAINTENANCE OF FIRE SERVICE GROUND LADDERS

**TIME FRAME:**
0:30

**LEVEL of INSTRUCTION:**
Level II

**AUTHORITY:**
1997 NFPA 1001 3-5.3

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the inspection, and maintenance procedures used for various types of fire service ground ladders by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 9 or *Fire Service Ground Ladders*, IFSTA, Eighth Edition, Chapter 2

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Essentials of Fire Fighting*, IFSTA, Fourth Edition
- *Fire Service Ground Ladders*, IFSTA, Eighth Edition

**PREPARATION:** Fire service ground ladders, as with any tool or appliance, require unique maintenance procedures. These procedures will vary according to the type of construction and materials used. Ground ladder maintenance is critical because of their direct involvement in lifesaving situations.
## I. INSPECTION

A. The NFPA Standard #1932 calls for a monthly inspection and after each use

B. These inspections include, but are not limited to, checking the heat sensor label on metal and fiberglass ladders

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Metal ladders which have been exposed to heat should be placed out of service until a hardness test can be performed, checking</td>
<td>What should be done with metal ladders that have been exposed to heat?</td>
</tr>
<tr>
<td>a) All rungs for snugness and tightness</td>
<td></td>
</tr>
<tr>
<td>b) All bolts and rivets for tightness</td>
<td></td>
</tr>
<tr>
<td>c) Welds for any cracks or apparent defects</td>
<td></td>
</tr>
<tr>
<td>d) Beams and rungs for cracks, splintering, breaks, gouges, checks, wavy conditions, or deformation</td>
<td>If any of these conditions exist, what would you do with this ladder?</td>
</tr>
<tr>
<td>e) Check halyard ropes for unique wear</td>
<td></td>
</tr>
<tr>
<td>f) If any of these conditions exist</td>
<td></td>
</tr>
<tr>
<td>1) The ladder should be removed from service until it can be repaired and tested or it should be destroyed</td>
<td></td>
</tr>
</tbody>
</table>

C. Wood ladders

1. Chaffed or scraped off varnish
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
</table>
| 2. Darkening of the varnish  
  a) Age and deterioration of varnish  
  3. Cracks, splinters  
  4. Burn marks, char | What would the darkening varnish indicate? |
| 5. Dark streaks in wood  
  a) Indicate deterioration of the wood  
  b) Remove from service for repair and/or replacement | What would dark streaks in the wood indicate? |
| D. Roof ladders  
  1. Proper operating roof hooks and assemblies  
    a) Deformed or loose hooks  
    b) Spring movement  
  2. Rust  
  3. Dirt | What moving part would you inspect on a roof ladder? |
| E. Extension and pole ladders  
  1. Proper operations of pawl assemblies  
  2. Fraying or kinking of halyard  
  3. Snugness of any halyard cable  
    a) Must be snug to ensure proper synchronization of upper section during operation | Why would halyard cable be snug? |
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Free-turning pulleys</td>
<td></td>
</tr>
<tr>
<td>5. Free movement of fly section</td>
<td></td>
</tr>
<tr>
<td>6. Free operation of the staypole toggles</td>
<td></td>
</tr>
</tbody>
</table>

II. MAINTENANCE

A. Ground ladders must be maintained to department standards at all times
B. Ground ladders to be free of moisture
C. Avoid storage where they are exposed to the elements
D. No paint except for the top and bottom (12 inches)
E. Test ladders when they have been subjected to high temperature, overloads, and stresses, and impacts
F. Wood ladders
   1. Store away from steam pipes, radiators, and out of direct sunlight

   a) Continued exposure to a heating source or direct sunlight will cause the wood to dry out and lose its strength
   2. Protect wood by at least two coats of varnish

G. Fiberglass ladders only
   1. Store out of direct sunlight

   a) Erodes the fiberglass surface and causes the fibers to be exposed, thereby weakening the ladder
   2. An occasional application of a good automotive paste wax to restore the surface finish
      a) Not on rungs

What does this do to wood ladders?

Why should you store fiberglass ladders out of direct sunlight?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Extension ladders</td>
<td></td>
</tr>
<tr>
<td>1. Clean and lubricate pawl assemblies</td>
<td>How often should you replace pawl torsion springs?</td>
</tr>
<tr>
<td>2. Replace pawl torsion springs every 5 years</td>
<td></td>
</tr>
<tr>
<td>3. Lubricate ladder slide areas with candle wax or bar soap</td>
<td></td>
</tr>
<tr>
<td>a) Bar soap is easier to clean off</td>
<td></td>
</tr>
<tr>
<td>I. Cleaning</td>
<td></td>
</tr>
<tr>
<td>1. Regular and proper cleaning of ladders is more than a matter of appearance</td>
<td>What happens if ladders are not cleaned?</td>
</tr>
<tr>
<td>a) Dirt hampers movement of mechanical parts and hides damaged areas</td>
<td>What should be used to remove dirt from ladders?</td>
</tr>
<tr>
<td>2. A brush and clean running water should be used to clean ladders</td>
<td></td>
</tr>
<tr>
<td>3. Tar or oily greasy residues are removed with safety solvents</td>
<td></td>
</tr>
<tr>
<td>4. During cleaning, be alert for defects</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

As any equipment used in the fire service, ground ladders require periodic and thorough inspection, and regular cleaning and lubrication to ensure that they are safe and 100% operational. This degree of reliability does not occur by accident.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9 or Fire Service Ground Ladders, IFSTA, Eighth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: GROUND LADDER TESTING

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-5.1 and 3-5.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of ground ladder testing by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ground Ladders, IFSTA, Ninth Edition
- NFPA Standard #1932, NFPA, 1999 Edition

PREPARATION:
Fire service ground ladders are subject to abuse and overloading. The purpose of testing shall be to provide reasonable safety for firefighters and victims during use. It is important for a firefighter to have a full understanding of the testing practices related to ladders.
I. LADDER TESTING
   A. NFPA Standard #1932, NFPA, 1999 Edition
   B. The service test for ground ladders shall only be conducted by fire departments on fire department ground ladders
   C. Testers must be Cal-OSHA certified

II. SAFETY CONSIDERATIONS
   A. Caution shall be used when performing service test to prevent
      1. Damage to ladder
      2. Injury of personnel during test
   B. Test load shall be placed on the ladder in such a manner as to avoid
      1. Shocks
      2. Impact loading
   C. Personnel involved in service testing shall be competently trained in the service testing procedures and equipment
   D. Personnel shall be fully cognizant at all times of sudden and dramatic failure of the ground ladder undergoing service testing

III. TESTING SCHEDULE
   A. All ground ladders shall be tested
      1. At least annually
2. Any time a ladder is suspected of being unsafe
3. After it has been subjected to overloading
4. After the ladder has been subject to impact
5. After heat exposure
6. After ladder has been repaired except for halyard replacement

What records are needed when testing?

IV. RECORDS
A. Standardized form
B. Identification
C. Dates
D. Status
E. Location
F. History
G. All service test results shall be permanently recorded

What types of tests are performed on ladders?

V. TYPES OF TESTS
A. Destructive
   1. Horizontal bending test
   2. Hardware test
   3. Roof hook test
   4. Pompier ladder test
B. Nondestructive
   1. Eddy current test
   2. Liquid penetrant test
   3. Acoustic test
SUMMARY:

It is important that fire fighters are aware of the testing requirements as well as steps required to return damaged or exposed ladders to service. The fire fighter should be able to describe the various tests used for ground ladders and the reason for each of them.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:** HOW TO REMOVE A LADDER FROM AN APPARATUS, ONE-PERSON METHOD

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**

**Condition:** An apparatus with vertical rack side-mounted ladders and appropriate personal protective equipment

**Behavior:** The student will remove a ladder from an apparatus using the one-person method

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Apparatus with vertical rack side-mounted ladders
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

**PREPARATION:**
In order for you to safely use ladders on the fireground, they must first be able to first locate and remove the ladder from the apparatus. You must know how to correctly remove ladders from apparatus.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Face apparatus</td>
<td>1a. For access to ladders</td>
</tr>
<tr>
<td></td>
<td>b. At forward ladder lock</td>
</tr>
<tr>
<td>2. Grasp forward ladder lock handle or center</td>
<td>2a. With working hand</td>
</tr>
<tr>
<td>ladder lock</td>
<td>b. Firmly</td>
</tr>
<tr>
<td>3. Release ladder lock</td>
<td>3a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td></td>
<td>b. To gain access to ladders</td>
</tr>
<tr>
<td>4. Move to rear lock</td>
<td>4a. If applicable</td>
</tr>
<tr>
<td></td>
<td>b. To gain access</td>
</tr>
<tr>
<td>5. Grasp ladder rung</td>
<td>5a. With nonworking hand</td>
</tr>
<tr>
<td></td>
<td>b. Firmly</td>
</tr>
<tr>
<td>6. Grasp rear ladder lock handle</td>
<td>6a. If applicable</td>
</tr>
<tr>
<td></td>
<td>b. With working hand</td>
</tr>
<tr>
<td></td>
<td>c. Firmly</td>
</tr>
<tr>
<td>7. Release ladder lock</td>
<td>7a. If applicable</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>8. Move to center of ladder</td>
<td>8a. At balance point</td>
</tr>
<tr>
<td></td>
<td>b. Facing ladder</td>
</tr>
<tr>
<td>9. Step toward ladder</td>
<td>9a. With right foot</td>
</tr>
<tr>
<td></td>
<td>b. Center two rungs</td>
</tr>
<tr>
<td>10. Grasp ladder</td>
<td>10a. Rungs, either side of center</td>
</tr>
<tr>
<td></td>
<td>b. With both hands</td>
</tr>
<tr>
<td></td>
<td>c. One hand on each rung</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>11. Lift ladder</td>
<td>11a. Upward</td>
</tr>
<tr>
<td></td>
<td>b. Towards chest</td>
</tr>
<tr>
<td></td>
<td>c. Clearing racking device</td>
</tr>
<tr>
<td></td>
<td>d. Using legs</td>
</tr>
<tr>
<td></td>
<td>e. Back straight</td>
</tr>
<tr>
<td>12. Step backwards</td>
<td>12a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
<tr>
<td>13. Lift ladder</td>
<td>13a. Towards chest as necessary</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Back straight</td>
</tr>
<tr>
<td></td>
<td>d. Preparing to shoulder</td>
</tr>
<tr>
<td>14. Shoulder ladder</td>
<td>14a. On beam</td>
</tr>
<tr>
<td></td>
<td>b. Insert arm between rungs</td>
</tr>
<tr>
<td></td>
<td>c. Grasping two convenient rungs</td>
</tr>
<tr>
<td></td>
<td>d. One with each hand</td>
</tr>
<tr>
<td></td>
<td>e. Walking toward objective</td>
</tr>
</tbody>
</table>
FIRE FIGHTER I

APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO REMOVE A LADDER FROM AN APPARATUS, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: An apparatus with vertical rack side mounted ladders and appropriate personal protective equipment

Behavior: The students will remove a ladder from an apparatus using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

• Job breakdown
• Apparatus with vertical rack side mounted ladders
• Appropriate personal protective equipment

REFERENCES:

• Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION: In order for fire fighters to safely use ladders on the fireground, they must be able to first locate and remove the ladder from the apparatus. Fire fighters must be taught how to correctly remove ladders from apparatus.
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<th>KEY POINTS</th>
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<td>1a. For access to ladders</td>
</tr>
<tr>
<td></td>
<td>b. With one person at each ladder lock</td>
</tr>
<tr>
<td>2. Grasp ladder lock handle</td>
<td>2a. With working hand</td>
</tr>
<tr>
<td></td>
<td>b. Firmly</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining grip</td>
</tr>
<tr>
<td>3. Grasp ladder rungs</td>
<td>3a. With nonworking hand</td>
</tr>
<tr>
<td></td>
<td>b. Firmly</td>
</tr>
<tr>
<td>4. Release lock handles</td>
<td>4a. If applicable</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>5. Grasp ladder rung</td>
<td>5a. With both hands</td>
</tr>
<tr>
<td></td>
<td>b. One hand on each rung</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining grip</td>
</tr>
<tr>
<td>6. Step toward ladder</td>
<td>6a. With right foot</td>
</tr>
<tr>
<td>7. Base person gives command</td>
<td>7a. &quot;REMOVE LADDER!&quot;</td>
</tr>
<tr>
<td>8. Lift ladder</td>
<td>8a. Upward</td>
</tr>
<tr>
<td></td>
<td>b. In unison</td>
</tr>
<tr>
<td></td>
<td>c. Toward chest</td>
</tr>
<tr>
<td></td>
<td>d. Clearing mounting devices</td>
</tr>
<tr>
<td></td>
<td>e. Using legs</td>
</tr>
<tr>
<td></td>
<td>f. Back straight</td>
</tr>
<tr>
<td>9. Step backwards</td>
<td>9a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
## How To Remove A Ladder From An Apparatus, Two-Person Method

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Lift ladder</td>
<td>10a. Towards chest as necessary</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Back straight</td>
</tr>
<tr>
<td>11. Lower ladder</td>
<td>11a. To ground</td>
</tr>
<tr>
<td></td>
<td>b. Onto beam</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO LIFT AND LOWER A LADDER FROM THE GROUND, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A ladder and appropriate personal protective equipment

Behavior: The students will lift and lower a ladder from flat on the ground using the one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Appropriate ladder
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION: Each year many fire fighters are injured when using improper lifting and lowering techniques. These injuries are preventable. To safely lift and lower ladders, body position is critical. The back must remain straight and leg muscles must be used for lifting and lowering. Always be familiar with the balance point of the ladder. These precautions and techniques should be developed using smaller, lighter ladders.

NOTE: Ladder carries can originate from different mountings: vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Facing tip of ladder</td>
</tr>
<tr>
<td></td>
<td>b. At ladder balance point</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td></td>
<td>d. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>e. Back straight</td>
</tr>
<tr>
<td>3. Grasp closest beam</td>
<td>3a. With inside hand</td>
</tr>
<tr>
<td>4. Raise ladder</td>
<td>4a. Onto beam</td>
</tr>
<tr>
<td></td>
<td>b. Lifting away from body</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining grip</td>
</tr>
<tr>
<td>5. Take position</td>
<td>5a. Next to beamed ladder</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td>7. Rotate position</td>
<td>7a. Pivoting 180° (toward base)</td>
</tr>
<tr>
<td></td>
<td>b. Placing nonworking hand between rungs</td>
</tr>
<tr>
<td></td>
<td>7b. Grasping upper beam</td>
</tr>
<tr>
<td>8. Shoulder ladder</td>
<td></td>
</tr>
<tr>
<td>9. Lower ladder</td>
<td>9a. To ground</td>
</tr>
<tr>
<td></td>
<td>b. Reversing procedure for lifting</td>
</tr>
<tr>
<td></td>
<td>c. Keeping body and toes parallel to ladder</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A LADDER, ONE-PERSON, HIGH-SHOULDER METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A straight or extension ladder and appropriate personal protective equipment

Behavior: The student will carry a ladder using the one-person, high-shoulder method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Straight or 24-foot extension ladder
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION: You must know several methods of safely carrying ladders on the fireground. During this session, you will be taught how to correctly carry a ladder using the one-person, high-shoulder method. This is a method that is of great use when a ladder is to be raised on the beam.

NOTE: Ladder carries can originate from different mountings: vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
## How To Carry A Ladder, One-Person, High-Shoulder Method

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Facing tip of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Near third rung from tip</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td>3. Raise ladder</td>
<td>3a. Onto beam</td>
</tr>
<tr>
<td></td>
<td>b. Lifting away from body</td>
</tr>
<tr>
<td></td>
<td>c. Using inside hand</td>
</tr>
<tr>
<td>4. Take position</td>
<td>4a. Next to beamed ladder</td>
</tr>
<tr>
<td>5. Grasp top beam</td>
<td>5a. Near the tip of ladder</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. Preparing to shoulder ladder</td>
</tr>
<tr>
<td>7. Rotate position</td>
<td>7a. Pivoting 180° (toward base)</td>
</tr>
<tr>
<td></td>
<td>b. Placing outside hand beneath bottom beam</td>
</tr>
<tr>
<td>8. Shoulder ladder</td>
<td>8a. Setting lower beam on shoulder</td>
</tr>
<tr>
<td>9. Move toward ladder base</td>
<td>9a. Sliding both hands on respective beams</td>
</tr>
<tr>
<td></td>
<td>b. Until bottom hand is on the balance point marking</td>
</tr>
<tr>
<td>10. Bend at the knees</td>
<td>10a. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>b. Allowing ladder to pick itself up from ground</td>
</tr>
<tr>
<td>11. Steady ladder</td>
<td></td>
</tr>
<tr>
<td>12. Lower base end</td>
<td>12a. Angle slightly downward</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>13. Carry ladder</td>
<td>13a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** HOW TO CARRY A STRAIGHT LADDER, ONE-PERSON, ARM'S-LENGTH METHOD

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**

*Condition:* A straight ladder and appropriate personal protective equipment

*Behavior:* The student will carry a ladder using the one-person, arm's-length method

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Straight ladder
- Appropriate personal protective equipment

**REFERENCES:**

- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

**PREPARATION:**

Some of the most important skills you must acquire and practice throughout your career involves the proper use of ladders. Safely moving a ladder from one location to another is a necessity on the fireground. You must know how to correctly carry a ladder using the one-person, arm's-length method.

**NOTE:** Ladder carries can originate from different mountings: vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
How To Carry A Straight Ladder, One-Person, Arm’s-Length Method

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Facing direction of travel</td>
</tr>
<tr>
<td></td>
<td>b. At center of ladder</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td></td>
<td>d. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>e. Back straight</td>
</tr>
<tr>
<td>3. Grasp closest beam</td>
<td>3a. With inside hand</td>
</tr>
<tr>
<td>4. Raise ladder</td>
<td>4a. Onto beam</td>
</tr>
<tr>
<td></td>
<td>b. Lifting away from body</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining grip</td>
</tr>
<tr>
<td>5. Take position</td>
<td>5a. Next to beamed ladder</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. To arm’s length</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Back straight</td>
</tr>
<tr>
<td>7. Carry ladder</td>
<td>7a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstruction</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A LADDER, ONE-PERSON, LOW-SHOULDER METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A straight ladder and appropriate personal protective equipment

Behavior: The student will carry a ladder using the one-person, low-shoulder method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Straight ladder (16-foot maximum)
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION:
Some of the most important skills you must acquire and practice throughout your career involves the proper use of ladders. Safely moving a ladder from one place to another is a necessity on the fireground.

NOTE: Ladder carries can originate from different mountings: vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Facing tip of ladder</td>
</tr>
<tr>
<td></td>
<td>b. At balance point</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td>3. Grasp closest beam</td>
<td>3a. With inside hand</td>
</tr>
<tr>
<td>4. Raise ladder</td>
<td>4a. Onto beam</td>
</tr>
<tr>
<td></td>
<td>b. Lifting away from body</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining grip</td>
</tr>
<tr>
<td>5. Take position</td>
<td>5a. Next to beamed ladder</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. Preparing to shoulder ladder</td>
</tr>
<tr>
<td>7. Rotate position</td>
<td>7a. Pivoting 180° (towards base)</td>
</tr>
<tr>
<td></td>
<td>b. Inserting nonworking arm between rungs</td>
</tr>
<tr>
<td></td>
<td>c. At balance point</td>
</tr>
<tr>
<td>8. Shoulder ladder</td>
<td>8a. Resting upper beam on shoulder</td>
</tr>
<tr>
<td>9. Steady ladder</td>
<td></td>
</tr>
<tr>
<td>10. Lower base end</td>
<td>10a. Angle slightly downward</td>
</tr>
<tr>
<td>11. Carry ladder</td>
<td>11a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO CARRY A LADDER, TWO-PERSON, LOW-SHOULDER METHOD

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**
- **Condition:** A ladder and appropriate personal protective equipment
- **Behavior:** The students will carry a ladder using the two-person, low-shoulder method
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Ladder (24-foot minimum)
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

**PREPARATION:** Some of the most important skills you must acquire and practice throughout your career involves proper use of ladders. Safely moving a ladder from one place to another is a necessity on the fireground.

**NOTE:** Ladder carries can originate from different mountings: vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
<table>
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<tr>
<th>OPERATIONS</th>
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<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td></td>
<td>b. Fly section up, if applicable</td>
</tr>
<tr>
<td>2. Take positions</td>
<td>2a. Same side of ladder</td>
</tr>
<tr>
<td></td>
<td>2b. One person near base</td>
</tr>
<tr>
<td></td>
<td>b. One person near tip</td>
</tr>
<tr>
<td></td>
<td>c. Facing tip of ladder</td>
</tr>
<tr>
<td></td>
<td>d. Kneeling</td>
</tr>
<tr>
<td></td>
<td>e. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>f. Back straight</td>
</tr>
<tr>
<td>3. Base person gives command</td>
<td>3a. &quot;PREPARE TO BEAM!&quot;</td>
</tr>
<tr>
<td>4. Grasp closest beam</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td></td>
<td>b. Base person between second and third rungs from base</td>
</tr>
<tr>
<td></td>
<td>c. Tip person between second and third rungs from tip</td>
</tr>
<tr>
<td>5. Base person gives command</td>
<td>5a. &quot;BEAM LADDER!&quot;</td>
</tr>
<tr>
<td>6. Raise ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>6b. Onto beam</td>
</tr>
<tr>
<td></td>
<td>b. Lifting away from body</td>
</tr>
<tr>
<td></td>
<td>c. Position on halyard side, if applicable</td>
</tr>
<tr>
<td></td>
<td>d. Maintaining grip</td>
</tr>
<tr>
<td>7. Base person gives command</td>
<td>7a. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td>8. Take positions</td>
<td>8a. Next to beamed ladder</td>
</tr>
<tr>
<td>9. Base person gives command</td>
<td>9a. &quot;LIFT LADDER!&quot;</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>10. Lift ladder</td>
<td>10a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Back straight</td>
</tr>
<tr>
<td></td>
<td>d. Preparing to shoulder ladder</td>
</tr>
<tr>
<td>11. Rotate positions</td>
<td>11a. Pivoting 180°</td>
</tr>
<tr>
<td></td>
<td>b. Placing nonworking arm through ladder between second and third rungs from butt and tip respectively</td>
</tr>
<tr>
<td>12. Shoulder ladder</td>
<td>12a. Setting upper beam on shoulder</td>
</tr>
<tr>
<td>13. Grasp lower beam</td>
<td>13a. With hand of arm that is through ladder</td>
</tr>
<tr>
<td>14. Steady ladder</td>
<td></td>
</tr>
<tr>
<td>15. Grasp upper beam (optional)</td>
<td>15a. With opposite hand</td>
</tr>
<tr>
<td></td>
<td>b. Base person covers top heel/spur with opposite hand</td>
</tr>
<tr>
<td>16. Base person gives commands</td>
<td>16a. &quot;PREPARE TO MOVE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;WALK!&quot; or &quot;FORWARD!&quot;</td>
</tr>
<tr>
<td>17. Carry ladder</td>
<td>17a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The students will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The students will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY AN EXTENSION LADDER, TWO OR THREE-PERSON, ARM'S-LENGTH-ON-EDGE METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: An extension ladder and appropriate personal protective equipment

Behavior: The students will carry an extension ladder, using the two or three-person, arm's-length-on-edge method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Extension ladder (35-foot minimum)
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION:
Some of the most important skills you must acquire and practice throughout your career involves the proper use of ladders. Safely moving a ladder from one place to another is a necessity on the fireground.

NOTE: Ladder carries can originate from different mountings: vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
<table>
<thead>
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<th>OPERATIONS</th>
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<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take positions</td>
<td>2a. Same side of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Base and tip persons between second and third rung from their respective ends</td>
</tr>
<tr>
<td></td>
<td>c. Third person (if using) at ladder midpoint</td>
</tr>
<tr>
<td></td>
<td>d. Facing base of ladder</td>
</tr>
<tr>
<td></td>
<td>e. Kneeling</td>
</tr>
<tr>
<td>3. Base person gives command</td>
<td>3a. &quot;PREPARE TO BEAM!&quot;</td>
</tr>
<tr>
<td>4. Grasp closest beam (outermost fly section)</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td>5. Base person gives command</td>
<td>5a. &quot;BEAM LADDER!&quot;</td>
</tr>
<tr>
<td>6. Raise ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Onto beam</td>
</tr>
<tr>
<td></td>
<td>c. Lifting away from body</td>
</tr>
<tr>
<td></td>
<td>d. Maintaining grip</td>
</tr>
<tr>
<td>7. Base person gives command</td>
<td>7a. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td>8. Take positions</td>
<td>8a. Next to beamed ladder</td>
</tr>
<tr>
<td>9. Base person gives command</td>
<td>9a. &quot;LIFT LADDER!&quot;</td>
</tr>
<tr>
<td>10. Lift ladder</td>
<td>10a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. To arm's length</td>
</tr>
<tr>
<td></td>
<td>c. With legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td>11. Base person gives commands</td>
<td>11a. &quot;PREPARE TO MOVE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;WALK!&quot; or &quot;FORWARD!&quot;</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>12. Carry ladder</td>
<td>12a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A LADDER, THREE-PERSON, FLAT-SHOULDER METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A ladder and appropriate personal protective equipment

Behavior: The students will carry a ladder using the three-person, flat-shoulder method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ladder (28-foot minimum)
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION:

Some of the most important skills you must acquire and practice throughout your career involves the proper use of ladders. Safely moving a ladder from one location to another is a necessity on the fireground.

NOTE: Ladder carries can originate from different mountings: Vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
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<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take positions</td>
<td>2a. Base person between second and third rungs near base (heel of ladder)</td>
</tr>
<tr>
<td></td>
<td>b. Tip person between second and third rungs from tip of ladder</td>
</tr>
<tr>
<td></td>
<td>c. Center person at center of ladder, opposite side from base person and</td>
</tr>
<tr>
<td></td>
<td>tip person</td>
</tr>
<tr>
<td></td>
<td>d. Facing tip of ladder</td>
</tr>
<tr>
<td></td>
<td>e. Kneeling</td>
</tr>
<tr>
<td></td>
<td>f. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>g. Back straight</td>
</tr>
<tr>
<td>3. Base person gives command</td>
<td>3a. &quot;PREPARE TO SHOULDER!&quot;</td>
</tr>
<tr>
<td>4. Grasp closest beam/rung</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining grip</td>
</tr>
<tr>
<td>5. Base person gives command</td>
<td>5a. &quot;SHOULDER LADDER!&quot;</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Chest high</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td></td>
<td>e. Preparing to shoulder the ladder</td>
</tr>
<tr>
<td>7. Rotate Position</td>
<td>7a. Pivoting 180° (toward base)</td>
</tr>
<tr>
<td>8. Shoulder ladder</td>
<td>8a. Resting beam on inside shoulder</td>
</tr>
<tr>
<td>9. Steady ladder</td>
<td>9a. Inside hand on beam</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| 10. Base person gives commands | 10a. "PREPARE TO MOVE!"  
| | b. "WALK!" or "FORWARD!" |
| 11. Carry ladder | 11a. To desired location  
| | b. Carefully  
| | c. Watching of obstructions |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY AN EXTENSION LADDER, THREE-PERSON, FLAT-ARM'S-LENGTH METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

- Condition: An extension ladder and appropriate personal protective equipment
- Behavior: The students will carry an extension ladder using the three-person, flat-arm's-length method
- Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Extension ladder (28-foot minimum)
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION:
Some of the most important skills that you must acquire and practice throughout your career involve the proper use of ladders. Safely moving ladders from one place to another is a necessity on the fireground.

NOTE:
Ladder carries can originate from different mountings: Vertical racking (side or rear removal), flat racking (side or rear removal), or flat on the ground.
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<td>1. Position ladder</td>
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<tr>
<td>2. Take positions</td>
<td>2a. Base person between second and third rungs near base (heel of ladder)</td>
</tr>
<tr>
<td></td>
<td>b. Tip person between second and third rungs from tip of ladder</td>
</tr>
<tr>
<td></td>
<td>c. Center person at center of ladder, opposite side from base person and tip</td>
</tr>
<tr>
<td></td>
<td>d. Facing base of ladder</td>
</tr>
<tr>
<td></td>
<td>e. Kneeling</td>
</tr>
<tr>
<td></td>
<td>f. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>g. Back straight</td>
</tr>
<tr>
<td>3. Base person gives command</td>
<td>3a. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td>4. Grasp closest rung</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining grip</td>
</tr>
<tr>
<td>5. Base person gives command</td>
<td>5a. &quot;LIFT LADDER!&quot;</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. To arm's length</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td>7. Base person gives commands</td>
<td>7a. &quot;PREPARE TO MOVE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;WALK!&quot; or &quot;FORWARD!&quot;</td>
</tr>
<tr>
<td>8. Carry ladder</td>
<td>8a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
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</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY AN EXTENSION LADDER, FOUR TO SIX-PERSON, FLAT-SHOULDER METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: An extension ladder and appropriate personal protective equipment

Behavior: The students will carry an extension ladder using the four to six-person, flat-shoulder method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 35-foot extension ladder
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 3
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION:
Some of the most important skills you must acquire and practice throughout your career involves the proper use of ladders. Safely moving a ladder from one place to another is a necessity on the fireground. During this session, you will be taught how to safely carry an extension ladder using the four to six person, flat shoulder method.

NOTE: Ladder carries can originate from different mountings: Vertical racking (side or rear removal), Flat racking (side or rear removal), or flat on the ground.
<table>
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<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take positions</td>
<td>2a. Two base persons at ladder base on opposite beams between second and third rung from butt</td>
</tr>
<tr>
<td></td>
<td>b. Two tip persons at ladder tip on opposite beams between second or third rung from tip</td>
</tr>
<tr>
<td></td>
<td>c. Using fifth or sixth center persons on opposite beams of ladder at midpoint</td>
</tr>
<tr>
<td></td>
<td>d. Facing opposite to direction of travel</td>
</tr>
<tr>
<td></td>
<td>e. Kneeling</td>
</tr>
<tr>
<td></td>
<td>f. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>g. Back straight</td>
</tr>
<tr>
<td>3. Right base person gives command</td>
<td>3a. &quot;PREPARE TO SHOULDER!&quot;</td>
</tr>
<tr>
<td>4. Grasp closest beam/rung</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining grip</td>
</tr>
<tr>
<td>5. Right base person gives command</td>
<td>5a. &quot;SHOULDER LADDER!&quot;</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Chest high</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td></td>
<td>e. Preparing to shoulder ladder</td>
</tr>
<tr>
<td>7. Rotate position</td>
<td>7a. Pivoting 180°</td>
</tr>
<tr>
<td>8. Shoulder ladder</td>
<td>8a. Resting beam on inside shoulder</td>
</tr>
<tr>
<td></td>
<td>b. Inside hand on beam</td>
</tr>
<tr>
<td>9. Steady ladder</td>
<td>9a. Inside hand on beam</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>10. Right base person gives commands</td>
<td>10a. &quot;PREPARE TO MOVE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;WALK!&quot; or &quot;FORWARD!&quot;</td>
</tr>
<tr>
<td>11. Carry ladder</td>
<td>11a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A LADDER, FOUR TO SIX-PERSON, FLAT-ARM’S-LENGTH METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A ladder and appropriate personal protective equipment

Behavior: The students will carry a ladder using the four to six-person, flat-arm’s-length method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Ladder (35-foot minimum)
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION: Some of the most important skills you must acquire and master during your career involves the proper use of ladders. Safely moving a ladder from one location to another is a necessity on the fireground.

NOTE: Ladder carries can originate from different mountings: Vertical racking (side or rear removal), Flat racking (side or rear removal), or flat on the ground.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Lying flat on ground</td>
</tr>
<tr>
<td>2. Take positions</td>
<td>2a. Two base persons at ladder base on opposite beams between second and third rung from butt</td>
</tr>
<tr>
<td></td>
<td>b. Two tip persons at ladder tip on opposite beams between second or third rung from tip</td>
</tr>
<tr>
<td></td>
<td>c. Using fifth or sixth center persons on opposite beams of ladder at midpoint</td>
</tr>
<tr>
<td></td>
<td>d. Facing ladder</td>
</tr>
<tr>
<td></td>
<td>e. Kneeling</td>
</tr>
<tr>
<td></td>
<td>f. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>g. Back straight</td>
</tr>
<tr>
<td>3. Right base person gives command</td>
<td>3a. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td>4. Grasp closest rung</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining grip</td>
</tr>
<tr>
<td>5. Right base person gives commands</td>
<td>5A. &quot;LIFT LADDER!&quot;</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. To arm's length</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td>7. Right base person gives commands</td>
<td>7a. &quot;PREPARE TO MOVE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;WALK!&quot; or &quot;FORWARD!&quot;</td>
</tr>
<tr>
<td>8. Carry ladder</td>
<td>8a. To desired location</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO CARRY A LADDER THROUGH A NARROW PASSAGEWAY FROM FLAT-SHOULDER CARRY

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A ladder, appropriate personal protective equipment, and a suitable structure
- **Behavior:** The students will carry a ladder through a narrow passageway from flat-shoulder carry
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- A ladder (appropriate size for number of students)
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**

- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

**PREPARATION:** During ladder operations, a narrow passageway may be encountered. It is critical that you prepare and are able to safely and effectively adapt to this unique situation.

**NOTE:** Applies when using the flat-shoulder carry.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assume ladder carry</td>
<td>1a. Flat-shoulder carry</td>
</tr>
<tr>
<td></td>
<td>b. Spaced correctly to carry the assigned ladder with personnel available</td>
</tr>
<tr>
<td>2. Base person gives command</td>
<td>2a. Right base person if two people are positioned at butt</td>
</tr>
<tr>
<td></td>
<td>b. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td>3. Adjust positions</td>
<td>3a. Sufficient space to operate</td>
</tr>
<tr>
<td></td>
<td>b. If arranged side-by-side, left side moves towards center</td>
</tr>
<tr>
<td>4. Reposition hands</td>
<td>4a. Gripping ladder firmly</td>
</tr>
<tr>
<td></td>
<td>b. Preparing to lift</td>
</tr>
<tr>
<td>5. Base person gives command</td>
<td>5a. Right base person if two people are positioned at butt</td>
</tr>
<tr>
<td></td>
<td>b. &quot;LIFT!&quot;</td>
</tr>
<tr>
<td>6. Lift ladder</td>
<td>6a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Back straight</td>
</tr>
<tr>
<td></td>
<td>d. Over head</td>
</tr>
<tr>
<td></td>
<td>e. Arms extended</td>
</tr>
<tr>
<td></td>
<td>f. Stepping under ladder</td>
</tr>
<tr>
<td>7. Base person gives commands</td>
<td>7a. Right base person if two people are positioned at butt</td>
</tr>
<tr>
<td></td>
<td>b. &quot;PREPARE TO MOVE!&quot;</td>
</tr>
<tr>
<td></td>
<td>c. &quot;WALK!&quot; or &quot;FORWARD!&quot;</td>
</tr>
</tbody>
</table>
## How To Carry A Ladder Through A Narrow Passageway From Flat-Shoulder Carry

### Key Points

<table>
<thead>
<tr>
<th>Operations</th>
<th>Key Points</th>
</tr>
</thead>
</table>
| 9. Base person gives commands | 9a. Right base person if two people are positioned at butt<br>9b. "PREPARE TO LOWER/RETURN!"
|                       | 9c. "LOWER/RETURN LADDER!"
|                       | 9d. After leaving passageway                                                |
| 10. Lower/return ladder | 10a. To shoulder                                                            |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE A FOLDING (ATTIC) LADDER, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A folding (attic) ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will raise a folding (attic) ladder using the one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Folding (attic) ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: The raising phase is one of the most important and dangerous phases when using a ladder because it occurs in a hazardous operating zone. This situation occurs frequently. Particular attention needs to be given to this evolution. Improper raising may result in injury or permanent disability.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Vertically</td>
</tr>
<tr>
<td></td>
<td>b. Near desired objective</td>
</tr>
<tr>
<td></td>
<td>c. One foot pad on ground</td>
</tr>
<tr>
<td>2. Grasp ladder</td>
<td>2a. Head high</td>
</tr>
<tr>
<td></td>
<td>b. One hand on each beam</td>
</tr>
<tr>
<td></td>
<td>c. Palms facing each other</td>
</tr>
<tr>
<td>3. Pull beams apart</td>
<td>3a. Until rungs are level</td>
</tr>
<tr>
<td></td>
<td>b. Both foot pads on ground</td>
</tr>
<tr>
<td>4. Lock brace</td>
<td>4a. Securing ladder in open position</td>
</tr>
<tr>
<td></td>
<td>b. Be cautious of pinching fingers in or near</td>
</tr>
<tr>
<td></td>
<td>bracing</td>
</tr>
<tr>
<td>5. Check brace</td>
<td>5a. Visually for proper set-up</td>
</tr>
<tr>
<td></td>
<td>b. Manually for rigidity</td>
</tr>
<tr>
<td>6. Position ladder</td>
<td>b. Tip against wall or near edge of opening</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO EXTEND AN EXTENSION-TYPE A-FRAME COMBINATION LADDER, ONE-PERSON METHOD

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**

- **Condition:** An extension-type A-frame combination ladder and appropriate personal protective equipment
- **Behavior:** The student will extend a single an extension-type A-frame combination ladder using the one-person method
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Extension-type A-frame combination ladder
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Ground Ladders, IFSTA, Ninth Edition Chapter 4

**PREPARATION:**

The extension phase is one of the most important and dangerous phases when using a ladder because it occurs in a hazardous operating zone. This situation occurs frequently. Particular attention needs to be given to this evolution. Improper raising may result in injury or permanent disability. During this session, you will be taught how to extend an extension-type A-frame combination ladder using the one-person method.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Butt on ground</td>
</tr>
<tr>
<td></td>
<td>b. Near desired objective</td>
</tr>
<tr>
<td></td>
<td>c. Hinge up</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Facing ladder</td>
</tr>
<tr>
<td>3. Grasp both beams</td>
<td>3a. Firmly</td>
</tr>
<tr>
<td>4. Spread A-frame sections</td>
<td>4a. Fully</td>
</tr>
<tr>
<td>5. Press locking device</td>
<td>5a. Downward</td>
</tr>
<tr>
<td></td>
<td>b. Until locked</td>
</tr>
<tr>
<td>6. Set brace latch</td>
<td>6a. Facing beams</td>
</tr>
<tr>
<td>7. Shift position</td>
<td>7a. To side</td>
</tr>
<tr>
<td></td>
<td>b. In between the A-frame</td>
</tr>
<tr>
<td></td>
<td>c. At fly section</td>
</tr>
<tr>
<td>8. Grasp fly section</td>
<td>8a. Palm up on rungs</td>
</tr>
<tr>
<td>9. Extend ladder</td>
<td>9a. Pushing upward</td>
</tr>
<tr>
<td>10. Lock pawls (dogs and locks)</td>
<td>10a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. Confirming by sight and sound</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO RAISE A COMBINATION A-FRAME LADDER, ONE-PERSON METHOD

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**

*Condition:* A combination A-frame ladder, appropriate personal protective equipment, and a suitable structure

*Behavior:* The student will raise a combination A-frame ladder using the one-person method

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Combination A-frame ladder
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**
- Fire Service Ground Ladders, IFSTA, Ninth Edition Chapter 4

**PREPARATION:** The extension phase is one of the most important and dangerous phases when using a combination A-frame ladder. Particular attention needs to be given to this evolution. Improper raising may result in injury or permanent disability.
### METHOD 1

**NOTE:** Using a combination A-frame ladder as an extension ladder

1. Position ladder
   - Vertically
   - Near desired objective
   - Fly towards self

2. Grasp ladder
   - Both hands
   - Both beams
   - Shoulder high

3. Position butt
   - Where ladder is to be raised

4. Grasp rung
   - On fly section
   - With either hand

5. Extend ladder
   - Pushing upwards
   - While grasping rung

6. Lock pawls (dogs and locks)
   - Once correct height is obtained
   - Confirming by sight and sound

7. Lower ladder
   - Either foot on bottom rung
   - Both hands on rung at shoulder height
   - Against structure
   - Gently

### METHOD 2

**NOTE:** Using an extension/A-frame combination ladder as an A-frame ladder.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Vertically</td>
</tr>
<tr>
<td></td>
<td>b. Near desired objective</td>
</tr>
<tr>
<td></td>
<td>c. Fly towards self</td>
</tr>
<tr>
<td>2. Grasp ladder</td>
<td>2a. With both hands on beams</td>
</tr>
<tr>
<td></td>
<td>b. At shoulder height</td>
</tr>
<tr>
<td>3. Position butt</td>
<td>3a. Where ladder is to be raised</td>
</tr>
<tr>
<td>4. Engage slotted fittings</td>
<td>4a. At top of bed section</td>
</tr>
<tr>
<td>5. Grasp side of ladder</td>
<td>5a. Main beam</td>
</tr>
<tr>
<td></td>
<td>b. Fly section beam</td>
</tr>
<tr>
<td>6. Lower fly section</td>
<td>6a. Pulling outward</td>
</tr>
<tr>
<td></td>
<td>b. Away from its nested position inside the rails of bed section</td>
</tr>
<tr>
<td>7. Engage locking device</td>
<td>7a. At top of A-frame</td>
</tr>
<tr>
<td></td>
<td>b. To prevent further spreading</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE A STRAIGHT OR ROOF LADDER, ONE-PERSON, HIGH-SHOULDER METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A straight or roof ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will raise the ladder using the one-person, high-shoulder method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Straight or roof ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: The raising phase is one of the most important and dangerous phases because it occurs in a hazardous operating zone. This situation occurs frequently. Particular attention needs to be given to this evolution. Improper raising may result in injury or permanent disability.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carry ladder</td>
<td>1a. To objective</td>
</tr>
<tr>
<td></td>
<td>b. Using high-shoulder carry</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td></td>
<td>d. With butt first</td>
</tr>
<tr>
<td>2. Check overhead</td>
<td>2a. For electrical hazards</td>
</tr>
<tr>
<td></td>
<td>b. For obstructions</td>
</tr>
<tr>
<td>3. Lower butt</td>
<td>3a. To ground</td>
</tr>
<tr>
<td></td>
<td>b. With knees bent</td>
</tr>
<tr>
<td></td>
<td>c. Lowering beam only</td>
</tr>
<tr>
<td>4. Raise ladder</td>
<td>4a. To vertical position</td>
</tr>
<tr>
<td></td>
<td>b. With both arms extended</td>
</tr>
<tr>
<td>5. Pivot ladder</td>
<td>5a. If needed</td>
</tr>
<tr>
<td></td>
<td>b. Until rungs are parallel to wall</td>
</tr>
<tr>
<td>6. Heel ladder</td>
<td>6a. With one foot on butt spur</td>
</tr>
<tr>
<td>7. Lower ladder</td>
<td>7a. Against structure</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE AND EXTEND AN EXTENSION LADDER, ONE-PERSON, HIGH-SHOULDER METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: An extension ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will raise and extend an extension ladder, one-person, high-shoulder method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Extension ladder (24-28 foot)
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 3

PREPARATION: The raising phase is one of the most important and dangerous phases because it occurs in a hazardous operating area. This is a situation that occurs frequently and must be carried out quickly and correctly. Improper raising may result in injury or permanent disability. During this session, you will be taught how to correctly raise and extend an extension ladder using the one-person, high-shoulder method.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carry ladder</td>
<td>1a. To objective</td>
</tr>
<tr>
<td></td>
<td>b. Using high-shoulder carry</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td></td>
<td>d. With butt first</td>
</tr>
<tr>
<td>Check overhead</td>
<td>2a. For electrical hazards</td>
</tr>
<tr>
<td></td>
<td>b. For obstructions</td>
</tr>
<tr>
<td>Spot ladder</td>
<td>3a. Lowering beam to ground</td>
</tr>
<tr>
<td></td>
<td>b. At correct distance and in line with objective</td>
</tr>
<tr>
<td>Raise ladder</td>
<td>4a. Pushing down on the lower beam</td>
</tr>
<tr>
<td></td>
<td>b. Pushing up on ladder</td>
</tr>
<tr>
<td></td>
<td>c. Walking simultaneously towards base</td>
</tr>
<tr>
<td>Stabilize ladder</td>
<td>5a. Maintaining ladder in vertical position</td>
</tr>
<tr>
<td></td>
<td>b. Heeling ladder with either foot</td>
</tr>
<tr>
<td></td>
<td>c. With hands on beams</td>
</tr>
<tr>
<td>Rotate ladder</td>
<td>6a. With far beam toward fire fighter</td>
</tr>
<tr>
<td>Heel ladder</td>
<td>7a. With one leg</td>
</tr>
<tr>
<td></td>
<td>b. Instep to side of beam</td>
</tr>
<tr>
<td></td>
<td>c. Knee to front of beam</td>
</tr>
<tr>
<td>Grasp halyard</td>
<td>8a. Firmly</td>
</tr>
<tr>
<td></td>
<td>b. Thumbs up or down</td>
</tr>
<tr>
<td></td>
<td>c. Forearms out and against beams</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9. Extend fly</td>
<td>9a. Looking up</td>
</tr>
<tr>
<td></td>
<td>b. While maintaining a firm grip on halyard</td>
</tr>
<tr>
<td></td>
<td>c. Pulling down</td>
</tr>
<tr>
<td></td>
<td>d. Smoothly</td>
</tr>
<tr>
<td></td>
<td>e. With ladder slightly angled towards building</td>
</tr>
<tr>
<td></td>
<td>f. With hand-over-hand raising</td>
</tr>
<tr>
<td>10. Control ladder</td>
<td>10a. With halyard and elbow</td>
</tr>
<tr>
<td></td>
<td>b. If ladder falls, push into building</td>
</tr>
<tr>
<td>11. Lock pawls (dogs and locks)</td>
<td>11a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. Confirming by sight and sound</td>
</tr>
<tr>
<td>12. Lower ladder</td>
<td>12a. Against structure</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. With one hand to beam (same side as heeling)</td>
</tr>
<tr>
<td></td>
<td>d. Looking up for obstacles</td>
</tr>
<tr>
<td>13. Prepare to roll ladder</td>
<td>13a. Facing beam to pivot on</td>
</tr>
<tr>
<td></td>
<td>b. Footing against pivot beam</td>
</tr>
<tr>
<td></td>
<td>c. With hands on beam</td>
</tr>
<tr>
<td></td>
<td>d. With one hand shoulder height</td>
</tr>
<tr>
<td></td>
<td>e. With one hand below waist height</td>
</tr>
<tr>
<td>14. Roll ladder</td>
<td>14a. Pulling nonheeled beam to 90°</td>
</tr>
<tr>
<td></td>
<td>b. With hand reposition</td>
</tr>
<tr>
<td></td>
<td>c. While grasping firmly</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15. Finish roll</td>
<td>15a. Repositioning foot placement</td>
</tr>
<tr>
<td></td>
<td>b. As opposite foot moves to heel stationary beam</td>
</tr>
<tr>
<td></td>
<td>c. Rotate until moving beam is against ground and objective</td>
</tr>
<tr>
<td></td>
<td>d. Using heel to foot ladder</td>
</tr>
<tr>
<td>16. Check ladder inclination</td>
<td>16a. With feet at butt</td>
</tr>
<tr>
<td></td>
<td>b. With arms extended to rungs</td>
</tr>
<tr>
<td></td>
<td>c. With back straight</td>
</tr>
<tr>
<td></td>
<td>d. Confirming proper climbing angle</td>
</tr>
<tr>
<td></td>
<td>e. Readjust if needed for safe climbing angle</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE A STRAIGHT OR EXTENSION LADDER, TWO-PERSON, BEAM METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A straight or extension ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The students will properly and safely raise the ladder using the two-person, beam method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Straight or extension ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: The raising phase is one of the most important and dangerous phases. Because it occurs in a hazardous operating zone, this is a situation that occurs frequently and particular attention needs to be given to this evolution. Improper raising may result in injury or permanent disability.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. On beam</td>
</tr>
<tr>
<td></td>
<td>b. Butt of beam located on the ground</td>
</tr>
<tr>
<td></td>
<td>c. Spotted position</td>
</tr>
<tr>
<td>2. Tip person raises tip</td>
<td>2a. Grabbing lower beam</td>
</tr>
<tr>
<td></td>
<td>b. Raising to shoulder</td>
</tr>
<tr>
<td>3. Base person foots ladder</td>
<td>3a. With inside foot upon lower beam at butt spur</td>
</tr>
<tr>
<td></td>
<td>b. Turning towards the ladder</td>
</tr>
<tr>
<td>4. Base person grasps upper beam</td>
<td>4a. Hands apart</td>
</tr>
<tr>
<td>5. Base person extends other leg</td>
<td>5a. Reaching back to act as counterweight and balance</td>
</tr>
<tr>
<td>6. Raise tip of ladder</td>
<td>6a. With hands on lower beam</td>
</tr>
<tr>
<td></td>
<td>b. Extending arms</td>
</tr>
<tr>
<td>7. Tip person advances ladder</td>
<td>7a. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>b. Toward butt end</td>
</tr>
<tr>
<td></td>
<td>c. Raising to vertical position</td>
</tr>
<tr>
<td></td>
<td>d. Checking for overhead obstructions</td>
</tr>
<tr>
<td>8. Grasp halyard</td>
<td>8a. Firmly</td>
</tr>
<tr>
<td></td>
<td>b. Placing thumbs up or down</td>
</tr>
<tr>
<td></td>
<td>c. Forearms out and against beams</td>
</tr>
<tr>
<td></td>
<td>d. By person nearest halyard</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9. Extend fly</td>
<td>9a. Looking up</td>
</tr>
<tr>
<td></td>
<td>b. Firm grip on halyard</td>
</tr>
<tr>
<td></td>
<td>c. Pulling down</td>
</tr>
<tr>
<td></td>
<td>d. Smoothly</td>
</tr>
<tr>
<td></td>
<td>e. Ladder slightly angles towards building</td>
</tr>
<tr>
<td></td>
<td>f. Hand-over-hand</td>
</tr>
<tr>
<td>10. Control ladder</td>
<td>10a. With halyard and elbows</td>
</tr>
<tr>
<td></td>
<td>b. If ladder falls, push into building</td>
</tr>
<tr>
<td>11. Lock pawls (dogs and locks)</td>
<td>11a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. Confirming by sight and sound</td>
</tr>
<tr>
<td>12. Lower ladder</td>
<td>12a. Against structure</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. One hand to beam (same side as heeling)</td>
</tr>
<tr>
<td></td>
<td>d. Looking up for obstacles</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO RAISE A STRAIGHT OR EXTENSION LADDER, TWO-PERSON, FLAT-RAISE METHOD

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.5

**BEHAVIORAL OBJECTIVE:**

*Condition:* A straight or extension ladder, appropriate personal protective equipment, and a suitable structure

*Behavior:* The students will raise a straight or extension ladder using the two-person, flat-raise method

*Standard:* Completing all operations within _________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Straight or extension ladder
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

**PREPARATION:** The raising phase is one of the most important and dangerous phases because it occurs in a hazardous operating zone. This situation occurs frequently. Particular attention needs to be given to this evolution. Improper raising may result in injury or permanent disability. The steps for raising ladders described in the following instruction guide assume that the raise is being made directly from the carry without first placing the ladder flat on the ground.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Flat position</td>
</tr>
<tr>
<td></td>
<td>b. On level ground</td>
</tr>
<tr>
<td>2. Base person grasps ladder</td>
<td>2a. To heel with both hands</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. Keeping feet on butt of ladder</td>
</tr>
<tr>
<td></td>
<td>d. Crouching</td>
</tr>
<tr>
<td></td>
<td>e. Leaning backwards</td>
</tr>
<tr>
<td></td>
<td>f. With hand on beam or rung depending on carry</td>
</tr>
<tr>
<td>3. Base person gives command</td>
<td>3a. &quot;RAISE LADDER!&quot;</td>
</tr>
<tr>
<td>4. Tip person moves under ladder</td>
<td>4a. Arms extending over head</td>
</tr>
<tr>
<td>5. Tip person advances ladder</td>
<td>5a. Toward vertical position</td>
</tr>
<tr>
<td></td>
<td>b. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>c. Hands on rung</td>
</tr>
<tr>
<td>6. Base person shifts hands</td>
<td>6a. As ladder advances towards vertical position</td>
</tr>
<tr>
<td></td>
<td>b. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>c. One rung at a time</td>
</tr>
<tr>
<td></td>
<td>d. Towards tip</td>
</tr>
<tr>
<td>7. Persons face each other</td>
<td>7a. When ladder is in vertical position</td>
</tr>
<tr>
<td></td>
<td>b. Hands on beams</td>
</tr>
<tr>
<td></td>
<td>c. At base</td>
</tr>
<tr>
<td>8. Foot beam</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9. Grasp halyard</td>
<td>9a. Firmly</td>
</tr>
<tr>
<td></td>
<td>b. With thumbs up or down</td>
</tr>
<tr>
<td></td>
<td>c. Forearms out and against beams</td>
</tr>
<tr>
<td>10. Extend fly</td>
<td>10a. Looking up</td>
</tr>
<tr>
<td></td>
<td>b. Firm grip on halyard</td>
</tr>
<tr>
<td></td>
<td>c. Pulling down</td>
</tr>
<tr>
<td></td>
<td>d. Smoothly</td>
</tr>
<tr>
<td></td>
<td>e. Angling ladder slightly towards building</td>
</tr>
<tr>
<td></td>
<td>f. Hand-over-hand</td>
</tr>
<tr>
<td>11. Control ladder</td>
<td>11a. With halyard and elbow</td>
</tr>
<tr>
<td></td>
<td>b. Pushing falling ladder into building</td>
</tr>
<tr>
<td>12. Lock pawls (dogs and locks)</td>
<td>12a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. Confirming by sight and sound</td>
</tr>
<tr>
<td>13. Lower ladder</td>
<td>13a. Against structure</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. Hands on beams</td>
</tr>
<tr>
<td></td>
<td>d. Base person stepping back</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE, EXTEND, AND LOWER AN EXTENSION LADDER, THREE-PERSON, FLAT-RAISE METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: An extension ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The students will raise, extend, and lower an extension ladder using the three-person, flat-raise method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 35-foot extension ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 5

PREPARATION: Some of the most important skills fire fighters must acquire and practice throughout their careers involve the proper use of ladders. Safely moving a ladder from one location to another is a necessity on the fireground. Improper raising may result in injury or permanent disability.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Butt toward objective</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Base person at base</td>
</tr>
<tr>
<td></td>
<td>b. Center and tip persons at opposite sides</td>
</tr>
<tr>
<td>3. Base person sets up</td>
<td>3a. With both feet on bottom rung</td>
</tr>
<tr>
<td>4. Base person places hands</td>
<td>4a. With both hands on rungs</td>
</tr>
<tr>
<td></td>
<td>b. To convenient position</td>
</tr>
<tr>
<td>5. Base person gives commands</td>
<td>5a. &quot;PREPARE TO RAISE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;RAISE LADDER!&quot;</td>
</tr>
<tr>
<td>6. Tip person and center person lift tip</td>
<td>6a. Overhead</td>
</tr>
<tr>
<td></td>
<td>b. With arms extended</td>
</tr>
<tr>
<td></td>
<td>c. Inside hand on rungs</td>
</tr>
<tr>
<td></td>
<td>d. Outside hand on beam</td>
</tr>
<tr>
<td>7. Proceed up ladder</td>
<td>7a. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>b. To vertical position</td>
</tr>
<tr>
<td>8. Base person grasps halyard</td>
<td>8a. Ladder at vertical position</td>
</tr>
<tr>
<td></td>
<td>b. Palms away</td>
</tr>
<tr>
<td></td>
<td>c. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>d. One foot at beam</td>
</tr>
<tr>
<td>9. Tip person and center person foot beam</td>
<td>9a. Ladder at vertical position</td>
</tr>
<tr>
<td></td>
<td>b. One on right side</td>
</tr>
<tr>
<td></td>
<td>c. Other on left side</td>
</tr>
<tr>
<td>10. Tip person and center person grasp beam</td>
<td>10a. Both hands</td>
</tr>
<tr>
<td></td>
<td>b. Opposite sides</td>
</tr>
</tbody>
</table>
11. Base person gives commands  
   a. "PREPARE TO EXTEND FLY!"
   b. "EXTEND FLY!"

12. Base person extends fly  
   a. On command
   b. In proper position

13. Lock pawls (dogs and locks)  
   a. Once correct height is obtained
   b. Confirming by sight and sound

14. Base person gives command  
   a. "PREPARE TO LOWER!"
   b. "LOWER LADDER!"

15. Base person moves feet  
   a. Stepping back while supporting ladder
   b. With hands on beams

16. Tip person and center person lower ladder  
   a. Against structure
   b. Gently
   c. Inside foot on bottom rung
   d. Inside hand to rung chest high
   e. Outside hand on beam

17. Position ladder  
   a. At desired position

18. Adjust ladder  
   a. If needed
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO RAISE AN EXTENSION LADDER, FOUR-PERSON, FLAT-RAISE METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: An extension ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The students will raise an extension ladder using the four-person, flat-raise method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 35-foot extension ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Some of the most important skills fire fighters must acquire and practice throughout their careers involve the proper use and application of ladders. Improper raising methods may result in injury or permanent disability. To operate safely and efficiently you will need to know how to work as a team and accomplish the operation.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Flat-shoulder carry</td>
</tr>
<tr>
<td>2. Base persons take position</td>
<td>2a. Facing base</td>
</tr>
<tr>
<td></td>
<td>b. Opposite sides</td>
</tr>
<tr>
<td></td>
<td>c. On shoulder</td>
</tr>
<tr>
<td></td>
<td>d. Between second and third rung</td>
</tr>
<tr>
<td></td>
<td>e. Inside hand on bottom of main beam, palm up</td>
</tr>
<tr>
<td>3. Tip persons take position</td>
<td>3a. At tip of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Opposite sides</td>
</tr>
<tr>
<td></td>
<td>c. On shoulder</td>
</tr>
<tr>
<td></td>
<td>d. Inside hand on bottom of main beam, palm up</td>
</tr>
<tr>
<td>4. Right base person spots ladder</td>
<td>4a. At desired objective</td>
</tr>
<tr>
<td></td>
<td>b. Checking for overhead obstructions</td>
</tr>
<tr>
<td>5. Right base person gives command</td>
<td>5a. &quot;PREPARE TO RAISE!&quot;</td>
</tr>
<tr>
<td>6. Base persons lower ladder</td>
<td>6a. Outside hand on top beam</td>
</tr>
<tr>
<td></td>
<td>b. Pivoting 180°</td>
</tr>
<tr>
<td></td>
<td>c. To ground</td>
</tr>
<tr>
<td>7. Base persons foot ladder</td>
<td>7a. With inside foot</td>
</tr>
<tr>
<td></td>
<td>b. On bottom rungs</td>
</tr>
<tr>
<td>8. Right base person gives command</td>
<td>8a. &quot;RAISE LADDER!&quot;</td>
</tr>
<tr>
<td>9. Tip persons raise ladder</td>
<td>9a. Fully extended arm</td>
</tr>
<tr>
<td></td>
<td>b. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>c. To vertical position</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>10. Right base person gives commands</td>
<td>10a. &quot;PREPARE TO EXTEND FLY!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;EXTEND FLY!&quot;</td>
</tr>
<tr>
<td>11. Right base person extends ladder</td>
<td>11a. Grasping halyard</td>
</tr>
<tr>
<td></td>
<td>b. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>c. To desired height</td>
</tr>
<tr>
<td>12. Left base person supports ladder</td>
<td>12a. Left beam with both hand</td>
</tr>
<tr>
<td></td>
<td>b. Outside foot on left spur</td>
</tr>
<tr>
<td>13. Left tip person supports ladder</td>
<td>13a. Left beam with both hands</td>
</tr>
<tr>
<td></td>
<td>b. Outside foot on left spur</td>
</tr>
<tr>
<td>14. Right tip person supports ladder</td>
<td>14a. Right beam with both hands</td>
</tr>
<tr>
<td></td>
<td>b. Outside foot on right spur</td>
</tr>
<tr>
<td>15. Lock pawls (dogs and locks)</td>
<td>15a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. All crewmembers checking</td>
</tr>
<tr>
<td>16. Right base person gives commands</td>
<td>16a. &quot;PREPARE TO LOWER!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;LOWER LADDER!&quot;</td>
</tr>
<tr>
<td>17. Base persons step back</td>
<td>17a. With inside hand on rung</td>
</tr>
<tr>
<td></td>
<td>b. With outside hands on beam</td>
</tr>
<tr>
<td>18. Tip persons lower ladder</td>
<td>18a. Against structure</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. Inside foot on bottom rung</td>
</tr>
<tr>
<td></td>
<td>d. With both hands on rung chest high</td>
</tr>
<tr>
<td>19. Base persons control ladder descent</td>
<td>19a. Stepping back as needed</td>
</tr>
<tr>
<td>20. Adjust ladder</td>
<td>20a. If needed</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DEPLOY A ROOF LADDER, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A raised extension ladder, a roof ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will deploy a roof ladder using the one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:  
- Job breakdown  
- Extension ladder (24-foot or longer)  
- Roof ladder  
- Appropriate personal protective equipment  
- Suitable structure

REFERENCES:  
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 5

PREPARATION: During fireground operations, it is often necessary to place a roof ladder into operation. This operation requires coordination and proper technique to complete safely.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position roof ladder</td>
<td>1a. On ground</td>
</tr>
<tr>
<td>2a. Next to the extension ladder</td>
<td></td>
</tr>
<tr>
<td>2. Open roof hooks</td>
<td>2a. Pushing down</td>
</tr>
<tr>
<td>2b. Rotating out 90°</td>
<td></td>
</tr>
<tr>
<td>2c. Both hooks in same direction</td>
<td></td>
</tr>
<tr>
<td>2d. Facing outward</td>
<td></td>
</tr>
<tr>
<td>3. Position ladder</td>
<td>3a. Vertically against extension ladder</td>
</tr>
<tr>
<td>3b. Hooks facing out</td>
<td></td>
</tr>
<tr>
<td>4. Climb extension ladder</td>
<td>4a. Two rungs above midpoint of roof ladder</td>
</tr>
<tr>
<td>5. Reach through rungs</td>
<td>5a. Of roof ladder</td>
</tr>
<tr>
<td>6. Hoist ladder</td>
<td>6a. On to shoulder</td>
</tr>
<tr>
<td>7. Climb ladder</td>
<td>7a. To top of extension</td>
</tr>
<tr>
<td>8. Lock in</td>
<td>8a. With leg lock</td>
</tr>
<tr>
<td>9. Remove roof ladder</td>
<td>9a. Off of shoulder</td>
</tr>
<tr>
<td>10b. Hand-over-hand</td>
<td></td>
</tr>
<tr>
<td>10c. Hooks down</td>
<td></td>
</tr>
<tr>
<td>11. Slide roof ladder</td>
<td>11a. Until hooks go over roof peak</td>
</tr>
<tr>
<td>11b. Solidly catching ridge line</td>
<td></td>
</tr>
<tr>
<td>12. Pull ladder</td>
<td>12a. In downward motion</td>
</tr>
<tr>
<td>12b. To set hooks into or against objective</td>
<td></td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DEPLOY A ROOF LADDER, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

**Condition:** A raised extension ladder, a roof ladder, appropriate personal protective equipment, and a suitable structure

**Behavior:** The students will deploy a roof ladder using the two-person method

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Extension ladder (24-foot or longer)
- Roof ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 5

PREPARATION: During fireground operations, it may be necessary to place a roof ladder into operation. This operation requires coordination between two fire fighters to carry a roof ladder to the roof using the proper technique to complete safely.
## OPERATIONS

<table>
<thead>
<tr>
<th></th>
<th>Carry roof ladder</th>
<th>Carry roof ladder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tip person lowers tip</td>
<td>Tip person lowers tip</td>
</tr>
<tr>
<td>2</td>
<td>Tip person opens roof hooks</td>
<td>Tip person opens roof hooks</td>
</tr>
<tr>
<td>3</td>
<td>Tip person returns tip</td>
<td>Tip person returns tip</td>
</tr>
<tr>
<td>4</td>
<td>Tip person climbs extension ladder</td>
<td>Tip person climbs extension ladder</td>
</tr>
<tr>
<td>5</td>
<td>Tip person locks in</td>
<td>Tip person locks in</td>
</tr>
<tr>
<td>6</td>
<td>Both persons remove roof ladder</td>
<td>Both persons remove roof ladder</td>
</tr>
<tr>
<td>7</td>
<td>Both persons push roof ladder</td>
<td>Both persons push roof ladder</td>
</tr>
<tr>
<td>8</td>
<td>Tip person turns roof ladder</td>
<td>Tip person turns roof ladder</td>
</tr>
<tr>
<td>9</td>
<td>Tip person slides ladder</td>
<td>Tip person slides ladder</td>
</tr>
</tbody>
</table>

## KEY POINTS

<table>
<thead>
<tr>
<th></th>
<th>To extension ladder</th>
<th>Tip first</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Using low-shoulder carry</td>
<td>Stopping at base</td>
</tr>
<tr>
<td>1b</td>
<td>Tip first</td>
<td></td>
</tr>
<tr>
<td>1c</td>
<td>Using low-shoulder carry</td>
<td></td>
</tr>
<tr>
<td>1d</td>
<td>Stopping at base</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>Until resting on upper leg</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>Pushing down</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>Rotating out 90°</td>
<td></td>
</tr>
<tr>
<td>3c</td>
<td>Both hooks in same direction</td>
<td></td>
</tr>
<tr>
<td>3d</td>
<td>Facing outward</td>
<td></td>
</tr>
<tr>
<td>3e</td>
<td>While base person keeps ladder on shoulder</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>To shoulder</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>For low-shoulder carry</td>
<td></td>
</tr>
<tr>
<td>5a</td>
<td>With free hand on beam</td>
<td></td>
</tr>
<tr>
<td>5b</td>
<td>Until reaching objective</td>
<td></td>
</tr>
<tr>
<td>6a</td>
<td>Located near roof edge</td>
<td></td>
</tr>
<tr>
<td>6b</td>
<td>Using leg lock</td>
<td></td>
</tr>
<tr>
<td>7a</td>
<td>From shoulders</td>
<td></td>
</tr>
<tr>
<td>8a</td>
<td>Onto roof</td>
<td></td>
</tr>
<tr>
<td>8b</td>
<td>Sliding on beam</td>
<td></td>
</tr>
<tr>
<td>8c</td>
<td>Until balance point is reached</td>
<td></td>
</tr>
<tr>
<td>9a</td>
<td>Flat</td>
<td></td>
</tr>
<tr>
<td>9b</td>
<td>With hooks down</td>
<td></td>
</tr>
<tr>
<td>10a</td>
<td>Until hooks go over roof peak</td>
<td></td>
</tr>
<tr>
<td>10b</td>
<td>Solidly catching ridge line</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>11. Tip person pulls ladder</td>
<td>11a. In downward motion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. To set hooks into or against objective</td>
<td></td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE A LADDER HALYARD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A raised extension ladder with sufficient halyard for tying, appropriate personal protective equipment, and a suitable structure

Behavior: The student will tie a ladder halyard

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- A raised extension ladder with sufficient halyard for tying
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Services Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: After an extension has been raised and lowered into proper position, excessive halyard must be secured before climbing. Any excess halyard rope should be tied to a rung as a safety measure to prevent the fly section(s) from slipping and to keep anyone from tripping over it.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position raised ladder</td>
<td>1a. Against objective</td>
</tr>
<tr>
<td>2. Lock pawls (dogs and locks)</td>
<td>2a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. Confirming by sight and sound</td>
</tr>
<tr>
<td>3. Take position</td>
<td>3a. Between ladder and building</td>
</tr>
<tr>
<td></td>
<td>b. Facing rungs</td>
</tr>
<tr>
<td>4. Grasp halyard</td>
<td>4a. Between rungs</td>
</tr>
<tr>
<td>5. Pull halyard</td>
<td>5a. Through rungs</td>
</tr>
<tr>
<td></td>
<td>b. Until standing part is taut</td>
</tr>
<tr>
<td></td>
<td>c. To your side of ladder</td>
</tr>
<tr>
<td>6. Form open bight</td>
<td>6a. Keeping standing part taut</td>
</tr>
<tr>
<td>7. Pass bight</td>
<td>7a. Around 2-3 rungs</td>
</tr>
<tr>
<td></td>
<td>b. To take up excess halyard</td>
</tr>
<tr>
<td></td>
<td>c. Finishing on upper rung</td>
</tr>
<tr>
<td></td>
<td>d. Leaving a 2-3 foot working bight</td>
</tr>
<tr>
<td>8. Tighten wraps</td>
<td>8a. With nonworking hand</td>
</tr>
<tr>
<td>9. Tie knot</td>
<td>9a. On rung at top of wraps</td>
</tr>
<tr>
<td></td>
<td>b. With clove hitch</td>
</tr>
<tr>
<td>10. Secure knot</td>
<td>10a. With overhand safety knot</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO PIVOT A FREE-STANDING STRAIGHT OR EXTENSION LADDER, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A raised straight or extension ladder and appropriate personal protective equipment

Behavior: The student will pivot a free-standing straight or extension ladder using the one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Straight or extension ladder (35-foot maximum)
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9

PREPARATION:

Often when a ladder is raised, the fire fighter discovers that the ladder is not in the correct position to reach the objective. Pivoting is an easy and safe method for solving the slightly incorrect placement of a ladder.
### OPERATIONS vs. KEY POINTS

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position raised ladder</td>
<td>1a. Vertically</td>
</tr>
<tr>
<td></td>
<td>b. On level footing</td>
</tr>
<tr>
<td>2. Position hands</td>
<td>2a. Grasping firmly on beams</td>
</tr>
<tr>
<td></td>
<td>b. Near shoulder height</td>
</tr>
<tr>
<td></td>
<td>c. With elbows slightly bent</td>
</tr>
<tr>
<td></td>
<td>d. With body square and parallel to rungs</td>
</tr>
<tr>
<td>3. Position feet</td>
<td>3a. Anchoring at anchor beam</td>
</tr>
<tr>
<td></td>
<td>b. With other foot back</td>
</tr>
<tr>
<td>4. Elevate opposite (moving) beam</td>
<td>4a. Slightly</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining control of ladder</td>
</tr>
<tr>
<td>5. Pivot ladder</td>
<td>5a. Carefully pulling ladder (moving beam)</td>
</tr>
<tr>
<td></td>
<td>b. Towards chest</td>
</tr>
<tr>
<td></td>
<td>c. With arms not feet</td>
</tr>
<tr>
<td></td>
<td>d. Maintaining firm grasp</td>
</tr>
<tr>
<td>6. Ground opposite (moving) beam</td>
<td>6a. Remaining on outboard side of the ladder away from objective</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining hand and heel contact</td>
</tr>
<tr>
<td></td>
<td>c. Repositioning footing if needed</td>
</tr>
<tr>
<td>7. Repeat process</td>
<td>7a. If correct placement has not been reached</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO PIVOT A FREE-STANDING STRAIGHT OR EXTENSION LADDER, TWO-PERSON METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A raised straight or extension ladder and appropriate personal protective equipment

Behavior: The students will pivot a free-standing straight or extension ladder using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Straight or extension ladder (35-foot or less)
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Often when a ladder is raised the fire fighter discovers that the ladder is not in the correct position to reach the objective. Pivoting is an easy and safe method for solving the slightly incorrect placement of a ladder. During this session, you will be taught to pivot a free-standing straight or extension ladder using the two-person method.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Vertically</td>
</tr>
<tr>
<td></td>
<td>b. On level footing</td>
</tr>
<tr>
<td>2. Take position</td>
<td>2a. Face-to-face</td>
</tr>
<tr>
<td></td>
<td>b. Through ladder</td>
</tr>
<tr>
<td>3. Position hands</td>
<td>3a. Firmly on beams</td>
</tr>
<tr>
<td></td>
<td>b. Shoulder height</td>
</tr>
<tr>
<td></td>
<td>c. Elbows slightly bent</td>
</tr>
<tr>
<td></td>
<td>d. Body square and parallel to rung</td>
</tr>
<tr>
<td>4. Position feet</td>
<td>4a. Base person on one beam</td>
</tr>
<tr>
<td></td>
<td>b. Tip person at same beam</td>
</tr>
<tr>
<td>5. Base person gives command</td>
<td>5a. &quot;PREPARE TO PIVOT!&quot;</td>
</tr>
<tr>
<td>6. Elevate opposite (moving) beam</td>
<td>6a. Maintaining control of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Moving beam slightly off ground</td>
</tr>
<tr>
<td>7. Base person gives command</td>
<td>7a. &quot;PIVOT LADDER!&quot;</td>
</tr>
<tr>
<td>8. Pivot ladder</td>
<td>8a. 90°</td>
</tr>
<tr>
<td></td>
<td>b. In unison</td>
</tr>
<tr>
<td></td>
<td>c. With arms, not foot shuffle</td>
</tr>
<tr>
<td></td>
<td>d. Towards base person</td>
</tr>
<tr>
<td>9. Ground moving beam</td>
<td>9a. Towards base person</td>
</tr>
<tr>
<td>10. Repeat pivot</td>
<td>10a. Until ladder is turned a full 180°</td>
</tr>
<tr>
<td>11. Reposition heeling/footing</td>
<td>11a. If needed</td>
</tr>
<tr>
<td>12. Repeat process</td>
<td>12a. If correct placement has not been reached</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO HEEL/FOOT A LADDER

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will heel/foot a ladder

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES: Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Fire fighters' concern for safety in handling ground ladders should be one of the most important features of training in their careers. Footing or heeling a ladder is an important step that ensures ladder stability. In this section, you will learn how to properly heel or foot a ladder.
## OPERATIONS

<table>
<thead>
<tr>
<th></th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>METHOD 1 - (INSIDE)</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Take position</td>
</tr>
<tr>
<td>2.</td>
<td>Face ladder</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Look ahead or slightly down</td>
</tr>
<tr>
<td>4.</td>
<td>Grasp beams</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Lean back</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Create tension</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>METHOD 2 - (OUTSIDE)</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Take position</td>
</tr>
<tr>
<td>2.</td>
<td>Face ladder</td>
</tr>
<tr>
<td>3.</td>
<td>Position feet</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Positions hands</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>5. Provide tension</td>
<td>5a. On ladder</td>
</tr>
<tr>
<td></td>
<td>b. Leaning into ladder</td>
</tr>
<tr>
<td></td>
<td>c. Gently</td>
</tr>
<tr>
<td></td>
<td>d. To reduce bounce and prevent slippage</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO ADJUST A LADDER'S CLIMBING ANGLE, ONE-PERSON METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A straight or extension ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will adjust a ladder's climbing angle, one-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Straight or extension ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9

PREPARATION: Often after placing a ground ladder, there exists a need to reposition the base of the ladder on the ground.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Take position</td>
<td>1a. On side of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Facing beam</td>
</tr>
<tr>
<td></td>
<td>c. Feet apart</td>
</tr>
<tr>
<td>2. Grasp ladder</td>
<td>2a. With inward hand</td>
</tr>
<tr>
<td></td>
<td>b. Hand closest to objective</td>
</tr>
<tr>
<td></td>
<td>c. At shoulder height</td>
</tr>
<tr>
<td></td>
<td>d. Nearest beam or rung</td>
</tr>
<tr>
<td>3. Grasp ladder</td>
<td>3a. With outward hand</td>
</tr>
<tr>
<td></td>
<td>b. Hand away from objective</td>
</tr>
<tr>
<td></td>
<td>c. Knee high</td>
</tr>
<tr>
<td></td>
<td>d. Beam near center of ladder</td>
</tr>
<tr>
<td>4. Lift/adjust base</td>
<td>4a. Looking up</td>
</tr>
<tr>
<td></td>
<td>b. Tips remaining on building</td>
</tr>
<tr>
<td></td>
<td>c. Back straight</td>
</tr>
<tr>
<td></td>
<td>d. Using legs to lift</td>
</tr>
<tr>
<td></td>
<td>e. Single motion</td>
</tr>
<tr>
<td>5. Check angle</td>
<td>5a. Standing erect</td>
</tr>
<tr>
<td></td>
<td>b. Toes at beams</td>
</tr>
<tr>
<td></td>
<td>c. Arms outstretched, elbows locked</td>
</tr>
<tr>
<td></td>
<td>d. Arms at 90° to body</td>
</tr>
<tr>
<td></td>
<td>e. Hands should touch rung at shoulder height</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CLIMB A LADDER

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will climb a ladder

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Fire fighter's engage in activities that are often above ground level. Climbing a ladder is often the quickest and most effective way to access locations that are not reachable from the ground level.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take position</td>
<td>Facing ladder</td>
</tr>
<tr>
<td>face ladder</td>
<td>By sight</td>
</tr>
<tr>
<td>Confirm pawls (dogs and locks) are locked</td>
<td>Of ladder</td>
</tr>
<tr>
<td>Confirm climbing angle</td>
<td>Grasping rung</td>
</tr>
<tr>
<td>Prepare to climb</td>
<td>Near shoulder height</td>
</tr>
<tr>
<td></td>
<td>With overhand grip</td>
</tr>
<tr>
<td></td>
<td>Near beam</td>
</tr>
<tr>
<td></td>
<td>Placing ball of foot on lowest rung</td>
</tr>
<tr>
<td></td>
<td>Opposite side from hand placement</td>
</tr>
<tr>
<td>Start climbing</td>
<td>With hand opposite side of body from foot on rung</td>
</tr>
<tr>
<td></td>
<td>Shoulder high</td>
</tr>
<tr>
<td></td>
<td>Arm straight</td>
</tr>
<tr>
<td></td>
<td>Palm down</td>
</tr>
<tr>
<td></td>
<td>Maintaining proper climbing angle</td>
</tr>
<tr>
<td></td>
<td>Looking up to next rung</td>
</tr>
<tr>
<td>Climb to next rung</td>
<td>&quot;Grounding&quot; foot to the next rung</td>
</tr>
<tr>
<td></td>
<td>Free hand to rung above gripped hand</td>
</tr>
<tr>
<td></td>
<td>One motion</td>
</tr>
<tr>
<td></td>
<td>Opposite hand and foot</td>
</tr>
<tr>
<td></td>
<td>In unison</td>
</tr>
<tr>
<td></td>
<td>Smooth and rhythmic</td>
</tr>
<tr>
<td></td>
<td>Using legs</td>
</tr>
<tr>
<td></td>
<td>Arms straight</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>7. Repeat Operation 4</td>
<td>i. Maintaining proper climbing angle</td>
</tr>
<tr>
<td></td>
<td>7a. Until desired height is obtained</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A PIKE POLE UP A LADDER

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A raised ladder, pike pole, appropriate personal protective equipment, and a suitable structure

Behavior: The student will carry a pike pole up a ladder

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ladder
- Pike pole
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:

- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION:

Often in emergencies, fire fighters are called upon to carry tools up a ladder when time or ropes are not available to hoist tools.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Take position</td>
<td>1a. At base of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Pike pole in hand</td>
</tr>
<tr>
<td>2. Hook pike pole</td>
<td>2a. On ladder rung</td>
</tr>
<tr>
<td></td>
<td>b. Moving towards tip</td>
</tr>
<tr>
<td></td>
<td>c. Butt of tool between beams against side</td>
</tr>
<tr>
<td>3. Climb ladder</td>
<td>3a. Hands on beams</td>
</tr>
<tr>
<td></td>
<td>b. Smoothly and rhythmically</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Not pulling with arms</td>
</tr>
<tr>
<td>4. Reposition pike pole</td>
<td>4a. Once midpoint of pike pole is reached</td>
</tr>
<tr>
<td></td>
<td>b. Hooking tip on rung</td>
</tr>
<tr>
<td></td>
<td>c. As close to tip of ladder as possible</td>
</tr>
<tr>
<td></td>
<td>d. Butt of pike pole between beams against one beam</td>
</tr>
<tr>
<td>5. Repeat Operations 3 and 4</td>
<td>5a. Until tip of ladder is reached</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO CARRY A HAND TOOL UP A LADDER

0:15

Level II

SBFS

Condition: A raised ladder, hand tool, appropriate personal protective equipment, and a suitable structure

Behavior: The student will carry a hand tool up a ladder

Standard: Completing all operations within __________ according to the job breakdown

Job breakdown
Ladder
Hand tool
Appropriate personal protective equipment
Suitable structure

Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

Often in emergencies, fire fighters are called upon to carry tools up a ladder when time or tools are not available to hoist tools.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Take position</td>
<td>1a. At base of ladder</td>
</tr>
<tr>
<td></td>
<td>b. Tool in hand</td>
</tr>
<tr>
<td>2. Climb ladder</td>
<td>2a. Tool hand resting on beam</td>
</tr>
<tr>
<td></td>
<td>b. Free hand on opposite beam</td>
</tr>
<tr>
<td></td>
<td>c. Smoothly and rhythmically</td>
</tr>
<tr>
<td></td>
<td>d. Using legs</td>
</tr>
<tr>
<td></td>
<td>e. Not pulling with arms</td>
</tr>
<tr>
<td></td>
<td>f. Sliding hands on beams</td>
</tr>
<tr>
<td>3. Look up</td>
<td>3a. For maximum safety</td>
</tr>
<tr>
<td>4. Repeat Operations 2 and 3</td>
<td>4a. Until tip of ladder is reached</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE A LADDER IN

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5, 3-3.5 (a) (b) and 3-3.11 (b)

BEHAVIORAL OBJECTIVE:

Condition: A raised ladder, rope or webbing, appropriate personal protective equipment, and a suitable structure

Behavior: The student will tie a ladder in

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Ladder
- Two 20 foot lengths of suitable rope or webbing
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION:
A fire fighter’s concern for safety in handling ground ladders should be one of the most important features of training in his/her career. Tying in a ladder is an important step that ensures ladder stability. Whenever possible, ladders should be tied in at both the top and bottom. This will prevent the tip from pulling away from the side of the building and the base from slipping. In this section, you will learn how to properly tie a ladder in.
### OPERATIONS

| 1. Position ladder | 1a. Raised to height appropriate for operation  |
| 2. Climb ladder     | 2a. Using proper technique                      |
| 3. Lock in         | 3a. If appropriate                              |
| 4. Attach rope      | 4a. To objective                                |
| 5. Extend rope      | 5a. Between beams                               |
| 6. Attach rope      | 6a. To next rung down                           |
| 7. Descend ladder   | 7a. Using proper technique                      |

<table>
<thead>
<tr>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Checking for proper climbing angle</td>
</tr>
<tr>
<td>c. Footing ladder</td>
</tr>
<tr>
<td>b. Positioning within arms' reach of objective</td>
</tr>
<tr>
<td>b. Using appropriate technique</td>
</tr>
<tr>
<td>c. If attachment can be reached safely</td>
</tr>
<tr>
<td>b. Using appropriate hitch</td>
</tr>
<tr>
<td>c. Securing to available object of sufficient strength</td>
</tr>
<tr>
<td>b. Over nearest rung</td>
</tr>
<tr>
<td>b. With appropriate hitch (clove hitch recommended)</td>
</tr>
<tr>
<td>c. Tying center of rung</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO WORK ON A LADDER, LEG-LOCK METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5 and 3-3.11(b)

BEHAVIORAL OBJECTIVE:

- **Condition:** An extension ladder, appropriate personal protective equipment, and a suitable structure
- **Behavior:** The student will work on a ladder using the leg-lock method
- **Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Extension ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Fire fighters are routinely required to perform tasks while standing on ladders. These tasks require that the hands be free. Special techniques must be used to prevent the fire fighter from falling off the ladder. The leg-lock method is one of these techniques.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Against wall or objective</td>
</tr>
<tr>
<td>2. Extend ladder</td>
<td>2a. To desired height</td>
</tr>
<tr>
<td>3. Climb ladder</td>
<td>3a. To desired height</td>
</tr>
<tr>
<td>4. Take position</td>
<td>4a. On ladder</td>
</tr>
<tr>
<td></td>
<td>b. With feet on any rung</td>
</tr>
<tr>
<td></td>
<td>c. With hands grasping convenient rung</td>
</tr>
<tr>
<td></td>
<td>d. Near shoulder high</td>
</tr>
<tr>
<td></td>
<td>e. Overhand grip</td>
</tr>
<tr>
<td>5. Insert either leg</td>
<td>5a. Between the second and third rungs above</td>
</tr>
<tr>
<td></td>
<td>where feet are located</td>
</tr>
<tr>
<td></td>
<td>b. Choosing foot opposite of side where work</td>
</tr>
<tr>
<td></td>
<td>is to be performed</td>
</tr>
<tr>
<td>6. Secure to ladder</td>
<td>6a. Locking foot on ladder</td>
</tr>
<tr>
<td></td>
<td>b. Turning foot sharply back between rungs</td>
</tr>
<tr>
<td></td>
<td>c. Placing locking leg firmly against beam</td>
</tr>
<tr>
<td></td>
<td>d. Wrapping foot around beam</td>
</tr>
<tr>
<td>7. Assume position of comfort</td>
<td>7a. May step down with unlocked leg one rung to</td>
</tr>
<tr>
<td></td>
<td>improve comfort</td>
</tr>
<tr>
<td></td>
<td>b. Placing unlocked foot against beam</td>
</tr>
<tr>
<td>8. Confirm leg-lock</td>
<td>8a. By leaning back from ladder</td>
</tr>
<tr>
<td></td>
<td>b. Releasing grip and placing both hands clasped</td>
</tr>
<tr>
<td></td>
<td>behind back</td>
</tr>
<tr>
<td></td>
<td>c. Leaning to one side of beam and then the</td>
</tr>
<tr>
<td></td>
<td>other</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISMOUNT A LADDER INTO A WINDOW

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will dismount a ladder into a window

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Ladder
- Appropriate personal protective equipment
- Suitable structure


PREPARATION: Once ladders are deployed and the fire fighters are climbing them, care must be taken when dismounting these ladders when the window is reached.
## Operations to Dismount a Ladder into a Window

<table>
<thead>
<tr>
<th>Operation</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climb ladder</td>
<td>1a. To the window</td>
</tr>
<tr>
<td>Stand on ladder</td>
<td>2a. One rung below window sill</td>
</tr>
<tr>
<td></td>
<td>b. Both feet on rung</td>
</tr>
<tr>
<td></td>
<td>c. Both hands on beams</td>
</tr>
<tr>
<td>Straddle window sill</td>
<td>3a. With leg of preference</td>
</tr>
<tr>
<td>Grab window sill</td>
<td>4a. With inside hand</td>
</tr>
<tr>
<td>Shift body weight</td>
<td>5a. To inside foot</td>
</tr>
<tr>
<td></td>
<td>b. To floor</td>
</tr>
<tr>
<td>Bring other foot in</td>
<td>6a. Over window sill</td>
</tr>
<tr>
<td></td>
<td>b. To floor</td>
</tr>
<tr>
<td>Release ladder</td>
<td>7a. With other hand</td>
</tr>
<tr>
<td></td>
<td>b. To establish balance</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISMOUNT A LADDER ONTO A ROOF

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A ladder, tool for sounding the roof, appropriate personal protective equipment, and a suitable structure

Behavior: The student will dismount a ladder onto a roof

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ladder
- Tool for sounding roof
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:


PREPARATION:

Once ladders are deployed and the fire fighters are climbing them, care must be taken when dismounting these ladders when the objective is reached.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Climb ladder</td>
<td>1a. To the roof</td>
</tr>
<tr>
<td>2. Stand on ladder</td>
<td>2a. One rung below the roof</td>
</tr>
<tr>
<td></td>
<td>b. Both feet on rung</td>
</tr>
<tr>
<td></td>
<td>c. Both hands on beams</td>
</tr>
<tr>
<td>3. Sound roof</td>
<td>3a. With sounding tool</td>
</tr>
<tr>
<td>4. Step off ladder</td>
<td>4a. With foot of preference</td>
</tr>
<tr>
<td></td>
<td>b. Same side that was sounded</td>
</tr>
<tr>
<td>5. Shift body weight</td>
<td>5a. To foot on roof</td>
</tr>
<tr>
<td>6. Reposition opposite hand</td>
<td>6a. Onto rung</td>
</tr>
<tr>
<td></td>
<td>b. To stabilize ladder</td>
</tr>
<tr>
<td>7. Step off ladder</td>
<td>7a. With other foot</td>
</tr>
<tr>
<td></td>
<td>b. Establishing balance</td>
</tr>
<tr>
<td>8. Release ladder</td>
<td>8a. With other hand</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE A POLE LADDER, FOUR-PERSON, FLAT-RAISE METHOD

TIME FRAME: 0:45

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5

BEHAVIORAL OBJECTIVE:

Condition: A pole ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The students will raise a pole ladder using the four-person, flat-raise method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Pole ladder (40-50 foot)
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Because of their length and weight, pole ladders require closely coordinated teamwork to be raised successfully and safely. A minimum of four fire fighters is required to raise these ladders safely. Staypoles provide a means for two additional fire fighters to apply lifting force when the ladder is raised and stability when the ladder is extended, pivoted, and lowered into position.
### OPERATIONS

1. Position ladder
   - 1a. Flat on ground
   - 1b. At the desired location
   - 1c. Fly up or down depending on manufacturer
   - 1d. Ladder butt spurs against objective

2. Take positions
   - 2a. Tip persons at base, one each side
   - 2b. Pole persons 15 feet out from tip
   - 2c. Pole persons in line with ladder beams

3. Tip persons release staypoles
   - 3a. At base

4. Tip persons pass staypoles
   - 4a. To pole persons
   - 4b. Simultaneously
   - 4c. With both hands
   - 4d. In lateral arch
   - 4e. Checking for overhead obstructions
   - 4f. On the outside of the poles
   - 4g. Returns to tip of ladder

5. Tip persons take position
   - 5a. At tip of ladder

### KEY POINTS

**NOTE:** Poles that are permanently attached are passed in a lateral arch. Poles that are not permanently attached are passed butt first to the pole persons and the tip person attach the toggles (swivels) to the bed section.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Pole persons take poles</td>
<td>6a. Facing center</td>
</tr>
<tr>
<td></td>
<td>b. One hand toward the ladder</td>
</tr>
<tr>
<td></td>
<td>c. Other hand with spur between fingers</td>
</tr>
<tr>
<td></td>
<td>d. Nearly in line with beam</td>
</tr>
<tr>
<td>7. Tip persons crouch</td>
<td>7a. At or about second rung down</td>
</tr>
<tr>
<td></td>
<td>b. Facing tip</td>
</tr>
<tr>
<td></td>
<td>c. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>d. Inside hand on beam or rung</td>
</tr>
<tr>
<td>8. Right tip person gives command</td>
<td>8a. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;LIFT LADDER!&quot;</td>
</tr>
<tr>
<td>9. Tip persons lift and pivot ladder</td>
<td>9a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Simultaneously</td>
</tr>
<tr>
<td></td>
<td>c. Pivoting 180°</td>
</tr>
<tr>
<td></td>
<td>d. Maintaining grip on tip</td>
</tr>
<tr>
<td></td>
<td>e. To shoulder height</td>
</tr>
<tr>
<td>10. Right tip person gives command</td>
<td>10a. &quot;PREPARE TO RAISE!&quot;</td>
</tr>
<tr>
<td></td>
<td>b. &quot;RAISE LADDER!&quot;</td>
</tr>
<tr>
<td>11. Tip persons raise ladder</td>
<td>11a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Extending arms</td>
</tr>
<tr>
<td></td>
<td>c. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>d. Toward base</td>
</tr>
<tr>
<td></td>
<td>e. To vertical position</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>12. Pole persons assist in raising ladder</td>
<td>12a. By pushing poles toward objective</td>
</tr>
<tr>
<td></td>
<td>b. When high enough, pushing toward structure</td>
</tr>
<tr>
<td></td>
<td>c. In line with beams</td>
</tr>
<tr>
<td></td>
<td>d. To vertical position</td>
</tr>
<tr>
<td>13. Tip persons shift ladder butt</td>
<td>13a. Outward</td>
</tr>
<tr>
<td></td>
<td>b. Grasping low rung</td>
</tr>
<tr>
<td></td>
<td>c. With near hand, palms up</td>
</tr>
<tr>
<td></td>
<td>d. Grasping high rung</td>
</tr>
<tr>
<td></td>
<td>e. With other hand, palms down</td>
</tr>
<tr>
<td></td>
<td>f. Head high</td>
</tr>
<tr>
<td></td>
<td>g. To where ladder will be positioned for climbing</td>
</tr>
<tr>
<td>14. Reposition pole persons</td>
<td>14a. For extending</td>
</tr>
<tr>
<td></td>
<td>b. One in line with the beam</td>
</tr>
<tr>
<td></td>
<td>c. Remaining pole person in line with bed of ladder</td>
</tr>
<tr>
<td>15. Reposition tip persons</td>
<td>15a. One behind the ladder</td>
</tr>
<tr>
<td></td>
<td>b. One heeling ladder from the outside</td>
</tr>
<tr>
<td>16. One tip person extends fly</td>
<td>16a. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>b. To desired height</td>
</tr>
<tr>
<td>17. Same tip person locks pawls (dogs and</td>
<td>17a. Once correct height is obtained</td>
</tr>
<tr>
<td>locks)</td>
<td>b. Confirming by sight and sound</td>
</tr>
</tbody>
</table>
### OPERATIONS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Tip persons lower ladder</td>
</tr>
<tr>
<td>19.</td>
<td>Secure halyard</td>
</tr>
<tr>
<td>20.</td>
<td>Pole persons set staypoles</td>
</tr>
</tbody>
</table>

### KEY POINTS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>18a.</td>
<td>Against structure</td>
</tr>
<tr>
<td>b.</td>
<td>Gently</td>
</tr>
<tr>
<td>c.</td>
<td>Stepping back</td>
</tr>
<tr>
<td>d.</td>
<td>Hands on beam</td>
</tr>
<tr>
<td>e.</td>
<td>Back straight</td>
</tr>
<tr>
<td>f.</td>
<td>Pole persons continue guiding tip of ladder slowly</td>
</tr>
<tr>
<td>19a.</td>
<td>Using approved knot</td>
</tr>
<tr>
<td>20a.</td>
<td>Parallel to building</td>
</tr>
<tr>
<td>b.</td>
<td>Lower to ground</td>
</tr>
</tbody>
</table>

**NOTE:** The staypoles must not be wedged. They are not designed to carry the stresses put on the ladder. When set in position, they are used only to prevent side slippage.
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO RAISE A POLE LADDER, FIVE TO SIX-PERSON, FLAT-RAISE METHOD

TIME FRAME: 0:45

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.5 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A pole ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The students will raise a pole ladder using the five to six-person, flat-raise method

Standard: Completing all operations within _________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Pole ladder (40-50 foot)
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 4

PREPARATION: Because of their length and weight, pole ladders require closely coordinated teamwork to be raised successfully and safely. A minimum of four fighters is required to raise these ladders safely. Staypoles provide a means for two additional fire fighters to apply lifting force when the ladder is raised and stability when the ladder is extended, pivoted, and lowered into position.
### Operations

<table>
<thead>
<tr>
<th>Operations</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Flat on ground</td>
</tr>
<tr>
<td></td>
<td>b. At the desired location</td>
</tr>
<tr>
<td></td>
<td>c. With fly up or down depending on manufacturer</td>
</tr>
<tr>
<td></td>
<td>d. With ladder butt spurs almost against building</td>
</tr>
<tr>
<td>2. Take positions</td>
<td>2a. Base person foots ladder during raise (sixth person is assigned here)</td>
</tr>
<tr>
<td></td>
<td>b. Tip persons at base, one each side</td>
</tr>
<tr>
<td></td>
<td>c. Pole persons 15 feet out from tip and in line with ladder beams</td>
</tr>
<tr>
<td>3. Tip persons release and remove staypoles</td>
<td>3a. Tip persons at base</td>
</tr>
<tr>
<td>4. Tip persons pass staypoles</td>
<td>4a. To pole persons</td>
</tr>
<tr>
<td></td>
<td>b. Simultaneously</td>
</tr>
<tr>
<td></td>
<td>c. With both hands</td>
</tr>
<tr>
<td></td>
<td>d. In lateral arch</td>
</tr>
<tr>
<td></td>
<td>e. On the outside of the poles</td>
</tr>
<tr>
<td></td>
<td>f. Returns to tip of ladder</td>
</tr>
</tbody>
</table>

**NOTE:** Poles that are permanently attached are passed in a lateral arch. Poles that are not permanently attached are passed butt first to the pole persons and the tip person attach the toggles (swivels) to the bed section.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Pole persons take poles</td>
<td>5a. Facing center</td>
</tr>
<tr>
<td></td>
<td>b. One hand toward the ladder</td>
</tr>
<tr>
<td></td>
<td>c. Other hand with spur between fingers</td>
</tr>
<tr>
<td></td>
<td>d. Nearly in line with beam</td>
</tr>
<tr>
<td>6. Base person crouches</td>
<td>6a. Both feet on bottom rung</td>
</tr>
<tr>
<td></td>
<td>b. Both hands on convenient rung</td>
</tr>
<tr>
<td>7. Tip persons crouch</td>
<td>7a. Tip persons at or about second rung down</td>
</tr>
<tr>
<td></td>
<td>b. Facing tip</td>
</tr>
<tr>
<td></td>
<td>c. Outside foot forward</td>
</tr>
<tr>
<td></td>
<td>d. Inside hand on beam or rung</td>
</tr>
<tr>
<td>8. Base person gives command</td>
<td>8a. Right base person if two people are positioned at butt</td>
</tr>
<tr>
<td></td>
<td>b. &quot;PREPARE TO LIFT!&quot;</td>
</tr>
<tr>
<td></td>
<td>c. &quot;LIFT LADDER!&quot;</td>
</tr>
<tr>
<td>9. Tip persons lift and pivot ladder</td>
<td>9a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Simultaneously</td>
</tr>
<tr>
<td></td>
<td>c. Pivoting 180°</td>
</tr>
<tr>
<td></td>
<td>d. Maintaining grip on tip</td>
</tr>
<tr>
<td></td>
<td>e. To shoulder height</td>
</tr>
<tr>
<td>10. Base person gives command</td>
<td>10a. Right base person if two people are positioned at butt</td>
</tr>
<tr>
<td></td>
<td>b. &quot;PREPARE TO RAISE!&quot;</td>
</tr>
<tr>
<td></td>
<td>c. &quot;RAISE LADDER!&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Tip persons raise ladder</td>
<td>11a. In unison</td>
</tr>
<tr>
<td></td>
<td>b. Extending arms</td>
</tr>
<tr>
<td></td>
<td>c. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>d. Toward base</td>
</tr>
<tr>
<td>11b.</td>
<td>To vertical position</td>
</tr>
<tr>
<td>12. Base person leans back</td>
<td>12a. Acting as counterweight</td>
</tr>
<tr>
<td>13. Pole persons assist in raising ladder</td>
<td>13a. At 45°</td>
</tr>
<tr>
<td></td>
<td>b. In line with beams</td>
</tr>
<tr>
<td></td>
<td>c. To vertical position</td>
</tr>
<tr>
<td>14. Base and tip persons heel ladder</td>
<td>14a. Maintaining control of ladder</td>
</tr>
<tr>
<td>15. Reposition pole persons</td>
<td>15a. For extending</td>
</tr>
<tr>
<td></td>
<td>b. One in line with the beam</td>
</tr>
<tr>
<td></td>
<td>c. One in line with bed of ladder</td>
</tr>
<tr>
<td>16. One tip person extends fly</td>
<td>16a. Hand-over-hand</td>
</tr>
<tr>
<td></td>
<td>b. To desired height</td>
</tr>
<tr>
<td>17. Same tip person locks pawls (dogs and locks)</td>
<td>17a. Once correct height is obtained</td>
</tr>
<tr>
<td></td>
<td>b. Confirming by sight and sound</td>
</tr>
<tr>
<td>18. Tip persons heel ladder</td>
<td>18a. Maintaining control of ladder</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>19. Base person lowers ladder</td>
<td>19a. Against structure</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td></td>
<td>c. Stepping back</td>
</tr>
<tr>
<td></td>
<td>d. Hands on beam</td>
</tr>
<tr>
<td></td>
<td>e. Back straight</td>
</tr>
<tr>
<td></td>
<td>f. Pole persons continue guiding tip of</td>
</tr>
<tr>
<td></td>
<td>ladder slowly</td>
</tr>
<tr>
<td></td>
<td>g. Ties of halyard</td>
</tr>
<tr>
<td>20. Secure halyard</td>
<td>20a. Using approved knot</td>
</tr>
<tr>
<td>21. Pole persons set staypoles</td>
<td>21a. Parallel to building</td>
</tr>
<tr>
<td></td>
<td>b. Lower to ground</td>
</tr>
</tbody>
</table>

**NOTE:** The staypoles must not be wedged. They are not designed to carry the stresses put on the ladder. When set in position, they are used only to prevent side slippage.
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: PRINCIPLES OF BREAKING OR PULLING LOCKS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of breaking or pulling locks by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Forcible Entry, IFSTA, Seventh Edition, Chapter 5

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials • Lock pullers • Key tools


PREPARATION: Upon arrival, fire fighters may see flames and smoke billowing from windows or roofs. However, basic fire attack strategy calls for fire fighters to advance and locate the seat of the fire, rather than automatically apply water at the window or roof and likely "push" the fire toward unburned areas. Therefore, entry into burning buildings is a first step to properly combat the fire. This entry can be done as easily as turning a doorknob, but this is not often the case. In those more frequent cases where entry is locked, fire fighters must resort to using tools and imaginative forcible entry techniques. Your ability to adapt to these problems may make an impact on the overall fire attack.
I. LOCKS VERSUS DOORS

A. Pulling the lock
   1. Tools
      a) "K-tool"
      b) "A-tool"
      c) Bam-bam tool
      d) Lock puller
   2. Operation
      a) Drive the tool into the lock cylinder behind the collar
      b) Apply force to pull the lock cylinder straight out of the door
      c) Forks of a Halligan tool can be used
         1) Fastest removal of a lock cylinder
         2) Easier on cheap locks than high security locks

B. Unscrewing the lock
   1. Use large vice grip pliers
      a) Will not work with flush mounted locks
   2. Operation
      a) Lock onto the protruding lock cylinder
      b) Rotate counterclockwise to unscrew the lock
   3. Less damaging than pulling the lock, but requires considerable more time to complete

C. Releasing the locking bolt
   1. Use a "key" tool or similarly shaped device
   2. Operation
      a) Move locking bolt to a retracted position
b) If locking bolt cannot be retracted (surface mount or "rim" lock)
   1) Insert a punch or the point of a Halligan tool or similar long headed tool into the cylinder hole
   2) Strike it with a sledge hammer
   3) Drive the lock off the inside of the door

D. Drilling a pin lock
   1. Use a drill
      a) Destroy the pins without destroying the entire lock cylinder
   2. Operation
      a) Drill just above the key hole
      b) Use a screwdriver to turn the lock in place of the key
   3. Slowest method of through-the-lock forced entry
      a) Can be used when time is not critical
   4. Least expensive to repair

E. Key-in-knob lock (residential)
   1. "Loiding" the lock with a homemade shove knife (putty knife)
      a) Works best on outward opening doors
   2. Operation
      a) Remove the knob using a lock puller
      b) Break knob off with a sledge hammer
      c) Use a screwdriver to operate internal mechanism
   3. This is the fastest, but most damaging method
SUMMARY:
In many instances, the best method of forcing entry may be through the door by pulling the lock cylinder out of the door or by otherwise defeating the locking mechanism. All of the methods rely on gaining access to the locking mechanism. This can be done by removing the cylinder, removing the outer ring, or drilling the tumblers. As a last resort, the locking pin can be cut with a rotary saw.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Forcible Entry, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF FORCING SINGLE-ENTRY DOORS

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of forcing single-entry doors by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials
• Door
• Pry tool

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition
• Forcible Entry, IFSTA, Sixth Edition

PREPARATION: Upon arrival at a fire building, fire fighters may see flames and smoke billowing from windows or roofs. However, basic fire attack strategy calls for the fire fighter to advance and locate the seat of the fire rather than automatically apply water at the window or roof and likely "push" the fire toward unburned areas. Therefore, entry into burning buildings is a first step to properly combat the fire. Ideally, this entry should be as easy as turning a doorknob, but this is not often the case. In those more frequent cases where entry is blocked, the fire fighter must resort to the use of tools and imaginative forcible entry techniques.
I. DOOR SIZE-UP

A. When doors are locked the following size-up should begin
   1. Force a door
   2. Force a window
   3. Force a lock
   4. Breach a wall

B. Two broad categories of doors
   1. Residential
   2. Commercial

C. "What are the fastest way and least damaging means into the building?"

D. Residential doors
   1. Usually made of wood, plastic, or glass
   2. Frames usually made from wood
   3. Usually yield to forcing techniques
   4. New and improved locking mechanisms may present more difficulty

E. Commercial doors
   1. Usually found in banks, hospitals, warehouses, and retail shops
   2. Generally design lends toward more sturdy construction
   3. This provides more protection to the business and withstands every day use
   4. Due to design and construction forcible entry techniques are more difficult and becoming more specialized

During forcible entry size-up, what question should you ask?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Construction material includes metal, wood, tempered glass, or any combination of the above</td>
<td></td>
</tr>
<tr>
<td>6. Locking mechanisms more sophisticated than residential</td>
<td></td>
</tr>
</tbody>
</table>

II. DOOR CONSTRUCTION

A. Classified by design and material
   1. Wood
   2. Metal
   3. Glass

B. Wood doors commonly designed in three ways
   1. Ledge
      a) Oldest type design
      b) Single boards joined by a frame
   2. Slab
      a) Usually milled from several wood components
      b) Two types of slab doors
         1) Solid core
            • Formed with laminated blocks or layers of wood with a veneer wood glued over
         2) Hollow core
            • Wood frame, wood veneer cover, and honey comb center
   3. Panel
      a) Solid wood members inset with panels
      b) Weakest section is usually the panel

What are some materials that doors are made of?
C. Metal doors are designed in four ways

1. Clad
   a) Usually a fire door
   b) Two designs
      1) Flush
         • Metal cover with wood core
      2) Panel
         • Rails and insulated panels

2. Hollow
   a) Manufactured from formed 20 gauge steel or greater
   b) Either flush or panel design

3. Sheet
   a) Design similar to hollow
   b) Usually made from 22 gauge steel or less

4. Curtain
   a) Similar to a steel overhead roll up door
   b) Made from interlocking steel slates
   c) Mounted in pairs to provide maximum fire resistance
      1) One door mounted inside and one outside the structure

D. Glass doors are usually designed two ways

1. Metal framed
   a) One piece tubular frame
   b) May contain concealed hinges
   c) Extremely difficult to force
   d) Through-the-lock should be considered
### Unframed

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate</td>
<td>1) Fragments when broken, no identifying marks</td>
</tr>
<tr>
<td>Laminated</td>
<td>1) Also called safety glass</td>
</tr>
<tr>
<td></td>
<td>• When broken will remain as a sheet</td>
</tr>
<tr>
<td>Tempered</td>
<td>1) Very strong and relatively safe to break</td>
</tr>
<tr>
<td></td>
<td>• Will have decal or stencil in corner to identify as such</td>
</tr>
</tbody>
</table>

### III. SINGLE-ENTRY DOOR TYPES

A. Most doors are one of the following types
   1. Swinging
   2. Sliding
   3. Folding
   4. Revolving

B. Swinging door
   1. Swings open and close
   2. Also called hinged doors
   3. Identified as right swinging or left swinging according to the position of the hinges
      a) As reference from the outside of the building; hinges on the right = right swinging

What three different types of glass do glass doors usually have?

What is another name for swinging doors?
4. Another way to identify is "in swinging" or "out swinging"
   a) In swinging door usually found on exterior door of residential homes
   b) Out swinging door usually found on exterior doors of commercial facilities
      1) Provides for quick egress out of building in panic situations

5. Swinging doors are mounted in frames to permit secure closing
   a) Frames have stops
   b) Stops prevent door from swinging through the frame
   c) Types of stops
      1) Nail on stop
         • Piece attached to the frame
      2) Rabbeted stop
         • Stop is milled as part of the frame - one piece

C. Sliding door
   1. Not as common as swing doors
   2. Usually found in residential homes as a patio door
   3. Commercially they are used in space constraints, or when emergency egress is needed from either direction

What are the two different types of stops on doorframes?

What are the three types of sliding doors?
b) Bypass sliding

5. Doors may be operated manually, electrically, or hydraulically

D. Folding doors

1. Rarely found in exterior openings although commercial designs are available
2. Usually intended for interior use
3. Also called accordion doors
4. For large openings and may be used for partition walls

E. Revolving Doors

1. Usually found in commercial applications
2. In fire door must be disabled to allow for suppression activities
3. Constructed with sections or wings that pivot on center pivot point
4. Doors are designed to collapse, or also called a book fold
5. Doors during normal operation are held by chain keepers or bars between the wings
6. Usually requires between 50-150 pounds to collapse
7. Usually locked with simple slide bolts mortise locks or custom locks
   a) Locks may not be exposed to the exterior
   b) In this case, it is best that the forcible entry personnel seek another entry point
IV. FIRE DOORS

A. Standard fire door types
   1. Horizontal and vertical sliding
   2. Single and double sliding
   3. Overhead rolling

B. Fire doors operate in two ways
   1. Self closing doors automatically close after someone opens them and passes through the opening
   2. Automatic closing doors normally stay open but close when heat activates a closing device

C. Fire doors that slide horizontal are preferred when floor space is not limited

D. Vertical sliding doors are used when horizontal cannot be used

E. Both types are usually counterweighted to allow them to close automatically

F. Swinging fire doors are used in stair wells
   1. Typically they close into a metal frame with a rabbeted jamb to prevent smoke penetration
   2. Swing fire doors can be found in single and double swinging
   3. These doors are usually equipped with concealed door closer, single point latch, and a holding device

Name the three standard types of fire doors.

What causes fire doors to close automatically?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) May range from electromagnetic to fusible links</td>
<td></td>
</tr>
</tbody>
</table>

**V. FORCING DOORS OPENING TOWARD FIRE FIGHTER**

A. Remove hinge pin
   1. Start with bottom pin
   2. Use screwdriver or other pry tool
   3. Use striking tool as necessary (hammer)
   4. Work towards top pin
   5. Pry door outward on hinged side to free latch

B. Force the blade in against the stop by working and pushing on tool
   1. Tool may be hammered with another object

C. Pry on tool bar away from the door to move the door and jamb apart

D. Pull the door open or pry open with another tool if needed when lock has cleared the keeper

**VI. FORCING DOORS OPENING AWAY FROM FIRE FIGHTER**

A. Remove door stop
   1. Bump cutting edge of tool against the door stop to break paint and varnish
   2. Pry door stop away and remove it

B. Pry door and frame apart
   1. Force blade of pry tool between door and frame near latch
   2. Apply leverage outward to separate door from frame
   3. Maintaining pressure, use second pry tool on other side of latch as necessary
4. Push door slowly when latch has cleared the striker plate

VII. FORCING TEMPERED GLASS DOORS AND WINDOWS

A. Should be broken only as a last resort
   1. Fire fighters should use every other means of forcible entry before deciding to gain entrance through an opening that is blocked by a tempered plate glass door

B. The breakage characteristics of tempered plate glass are quite different from those of ordinary plate glass
   1. Tempered glass is heat treated which results in high tension stresses and high compression stresses in the center and the exterior surfaces respectively
   2. The heat treatment increases the strength and the flexibility
   3. The resistance to shock pressure impacts and temperature are increased
   4. Tempered plate glass door panels are more expensive

C. Many are custom built and the time necessary to prepare a replacement and install it may be considerably longer than for other types of doors

D. Caution should be exercised when breaking tempered plate glass
   1. The glass will not fall out like ordinary plate glass
   2. May, in fact, explode with the fragments dispersing in a horizontal direction
   3. Fire fighters should be aware of these dangers and wear all appropriate personal protective equipment while working around glass
### VIII. FORCING POLYCARBONATE DOORS

A. Many doors are being made of polycarbonate material in place of glass

B. Lexan®, a polycarbonate, is 250 times stronger than safety glass and 50% lighter than glass
   1. The most common thickness is $\frac{\text{1}}{8}$-½ inch

C. Lexan® doors, like tempered glass doors should be forced only as a last resort

D. If entry must be made, a circular saw with a carbide-tipped blade is most effective
   1. In conjunction with the circular saw, a cooling water stream should be applied to the cut
   2. Heat from the blade will fuse the cut line resulting in lost time

### IX. FORCING DOUBLE SWINGING DOORS

A. Double swinging doors should be forced with a pry tool by prying the two doors apart to permit the lock bolt to pass the keeper
   1. If a molding is fastened to one of the doors in the center, it should be removed to expose the crack between the two doors

B. Insert a pry tool between the two doors near locking assembly and pry the doors until the bolt passes the keeper

C. If the door has a glass pane, breaking the glass may be the fastest means of entry

D. Most double swinging doors have a slide lock near the top and/or bottom of the door on one or both doors

E. The method to use to force a swinging door should be determined by how the door is hung and how the door is locked
X. OPENING TECHNIQUES FOR SLIDING DOORS

A. Check for additional locking mechanisms
   1. Examples
      a) Wooden dowels in slide track
      b) Bolt pins in upper and lower frame
   2. The need for rapid entry might require breaking the glass panel
      a) Break in an approved manner

B. One frame lock
   1. Force open by inserting a wedge or pry tool between the jamb and door near the lock and pry the door away from the frame
SUMMARY:

Gaining access to a building is imperative to successful fireground operations. A size-up of doors must be made before attempting forcible entry. The size-up should include the door type, construction materials, type of jamb, and how the door swings, rotates, or slides. Different methods are used to "hang" doors including hinges and pins. Different methods need to be employed depending on the mounting characteristics of each door.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF FORCING OVERHEAD DOORS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of forcing overhead doors by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Knowledge of overhead door locking mechanisms and opening procedures is essential in order to gain safe and rapid entry into structures with overhead doors. Overhead doors present unusual problems and may tax an unprepared fire fighter's ability. Your mastery of this material will allow you to gain access when time counts.
## PIVOTING DOOR (SLAB) WITH PANELS

A. Knock out panel and turn the latch  
B. Pull up and block open  
C. If removing the glass panel by breaking, remove all the broken glass prior to reaching in and turning the latch

## ROLLING DOOR (STEEL)

A. Heat induced metal fatigue to hinges and roller slide assembly may make opening difficult  
B. Pry upward at the bottom of the door, nearest the locking mechanism  
   1. Use a stout prying tool  
   2. Always block or secure open  
      a) Vice grips, pike poles, attic ladder  
C. Avoid using striking or battering devices if possible

Why should you avoid using striking or battering devices?  
1. Time consuming  
2. Distorts shape  
3. Fire fighter fatigue

## Entry

1. Use of circular power saw with carbide-tipped blade  
2. Slide blade between frame and door panel and cut slide bar or rod  
   a) Use pry tool to obtain opening  
3. Approach center of door and cut a large triangular hole  
   a) Make opening large enough for a fire fighter in full personal protective equipment
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Reach as high as possible, and still maintain personal stability</td>
<td></td>
</tr>
<tr>
<td>1) Have an attack line ready</td>
<td></td>
</tr>
<tr>
<td>c) Cut as close to bottom of door as possible</td>
<td></td>
</tr>
<tr>
<td>d) Fold cut material inward from the bottom</td>
<td></td>
</tr>
<tr>
<td>e) Enter through this opening</td>
<td></td>
</tr>
<tr>
<td>4. Option &quot;X&quot; cut</td>
<td></td>
</tr>
<tr>
<td>a) Determine first whether or not you can remove the interlocking door panels by sliding them horizontally with a pair of engaged vice grips</td>
<td></td>
</tr>
<tr>
<td>b) Begin the cut as high as possible with a circular/rotary saw near an upper corner</td>
<td></td>
</tr>
<tr>
<td>c) Cut in a diagonal line to opposite lower corner</td>
<td></td>
</tr>
<tr>
<td>d) Repeat steps &quot;b&quot; and &quot;c&quot; from the opposite directions</td>
<td></td>
</tr>
<tr>
<td>e) Push lower &quot;v&quot; of the &quot;x&quot; inward</td>
<td></td>
</tr>
<tr>
<td>f) Slide individual interlocking panels or slats out of the restrained grooves towards the center until a &quot;box&quot; shaped opening remains</td>
<td></td>
</tr>
<tr>
<td>5. Middle cut</td>
<td></td>
</tr>
<tr>
<td>a) Determine first whether or not you can remove interlocking door panels or slats by sliding them horizontally with a pair of engaged vice grips</td>
<td></td>
</tr>
<tr>
<td>b) Begin the cut as high as possible in the center of the door with a circular/rotary saw, while maintaining personal stability</td>
<td></td>
</tr>
<tr>
<td>c) Make small opening at base of the cut</td>
<td></td>
</tr>
</tbody>
</table>
d) Slide individual interlocking door panels or slats, towards the center, out of their retraining grooves until a "box" shaped opening remains

6. Box cut
   a) If door panels are bolted to the side restraints/assemblies, then prepare to make a box cut
   b) Make a shoulder high horizontal cut, with a circular/rotary saw, while maintaining personal stability, from one side of the door to the opposite side of the door
   c) Make a vertical cut from the top of one horizontal cut, to the bottom of the door, 4-6 inches inside the door track
   d) Repeat step "c" for the opposite side of the door
   e) Push door in or remove portion, if possible, to reveal a "box" shaped opening

III. OVERHEAD FOLDING DOORS
   A. Constructed of panels
      1. Metal, fiberglass, wood, or glass
   B. Horizontal below ceiling when door is open
   C. Found in residential garages, warehouses, and service stations
   D. Operated mechanically, manually, or electrically
   E. Entry
      1. Cut or knock out a panel
2. Release the locking mechanism
   a) Electrically operated doors (often remote controlled) may require fire fighters to enter through a panel to trip the release mechanism

3. Alternate entry
   a) Make cuts forming two sides of a triangle in a single panel above the door/handle locking assembly
   b) Push cut section inward
   c) Reach in and release locking mechanism
**SUMMARY:**

Gaining access to a structure through large and heavy overhead doors is hazardous but necessary. The ability to recognize whether a door is a slab door or a rolling steel door, its locking mechanism, and opening procedure is essential for rapid and safe entry.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8* in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF OPENING WALLS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of opening walls by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9

MATERIALS NEEDED:
• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:
• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Firefighter's Handbook, Delmar, 2000 Edition
• Forcible Entry, IFSTA, Seventh Edition

PREPARATION:
As a fire fighter, you may have to open various types of walls. To prevent fire loss, you will need to do this quickly. It is important that you have a basic understanding of how to accomplish this difficult task.
I. OPENING MASONRY WALLS

A. Composition
   1. Types
      a) Brick
      b) Stone
      c) Concrete blocks
      d) Glass blocks
   2. Walls are generally 8-12 inches thick
      a) Depending upon the material used and the size of the building
   3. Steel reinforcing bars are spaced 4-16 inches apart
      a) Depending upon the height and thickness of the wall
         1) Vertical
         2) Horizontal

B. General considerations
   1. Make opening where it will not significantly weaken the wall
      a) Especially where wall is a bearing wall
      b) Most exterior walls, also some interior walls
   2. Load-bearing wall versus nonload-bearing
      a) Load-bearing
         1) A wall that support structural weight
      b) Nonload-bearing
         1) AKA "partition" wall
         2) Commonly separates areas or rooms

What is a load-bearing wall?
What should be avoided when breaching a wall?

3. Avoid electrical wires and plumbing
4. Hole should be diamond shaped
5. Hole should be large enough to
   a) Allow access to door locks/latches
   b) Allow personnel with tools and SCBA to pass through

C. Power breaching tools
   1. Types
      a) Hydraulic
      b) Gas
      c) Air
      d) Electric

Why are powered breaching tools preferred?

2. Fastest means of opening wall
3. Requires fewer personnel
4. Examples of power tools
   a) Heavy duty circular saw with masonry blades
      1) Circular vent saw, etc.
   b) Impact jack hammers
      1) Air operated
      2) Electric
   c) Drills
   d) Air chisels
      1) Requiring large air supply
   e) Hydraulic spreaders
What is a drawback of hand tool use?

D. Hand tools
   1. Generally slow and labor intensive (prepare for personnel rotation often)
   2. Types
      a) Sledge hammers
      b) Battering ram
         1) Jagged end to pierce masonry wall
         2) Rounded end for doors

II. OPENING MASONRY VENEER WALLS
   A. Opening a masonry veneer wall requires removing the veneer before starting breaching
      1. Masonry veneer walls are such that the supporting members are wood with one layer of brick or stone on the exterior to give the appearance of a solid brick or stone wall
      2. The interior wall consists of upright wood supporting members which are called "studs"
         a) The studs are usually 2"x4" or 2"x6", spaced at intervals from 16-24 inches
      3. Knock off the veneer with a sledge hammer, battering ram or power equipment before starting to breach the main wall
      4. Open main wall the same as other masonry walls

III. OPENING METAL WALLS
   A. Metal walls are generally found in
      1. Storage buildings
      2. Service station
      3. Store fronts
4. Commercial structures
5. Mobile homes

B. Metal skin attached to studs
   1. Wood
   2. Metal

C. Guidelines
   1. Breach metal wall as last resort
      a) Preferable to gain entry through
         1) Glass
         2) Door
      b) Use triangular cut near locking mechanism with base intact
   2. Anticipate and avoid
      a) Electrical wires
      b) Plumbing
   3. Do not cut through wall support members
   4. Cut adjacent to studs to minimize vibration

What tools are commonly used to breach metal walls?

5. Power tools
   a) Power saw with aluminum oxide or similar metal cutting blade
   b) Air chisel
   c) Hydraulic spreaders
   d) Cutting torch

6. Hand tools
   a) Slower and cumbersome
      1) Prying tools
      2) Cutting tools
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>7. Metal covered with porcelain, when cut, can create flying chips</td>
<td></td>
</tr>
<tr>
<td>a) Wear eye protection and keep unnecessary personnel out of the cutting area</td>
<td></td>
</tr>
</tbody>
</table>

**IV. OPENING WOOD FRAME WALLS**

A. Most common type of wall construction

B. Interior coverings are of various type materials and may be combustible

1. Sheetrock
   a) Wall board
   b) Gypsum board
   c) Dry wall

2. Paneling
3. Lath and plaster

C. Exterior coverings may or may not be wooden

1. Aluminum siding
2. Vinyl siding
3. Stucco
4. Asbestos shingles

D. Insulation between walls may be combustible and/or toxic

1. Can trap heat inside a building and hamper ventilation openings

E. Easily cut with a power saw or cutting tool

1. Chain or circular saws, reciprocating saw, etc.
2. Axe
3. Do not cut studs, wiring, or plumbing

What are some examples of interior coverings?
F. Determine if wall is load-bearing
   1. If so, restrict the size of the opening
      a) Remove one stud to permit passage of personnel
         1) This would be the limit unless shoring is used

G. Old construction may have new walls over older walls, which may not be wood construction
   1. This process of building over existing walls is called "wrapping"
      a) Very critical in fire spread

H. Interior partition (nonbearing) walls, while usually easier to breach, still have electrical and other hazards in them
   1. Before opening the wall check for heat or fire
      a) Look, listen, feel, or use heat sensor/detector
      b) Breaching could extend fire into your compartment
      c) Have hoselines in place
   2. If possible, place a salvage cover on the floor
      a) To minimize damage from debris and water

What should you do before you open up a wall?
SUMMARY:

Opening walls is a difficult task. Breaching of a wall should be a last resort after doors, windows, or other openings are considered. If you must breach a wall, it is important that you understand the various construction materials, breaching techniques and that you be familiar with the tools available in order to make this operation safe and quick.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF OPENING PARTITIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of opening partitions by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- One wall (frame construction)
- Diagram of various types of wall construction
- List of tools

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Forcible Entry, IFSTA, Seventh Edition

PREPARATION:
Upon arrival at a fire building, fire fighters may see flames and smoke billowing from windows or roofs. However, basic fire attack strategy calls for the fire fighter to advance and locate the seat of the fire rather than automatically apply water at the window or roof and likely "push" the fire toward unburned areas. Therefore, entry into burning buildings is a first step to properly combat the fire. Ideally, this entry should be as easy as turning a doorknob, but this is not often the case. In those more frequent cases where entry is blocked, the fire fighter must resort to the use of tools and imaginative forcible entry techniques. This session will introduce the fire fighter to some of the techniques on how to open partitions.
I. OPENING PARTITIONS

A. Select the location to make the opening
   1. Open on the side that will cause the least damage
   2. Check for electrical wall plugs and switches
   3. Check for structural integrity
   4. If possible, place a salvage cover on the floor

B. Have sufficient tools at hand

What tools can fire fighters use to open a partition?

1. Power tools
2. Picks
3. Fire axes
4. Sledges
5. Pry bars

How does a fire fighter locate studs in a wood partition?

C. If the studding in the partition is wood or metal, locate the studs by sounding
   1. Strike wall with striking tool
   2. Listen and feel for solid stud inside of wall

D. Cut along the studs with the fire axe (or other tools as needed)
   1. Use an axe safely
      a) Take small, chopping swings
      b) Never swing past shoulder
   2. Grasp handle with hands spread apart
   3. Always wear full personal protective equipment including eye protection
SUMMARY:
Aggressive fire fighting requires the knowledge of many suppression techniques. It is important to identify the appropriate location for an opening. Locating plumbing, electrical wires, and support studs is also critical, as well as selecting the proper cutting and prying tools.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF OPENING CEILINGS WITH A PIKE POLE

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of opening a ceiling with a pike pole by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Pike pole
- Simulated roof to be opened

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Forcible Entry, IFSTA, Sixth Edition
- Truck Company Fireground Operations, Harold Richman, Second Edition

PREPARATION: Sometimes the only way to determine whether fire has extended into the attic space is to pull the ceiling. It is important to be able to pull the ceiling quickly to open the attic area for water application and stop the fire’s progress.
I. PRIOR TO OPENING
   A. Don't stand under the space to be opened
   B. Place a salvage cover or tarp under the area
      1. Assists in removing the debris
   C. Stand between the area to be pulled and an escape route
   D. Have a charged hoseline at the ready
   E. Consider salvage if time allows

II. PROCEDURE
   A. Break hole into plaster/drywall board
      1. Using tip, break hole into plaster
         a) Watch for electrical wires, plumbing, and insulation
      2. Push head of pike pole through plaster
      3. Be aware that plywood or planking may be on top of ceiling joist to support items stored in attic
   B. Pull off lath/drywall board
      1. Wet drywall board will often come down in full sheets
         a) Entire ceiling may fall with one pull
      2. Pull down and away to prevent material from dropping on fire fighter's head
      3. Continue to pull material until desired hole size is obtained

   Why use a salvage cover or tarp?
**SUMMARY:**

Pulling ceilings to access overhead fires is a necessary component of aggressive fire fighting. Ceilings should be pulled in a correct, safe, and effective manner and the fire fighter should always allow for a way out of a building. If personnel and time allows, consider salvage operations of interior furnishings before pulling the ceiling.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 16 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF OPENING FLOORS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of opening floors by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Jack hammer
- Axe
- Power saw
- Penetrating nozzle

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Forcible Entry, IFSTA, Seventh Edition

PREPARATION:
There are almost as many kinds of floors as there are buildings. Floor construction, however, is limited to wood and concrete. Either may be finished with a variety of floor covering materials. Many wooden floors are laid over a concrete slab. Use the pre-incident inspection surveys to determine the floor construction of business and industrial structures. The same information is not as readily available for residential structures. An effective fire fighter will be able to identify construction methods and apply the proper techniques to quickly open floors.
I. OPENING WOODEN FLOORS WITH AN AXE

A. Determine location for hole
   1. Sound for floor joints
   2. Have a charged hoseline ready

B. Remove carpet and other floor coverings if necessary

C. Cut finished floor
   1. Use angled cuts
   2. Work from weakest area of floor back to stronger area
   3. Cut one side, then the other

D. Remove flooring
   1. Use pick head axe

E. Cut subfloor
   1. Cut one side of subfloor, then cut other

F. Remove subfloor
   1. Use pick head axe

From what side should we start?

II. OPENING WOODEN FLOORS WITH POWER SAW

A. Determine location for hole
   1. Sound for floor joists
   2. Have charged hoseline ready

B. Cut all four edges
   1. Carefully
   2. Do not cut through floor joists
      a) Roll the joists, if necessary

What tool should be used to remove a floor/subfloor?
3. Make an appropriate sized hole for task
C. Remove wood floor with an axe or other pry tool

III. TOOLS FOR OPENING CONCRETE FLOORS
A. Jackhammer
   1. If available, is probably the fastest method
B. Power saw
   1. Saw equipped with a masonry blade will make clean opening
   2. Not as fast as the jackhammer
C. Hand tools
   1. The fire fighter can use hand tools such as sledge hammers and battering rams to breach concrete floors
   2. Hard work and very slow
   3. Probably too slow for fire extinguishments
D. Penetrating nozzles
   1. Special hardened nozzle tips on wand or pipe with holes for water application
   2. Can penetrate concrete by driving the nozzle through the concrete with a sledge hammer
   3. Equipped with 1½" hose fitting to supply water to tip
   4. Before attempting to drive "penetrating" or "puncture" nozzles strike concrete with sledge hammer to shatter concrete topping and provide a center for the tool
**SUMMARY:**

Opening floor can be a very formidable task. Floors are constructed of either wood or concrete. While wood floors can be opened with either an axe or a saw, concrete floors often require heavier equipment or penetrating nozzles.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting, IFSTA, Fourth Edition*, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO FORCE OPEN AND REMOVE SECURITY BARS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A gasoline-powered rotary saw with metal blade, Halligan tool, an access opening covered by a security bar system, and appropriate personal protective equipment

Behavior: The student will force open and remove security bars

Standard: Completing all operations within ______ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Gasoline-powered circular saw with metal blade
- Halligan tool
- Access opening covered by a security bar system
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

PREPARATION: The fire fighter faced with the stressful task of forcing and removing security bar systems from a structure during an emergency is dealt a challenge equal to few. Therefore, his or her knowledge and proficiency on these devices is vital to the outcome.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Size-up the situation</td>
<td>1a. Examine mounting devices and/or release mechanisms</td>
</tr>
<tr>
<td>2. Start rotary saw</td>
<td>2a. To warm up prior to the operation</td>
</tr>
<tr>
<td></td>
<td>2b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>3. Cut mounting bolts (if exposed)</td>
<td>3a. Flush with frame</td>
</tr>
<tr>
<td>4. Cut horizontal frame brackets (if bolts are unexposed)</td>
<td>4a. At one end</td>
</tr>
<tr>
<td></td>
<td>4b. If hinged, cut nonhinged end</td>
</tr>
<tr>
<td>5. Remove bar assembly</td>
<td>5a. Pulling out and swinging away from access opening</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO FORCE OPEN AND REMOVE A SECURITY SCREEN

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A flat-head axe, sledge hammer, access opening covered by a security screen, and appropriate personal protective equipment

Behavior: The student will force open and remove a security screen

Standard: Completing all operations within _________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Flat-head axe
- 6-8 pound sledge hammer
- Access opening covered by a security screen
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

PREPARATION:

The fire fighter faced with the stressful task of forcing and removing security screens and bars from a structure during an emergency is dealt a challenge equal to few. Therefore, his or her knowledge and proficiency on these devices is vital to the outcome.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place axe head</td>
<td>1a. Behind mounting bolt head</td>
</tr>
<tr>
<td>2. Strike axe head</td>
<td>2a. With a sledge hammer</td>
</tr>
<tr>
<td>3. Pry screen assembly</td>
<td>3a. Away from window</td>
</tr>
<tr>
<td>4. Place screen assembly</td>
<td>4a. In a place where foot traffic is not hindered</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: OPERATING PRINCIPLES FOR VARIOUS WINDOW STYLES

TIME FRAME: 0:45

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the operating principles for various window styles by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Examples of local windows

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION:

There are many types and designs of windows that fire fighters must force entry in order to perform their rescue and fire suppression duties. Each type presents a different technique if effective forcible entry is to be accomplished. It is often easier to force a window than to force a door providing vital extra time to perform rescues or suppress fires.
I. DOUBLE-HUNG/CHECKRAIL WINDOWS
A. Made of wood or metal
B. Consists of two sashes that meet in center
   1. Upper and lower sash
C. May be locked together by latch or bolt on inside
D. Wooden windows are normally easy to pry open if latch is on checkrail
   1. Screws will normally pull out of wood when pried on
   2. Practically any prying tool will work
   3. "Try before you pry" concept
E. Pry should be made at center of the lowest sash
F. Metal windows are more difficult
   1. May be easier and less damaging to break glass near lock and release lock mechanism
   2. Wire glass generally requires more force to break

II. CASEMENT WINDOWS
A. Usually made of metal but may also be made of wood
B. Consist of one or two sashes hinged on the side and which swing outward
C. If screens are used
   1. Usually are located on the inside
   2. Opposite the direction which the windows swing
D. Various locks and operating devices are found
E. These windows are not latched but also have an opening mechanism to open window
F. To reach the latch
   1. Break lowest pane
      a) Clean out sharp edges
   2. Force or cut screen in same area
      a) Push inward
   3. Reach in upward to unlock latch and operate crank(s) at bottom

III. PROJECTED WINDOWS
   A. Ordinarily made of metal
   
   B. May project in or out from an opening
      1. Projected out
         a) Swing outward at bottom
         b) Lie down from the top in a groove
      2. Projected in
         a) Swing upward at top
         b) Usually hinged at bottom
   
   C. May be pivoted in the center, top, or bottom
   D. Usually operated by a push bar
   E. Screens are seldom used
   F. Practical method of forcing
      1. Same as for casement type

IV. AWNING OR JALOUSIE WINDOWS
   A. Considered to be same type
   B. Referred to as louver windows
   C. Two main differences that must be considered
      1. Awning windows
         a) Consist of large (≈1 foot) section of glass as wide as the window
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Are constructed with metal on wood frames</td>
<td></td>
</tr>
<tr>
<td>2. Jalousie windows</td>
<td></td>
</tr>
<tr>
<td>a) Consist of small (4 inch) sections as long as the window</td>
<td></td>
</tr>
<tr>
<td>b) Jalousie window sections are usually without frames</td>
<td></td>
</tr>
<tr>
<td>c) Glass is heavy plate</td>
<td></td>
</tr>
<tr>
<td>D. Glass sections of both awning and jalousie windows are supported on each end by a metal operating mechanism</td>
<td></td>
</tr>
<tr>
<td>1. Each glass section opens in same direction</td>
<td></td>
</tr>
<tr>
<td>E. Operating crank is located at bottom of window</td>
<td></td>
</tr>
<tr>
<td>F. Most difficult of all window types to force</td>
<td></td>
</tr>
<tr>
<td>G. Entrance through these windows requires that several panels be broken out</td>
<td></td>
</tr>
</tbody>
</table>

Why should you avoid these openings?

1. Gaining entrance through these windows is costly and should be avoided if at all possible

V. **LEXAN® WINDOWS**

| A. | Plexiglas® and other thermoplastics |
| B. | Lexan® is an example of such a polycarbonate |
| C. | Can withstand abuse, vandalism, or weather |
| D. | 250 times stronger than safety glass |
| E. | Classified as self-extinguishing |
| F. | 50% lighter than glass |
| G. | 43% lighter than aluminum |
| H. | Available in thickness from ⅛-½ inch |
I. Most effective tool to use to gain entry
   1. Circular saw with carbide tip blade
      a) Blade selection
         1) Teeth too small will melt Lexan® and cause blade to bind and kick back
         2) Teeth too coarse will cause blade to slide dangerously over cutting surface
         3) Use medium blade
            • Approximately 40 teeth

VI. SCREENED OR BARRED WINDOWS
   A. Present serious problems
   B. Consist of mesh guards
   C. Hinged at top, side, or fitted in brackets and locked securely
   D. Forcing involves considerable time and should be avoided

   E. To free bars in masonry
      1. Strike bar with sledge about 10 feet above sill
      2. Bar should bend and pull free from sill
      3. Another method is to strike sill with sledge opposite end of bar
      4. Another method is to start a hammer head pick in the masonry at the edge of the bar
         a) Strike head of pick with a sledge hammer to crack masonry to release end of bar
SUMMARY:

There are several different types of windows that you will come across during fire fighting operations. You may have to force entry through casement, double-hung, projected, or awning windows. You may also have to breach Plexiglas®, or Lexan® panes. Each type of window construction and construction materials requires a different opening technique.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** PRINCIPLES OF BREAKING WINDOW GLASS

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.3

**BEHAVIORAL OBJECTIVE:**

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the principles of breaking window glass by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8 and Firefighter’s Handbook, Delmar, 2000 Edition, Chapter 17

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Appropriate forcible entry tools
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Forcible Entry, IFSTA, Seventh Edition

**PREPARATION:** Breaking glass in doors and windows may be the fastest and least costly method of forcible entry. For your personal safety, there are some basic steps you need to take when breaking glass.
I. BREAKING WINDOW GLASS
A. Breaking glass may be the quickest and most effective means of forcible entry
   1. Rash window breaking is both unnecessary and potentially dangerous

   a) Safety considerations
      1) Released heat and smoke could injure a fire fighter
      2) Falling glass could cause serious injury to personnel

   2. Pick-head axe is normally the tool of choice
   3. Pike pole, optional
   4. Halligan tool, optional
   5. Spring loaded center punch, optional

B. Procedure for breaking glass
   1. Wear appropriate personal protective equipment

      a) Helmet with face shield down or goggles
      b) Turn out coat fully button with collar up
      c) Turn out pants
      d) Steel toed boots

Why do we break windows?

What are some of the safety considerations when breaking glass?

What is normally the tool of choice for breaking glass?

What is appropriate personal protective clothing for breaking glass?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>e) Structure leather gloves</td>
<td>When do you need a hoseline present when breaking windows?</td>
</tr>
<tr>
<td>f) SCBA if you suspect hazardous/toxic environment</td>
<td></td>
</tr>
</tbody>
</table>

2. Staffed and charged hoseline, if you suspect presence of fire

3. Watch for signs or conditions which would indicate entry is not appropriate

<table>
<thead>
<tr>
<th>a) Backdraft</th>
<th>Before breaking the window, what operation would you perform first?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Brown gray smoke sucking in and puffing out</td>
<td></td>
</tr>
<tr>
<td>b) Flashover</td>
<td></td>
</tr>
<tr>
<td>1) High heat in upper portions of room</td>
<td></td>
</tr>
<tr>
<td>2) Thick black smoke rapidly banking to floor</td>
<td></td>
</tr>
<tr>
<td>3) Signs of fire flashing in the black smoke in the upper part of room</td>
<td></td>
</tr>
<tr>
<td>c) Unidentified substances involved</td>
<td></td>
</tr>
</tbody>
</table>

4. Verify that the window is locked

 a) "Try before you pry"

5. Take appropriate measures to protect victims, other fire fighters, and self

6. Take a position that allows for stability of person breaking glass
7. Preplan escape route should it become necessary

8. Approach the glass from the upward or windward side
   a) Wind will blow most of the smoke and heat away from the firefighter
   b) Will be on proper side of window for glass breaking operation

9. Do not approach from directly above

10. If working aboveground
    a) Clear area directly below the work area
    b) Give loud verbal warning
    c) Post lookouts to deny entry

11. Use a tool suitable for the task
    a) Long handle, if possible, to remove hands from impact area
    b) Security or specialty glass may require use of tool with heavy head to gain access
    c) Certain windows may not be breakable
        1) Typically found in high-rise, commercial properties
        2) Breakable windows in this environment may be identified by a sticker in the corner of the window

Why approach from windward side?

What should you do if breaking glass above ground?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Keep hands above the point of impact to prevent broken glass from falling on the arms and hands</td>
<td>Where should your hands be when performing glass-breaking operations?</td>
</tr>
<tr>
<td>13. Strike at the top of a pane and clear glass from sash by working downward</td>
<td></td>
</tr>
<tr>
<td>a) Start closest to you and work away</td>
<td></td>
</tr>
<tr>
<td>b) Keeps glass from area of arms and hands</td>
<td></td>
</tr>
<tr>
<td>14. Clear all remaining jagged pieces of glass from the frame to prevent injury or damage to personnel or hoselines</td>
<td></td>
</tr>
<tr>
<td>15. After completely removing glass</td>
<td></td>
</tr>
<tr>
<td>a) Reach inside to unlock/open door or window</td>
<td></td>
</tr>
<tr>
<td>b) Proceed through opening to gain interior access</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Breaking glass is one of the easiest methods of gaining access to a building. It is also a cost effective method because if done properly, the property owner can easily repair the damage. Some considerations when breaking window glass include the tool choice, personal protective equipment, signs of flashover or backdraft, and fire fighter positioning.

EVALUATION:

The student will complete a written test.

ASSIGNMENT:

TOPIC: HOW TO FORCE OPEN A DOUBLE-HUNG/CHECKRAIL WINDOW

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: A double-hung/checkrail window, forcible entry prying tool, piece of wood, and appropriate personal protective equipment

Behavior: The student will force open a double-hung/checkrail window

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Double-hung/checkrail window
- Forcible entry prying tool
- Piece of wood
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

PREPARATION:
Double-hung or checkrail window frames can be made of metal or wood. They consist of an upper sash and a lower sash, that meet in the middle of the window. It may be necessary for a fire fighter to gain access into a structure through this type of window. Therefore, proficiency in the technique is vital.
# Wood Frame

1. **Size-up the situation**
   - **KEY POINTS**
     - 1a. "Try before you pry"
     - b. Construction
     - c. Window lock method/type

2. **Remove window screen**
   - **KEY POINTS**
     - 2a. If found
     - b. By prying or cutting

3. **Insert forcible entry tool blade**
   - **KEY POINTS**
     - 3a. Between window sill and center of bottom sash

4. **Force window**
   - **KEY POINTS**
     - 4a. Prying up against the sash
     - b. Until lock screws are pulled out and sashes separate

5. **Raise bottom window sash**
   - **KEY POINTS**
     - 5a. May require both hands if tight

6. **Prop open window**
   - **KEY POINTS**
     - 6a. With a piece of wood
     - b. To allow entry

# Metal Frame

1. **Size-up the situation**
   - **KEY POINTS**
     - 1a. "Try before you pry"
     - b. Construction
     - c. Window locking method/type

2. **Remove window screen**
   - **KEY POINTS**
     - 2a. If found
     - b. Prying or cutting

3. **Position yourself**
   - **KEY POINTS**
     - 3a. To break the window glass
     - b. Windward side

4. **Strike glass**
   - **KEY POINTS**
     - 4a. Top of the pane
     - b. With a forcible entry tool
     - c. Hands above the point of impact
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Remove remaining glass</td>
<td>5a. From frame</td>
</tr>
<tr>
<td></td>
<td>b. Running entry tool around the frame</td>
</tr>
<tr>
<td></td>
<td>c. Removing all shards</td>
</tr>
<tr>
<td>6. Unlock sashes</td>
<td>6a. Reaching through window opening</td>
</tr>
<tr>
<td>7. Raise bottom window sash</td>
<td>7a. May require both hands if tight</td>
</tr>
<tr>
<td>8. Prop open window</td>
<td>8a. With a piece of wood</td>
</tr>
<tr>
<td></td>
<td>b. To allow entry</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO FORCE OPEN A CASEMENT (HINGED) WINDOW

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.3

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A casement (hinged) window, forcible entry prying tool, and appropriate personal protective equipment
- **Behavior:** The student will force open a casement (hinged) window
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Casement (hinged) window
- Forcible entry prying tool
- Appropriate personal protective equipment

**REFERENCES:**

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

**PREPARATION:**

Projected windows are commonly made of metal and they may project in or out. They may pivot in the center, or pivot at the top or bottom. Screens are seldom used with these windows. It may be necessary for a fire fighter to gain access into a structure through this type of window. Therefore, proficiency in the technique is vital.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Size-up the situation | 1a. "Try before you pry"
|                       | b. Construction                                      |
|                       | c. Window locking method/type                        |
| 2. Position yourself  | 2a. To break the window glass                       |
|                       | b. Windward side                                     |
| 3. Strike glass       | 3a. With forcible entry tool                         |
|                       | b. Lowest pane of glass (for multiple paned window) |
|                       | c. Top of glass (for single paned window)            |
|                       | d. Hands above point of impact                        |
| 4. Unlock window latch|                                                      |
| 5. Open window        | 5a. Reaching through window opening                  |
|                       | b. Turning the window crank on inside of sill        |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO FORCE OPEN AN AWNING OR JALOUSIE LOUVERED WINDOW

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

Condition: An awning or jalousie louvered window, forcible entry pry tool, and appropriate personal protective equipment

Behavior: The student will force open an awning or jalousie louvered window

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Awning or jalousie louvered window
- Forcible entry pry tool
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

PREPARATION:
Louvered windows are made of a series of unframed or metal, or wood framed glass sections that open in the same manner as projected windows. The mechanical device may be exposed or concealed along the side of the window. It is vital that the fire fighter be proficient in the technique used to gain access.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Size-up the situation</td>
<td>1a. &quot;Try before you pry&quot;</td>
</tr>
<tr>
<td></td>
<td>b. Construction</td>
</tr>
<tr>
<td></td>
<td>c. Determine the locking method/type</td>
</tr>
<tr>
<td>2. Position yourself</td>
<td>2a. To break window glass</td>
</tr>
<tr>
<td></td>
<td>b. Windward side</td>
</tr>
<tr>
<td>3. Break window glass</td>
<td>3a. With forcible entry pry tool</td>
</tr>
<tr>
<td></td>
<td>b. Lowest louver (or lowest several louvers if they are very narrow)</td>
</tr>
<tr>
<td></td>
<td>c. Hands above point of impact</td>
</tr>
<tr>
<td>4. Unlock window latch</td>
<td></td>
</tr>
<tr>
<td>5. Open louvers</td>
<td>5a. Reaching through window opening</td>
</tr>
<tr>
<td></td>
<td>b. Turning the window crank on inside sill or side of window</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO FORCE OPEN A PROJECTED (FACTORY) WINDOW

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

**Condition:** A projected (factory) window, pick-head axe, and appropriate personal protective equipment

**Behavior:** The student will force open a projected (factory) window

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Projected (factory) window
- Pick-head axe
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

PREPARATION:

Projected windows are commonly made of metal. They may pivot from the top, bottom, or center. They can be made to project (open) outward or inward. It may be necessary for a firefighter to gain access through this type of window. Therefore, proficiency in the technique is vital.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Size-up the situation      | 1a. "Try before you pry"
|                               | b. Construction |
|                               | c. Window locking method/type |
| 2. Position yourself          | 2a. To break window glass |
|                               | b. Windward side |
| 3. Strike glass               | 3a. With pick-head axe |
|                               | b. Lowest pane of glass (for multiple pane window) |
|                               | c. Top of glass (for single paned window) |
|                               | d. Hands above point of impact |
| 4. Unlock window latch        |            |
| 5. Open or force window       | 5a. Reaching through window opening |
|                               | b. Turning window crank on inside the sill or |
|                               | c. Prying window frame open |
| 6. Enlarge window opening     | 6a. For building access |
|                               | b. Prying support bars from window frame |
| 7. Remove entire window sash  |            |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
HOW TO FORCE OPEN A LEXAN® WINDOW

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.3

BEHAVIORAL OBJECTIVE:

**Condition:** A Lexan® window, gasoline-powered rotary saw, and appropriate personal protective equipment

**Behavior:** The student will safely force open a Lexan® window

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Lexan® window
- Gasoline-powered rotary saw with carbide-tipped, medium-toothed (approximately 40 teeth) circular blade
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

PREPARATION:

Lexan® is a polycarbonate. It is commonly used in various applications as a glass substitute because of its ability to withstand severe abuse from vandalism and weather. Safety shields on fire fighters helmets are made of Lexan®, because it allows visibility yet is 250 times stronger than safety glass. Lexan® cuts like wood and will not shatter when sawn. It may be necessary for a fire fighter to gain access into a structure through this type of window. Therefore, proficiency in the technique is vital.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Size-up the situation</td>
<td>1a. &quot;Try before you pry&quot;</td>
</tr>
<tr>
<td></td>
<td>b. Construction</td>
</tr>
<tr>
<td></td>
<td>c. Determine the locking method/type</td>
</tr>
<tr>
<td>2. Check saw blade</td>
<td>2a. For appropriate condition and requirements</td>
</tr>
<tr>
<td><strong>CAUTION:</strong> It is vital to use the proper blade saw. Blades with too few or too small of teeth will melt the Lexan® allowing the saw to bind and kick back.</td>
<td></td>
</tr>
<tr>
<td>3. Check hand guards</td>
<td>3a. Are in place</td>
</tr>
<tr>
<td>4. Start saw</td>
<td>4a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>5. Warm up saw</td>
<td>5a. Allows for optimum performance</td>
</tr>
<tr>
<td>6. Cut a triangle hole</td>
<td>6a. In the window</td>
</tr>
<tr>
<td></td>
<td>6b. Large enough to reach through with hand and arm</td>
</tr>
<tr>
<td></td>
<td>b. Near window lock device</td>
</tr>
<tr>
<td>7. Unlock window latch</td>
<td>7a. Reaching through window opening</td>
</tr>
<tr>
<td>8. Open window</td>
<td>8a. Using appropriate method for window style</td>
</tr>
</tbody>
</table>

**NONOPENING LEXAN® WINDOW**

1. Perform Operations 1-5
2. Cut window
3. Remove window pane
   2a. Around entire edge of pane
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: DANGERS OF FORCING ENTRY THROUGH DOORS, WINDOWS, AND WALLS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the dangers associated with forcing entry through doors, windows, and walls by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Forcible Entry, IFSTA, Seventh Edition, Chapters 4, 7, 8, and 9

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Forcible Entry, IFSTA, Seventh Edition

PREPARATION:

Forcible entry can be accomplished through several difference avenues. Forcible entry has inherent dangers that the fire fighter must be aware of. Taking proper precautions while performing forcible entry activities will increase fire fighter safety, improve rescue performance, and speed fire attack.
I. SAFETY PRECAUTIONS WHILE FORCING DOORS

A. Feel door with back of hand
   1. Fire behind the door

B. Observe for smoke puffing from around door
   1. Use ventilation to avoid backdraft

C. Don't use a fire fighter as a forcible entry tool
   1. The human body was not designed to be a battering ram

D. Avoid breaking glass in older sliding glass doors
   1. Not safety glass
      a) Glass breaks into long knife-like shards
         1) Presents severe laceration hazard

E. Support overhead doors
   1. Slab
      a) Prop open with pike pole or ladder
   2. Sectional/Rolling
      a) Use gripping pliers or C-clamps on track just below door
Why would you want to prop open/support an overhead door?

3. Door support springs may fail from heat damage
   a) Blocks egress
   b) Pinches hoseline(s)

F. Revolving doors
   1. Collapse door panels
      a) Different method for some doors
         1) Remove pin/bars
         2) Remove chain keepers
         3) Dislodge door panels
      b) Avoid restricting access/egress
      c) Allows unobstructed movement
      d) Allows unobstructed waterway

II. SAFETY PRECAUTIONS WHILE FORCING WINDOWS

A. Breaking plate glass
   1. Windward (upwind) side of the window
      a) To avoid smoke and flame
   2. Stand next to window
      a) To avoid contact with long heavy shards of glass
   3. Hands on tool handle above point of window breakage (impact)
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Prevent lacerations caused by glass sliding down handle</td>
<td>Why clear the remaining glass from the window frame?</td>
</tr>
<tr>
<td>4. Turn face away from breaking glass</td>
<td></td>
</tr>
<tr>
<td>5. Clear remaining glass from window frame</td>
<td>How does safety glass break?</td>
</tr>
<tr>
<td>a) To prevent lacerations when entry is made</td>
<td></td>
</tr>
</tbody>
</table>

B. Breaking safety glass
1. Same rules that apply to plate glass
2. Except glass breaks into small pieces
3. May shatter explosively
   a) Sends small pieces in all directions
   b) Presents hazards to eyes

C. Signs of possible backdraft present
1. Don't break glass
2. Use ventilation prior to breaking glass or forcing entry through mechanism

D. Hot or smoke stained window glass
1. Fire may be on other side
2. Use caution when forcing entry or breaking glass

III. SAFETY PRECAUTIONS WHILE BREACHING WALLS

A. Entry through walls may compromise structural integrity

What may happen to the rest of the structure if walls are breached?
1. Understand the relationship of the walls to the rest of the structure

B. Appropriate personal protective equipment is a must
   1. Protects from blunt trauma
   2. Protects from sharp edges
   3. Respiratory protection from dust particles

C. Power saw and cutting torch operations

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What are some dangers of using power saws and cutting torches?</td>
</tr>
<tr>
<td>1. Dangers</td>
<td>Why should a hoseline be in place prior to breaching operations?</td>
</tr>
<tr>
<td>a) Cutting through live electrical wires</td>
<td>a) Extinguish resulting fires</td>
</tr>
<tr>
<td>b) Sparks may ignite insulation or nearby materials</td>
<td>b) Keep dust and sparks down</td>
</tr>
<tr>
<td>c) Sharp edges around opening after the cut is made</td>
<td></td>
</tr>
<tr>
<td>d) Sharp edges of pieces being removed</td>
<td></td>
</tr>
<tr>
<td>e) Damage to plumbing</td>
<td></td>
</tr>
<tr>
<td>2. Have hoseline in place prior to breaching wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Forcible entry operations are inherently dangerous. Purposely forcing entry into a hazardous environment presents the fire fighter with additional dangers. Body positioning, possible fire extension and technique should be considered before forcing doors. Forcing windows can create respiratory, burn, and laceration hazards. Breaching walls can result in collapse, respiratory hazards, and fires. The fire fighter must be able to recognize the hazards associated with forcible entry and take measures to mitigate the hazard.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Forcible Entry, IFSTA, Seventh Edition, Chapters 4, 7, 8, and 9 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: COMPONENTS OF RESCUE OPERATIONS

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the components of rescue operations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Rescue, IFSTA, Sixth Edition, Chapter 2

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fire Service Field Operating Guide ICS 420-1, FIRESCOPE, 1999 Edition
- Fire Service Rescue, IFSTA, Sixth Edition

PREPARATION:

Regardless of the actual type of rescue to be performed, there are a few basic components common to all rescues that must be considered for safety and efficiency. Some of these steps may be done simultaneously. Lives are depending on you following a logical and proper procedure.
I. COMPONENTS OF A RESCUE OPERATION

A. Key command positions
   1. Incident Commander
   2. Safety Officer
   3. Rapid Intervention Crew

B. Size-up of scene
   1. Hazards unique to the particular rescue scenario
   2. Size-up considerations common to all rescue operations
      a) Number of victims
      b) Location of victim(s)
      c) Hazards to rescuers
      d) Resources needed
         1) Staffing
         2) Equipment
      e) Technical assistance needed

C. Incident Action Plan (IAP)
   1. All incidents need a plan
   2. Have achievable alternatives ready
   3. Based on incident facts
   4. Objective oriented
When should an Incident Action Plan be written?

II. STABILIZING THE SCENE
   A. Purpose
      1. To protect rescuers
      2. To protect victim(s)
      3. To protect bystanders
      4. To allow access for rescuers
   B. Examples
      1. Trench shoring
      2. Hand line protection
      3. Stabilizing vehicle
      4. Crowd control/law enforcement assistance
      5. Traffic control/law enforcement assistance
      6. Shut-off utilities/utility companies

What are some examples of stabilization?

What are situations requiring extrication?

III. EXTRICATION AND EMERGENCY CARE
   A. Extricate victim(s)
      1. Pinned in vehicle
      2. Caught in machinery
      3. In a trench
      4. In or under water
      5. Down a cliff
      6. Buried in debris
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Aircraft</td>
<td></td>
</tr>
<tr>
<td>8. Farm machinery</td>
<td></td>
</tr>
<tr>
<td><strong>B. Remove victim from hazardous area</strong></td>
<td>How is this different?</td>
</tr>
<tr>
<td>1. May be different from extrication</td>
<td></td>
</tr>
<tr>
<td>a) Pinned driver in burning gasoline tanker is extricated but still must be removed from area</td>
<td></td>
</tr>
<tr>
<td>b) Victim trapped under collapsed beam of downed building must be completely removed from building</td>
<td></td>
</tr>
<tr>
<td>c) Bystanders are included here</td>
<td></td>
</tr>
<tr>
<td><strong>C. Emergency care</strong></td>
<td></td>
</tr>
<tr>
<td>1. Determine nature and extent of injuries</td>
<td></td>
</tr>
<tr>
<td>a) May be done before extrication</td>
<td></td>
</tr>
<tr>
<td>2. Triage if multiple victims</td>
<td></td>
</tr>
<tr>
<td>3. Provide emergency care to appropriate level</td>
<td></td>
</tr>
<tr>
<td>a) May also begin before extrication</td>
<td></td>
</tr>
<tr>
<td>b) What level medical care is available at scene?</td>
<td></td>
</tr>
<tr>
<td>4. Transport victim from scene to the appropriate facility</td>
<td></td>
</tr>
</tbody>
</table>

**IV. STABILIZE REMAINING HAZARDOUS CONDITIONS**

A. Prevent further spread

B. Prevent further injuries

C. Actions to take

1. Cover spills
2. Cover holes
3. Erect barricades
### PRESENTATION

<table>
<thead>
<tr>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Position guards</td>
</tr>
<tr>
<td>5. Arrange for vehicle towing</td>
</tr>
</tbody>
</table>

### V. SECURE OPERATIONS

<table>
<thead>
<tr>
<th>Secure Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Pick up tools</td>
</tr>
<tr>
<td>B. Reservice equipment</td>
</tr>
<tr>
<td>C. Replenish supplies</td>
</tr>
</tbody>
</table>

What is the last step?

### VI. POST INCIDENT ANALYSIS

<table>
<thead>
<tr>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Keep constructive</td>
</tr>
<tr>
<td>B. Frequently overlooked</td>
</tr>
<tr>
<td>C. Allows for improvements to be made</td>
</tr>
<tr>
<td>D. Consider post incident stress defusing/debriefing</td>
</tr>
</tbody>
</table>
SUMMARY:

A thorough systematic approach to a rescue operation will always give better results than a haphazard guesswork job. You can achieve this by using the incident command system, performing a comprehensive size-up, and following the incident action plan.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Rescue, IFSTA, Sixth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS DURING A RESCUE SEARCH IN A BURNING BUILDING

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.8

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the safety considerations to be taken during a rescue search in a burning building by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7

MATERIALS NEEDED:
• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:
• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Service Rescue, IFSTA, Sixth Edition

PREPARATION: Every time a fire fighter responds to a fire, a human life may be in jeopardy. In those instances where life is in danger, a search must be initiated rapidly. However, to ensure that these strenuous situations do not become disastrous ones, rescuers must operate safely and with sound judgment.
I. UNSAFE CONDITIONS IN STRUCTURAL FIRES

A. Rescue should not be attempted
   1. Unlikely victim(s) would be alive
   2. Structure fully involved
   3. Imminent collapse

B. Smoke-charged building
   1. Ventilate the building
      a) To mitigate a backdraft situation
         1) Can cause serious injury
         2) Ventilation must occur prior to entry with a backdraft situation
      b) Improves visibility
      c) Improves victim(s) chance for survival
      d) Horizontal ventilation
         1) Open appropriate doors and windows to ventilate as they go
         2) When given authorization
         3) This may counteract PPV and must be approved by the IC or Operations

2. Always wear appropriate personal protective equipment
   a) SCBA
   b) All fasteners secured

If a building is fully charged with smoke, what should be done before attempting rescue?

What can rescuers do to help ventilation while conducting their search?
c) Neck and ears protected

3. Essential equipment
   a) Hand light
   b) Forcible entry tool
   c) Radio
   d) Marking device
   e) Rope or strap

4. Always work in pairs
   a) Stay in constant contact
      1) Physical
      2) Verbal

C. Always have a good plan
   1. Reduces disorientation
   2. Reduces wandering aimlessly
   3. Reduces duplication of efforts
   4. Always have a secondary means of egress

II. SAFETY PRECAUTIONS
   A. Have a charged hoseline ready
   B. Fire may extend through the floor
   C. Hoseline can be used as a lifeline

What should a fire fighter carry during search and rescue operations?

What will a good plan do for the rescuers?

What safety precaution should be used when searching the floor above the fire?
III. CHECK FOR FIRE EXTENSION

A. Remove your glove and feel the door
B. Stay to one side when opening
C. Open doors slowly
   1. Victim(s) may have collapsed at the door
D. Feel behind the door
E. Always stay low
   1. Better visibility
   2. Less toxic gases
   3. Less heat
F. Stay alert
   1. Use your senses
      a) Sight, sound, and touch
   2. Watch for hot spots
   3. Watch for weakened structures
   4. Crew always stays in contact with a wall
      a) Rope or strap can extend coverage

IV. LOST OR TRAPPED

A. Stay calm
B. Activate PASS device
C. Radio situation and location

If you become lost or trapped, what should you do?

What is a good method of checking to see if there might be fire on the other side of a closed door?
D. Attempt to find hoseline
   1. Female coupling is toward nozzle
   2. Male coupling is toward water source

E. Attempt to find window
   1. Signal for assistance
      a) Straddle windowsill
      b) Use flashlight
      c) Yell and wave arms
      d) Throw objects out the window
      e) UNDER NO CIRCUMSTANCES should fire fighters throw helmets or any other parts of personal protective equipment out a window

F. If you are losing consciousness, set a hand light on the floor shining at ceiling
SUMMARY:

When searching for victim(s) in a fire, rescuers must always be concerned with safety. Personnel should be properly trained and equipped with the necessary tools to accomplish the rescue in a minimum amount of time. Unsafe, hurried rescue attempts could be fatal to rescuers and victim(s). Search safely! Search systematically! Search thoroughly!

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SEARCH AND RESCUE PROCEDURES IN A BURNING, SMOKED-FILLED BUILDING

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.8

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the search and rescue procedures to be used in a burning, smoked-filled building by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- "End of the Line" video, Phoenix Fire Department
- Fire Service Rescue, IFSTA, Sixth Edition

PREPARATION: Searching a building has two objectives: finding victims and obtaining information on the extent of the fire. A proper search must be done systematically and consistently every time. The victims' lives may depend on your proficiency.
Upon arrival, what are possible sources of information to be used by rescuers before making a building search?

### I. INFORMATION GATHERING BEFORE MAKING A SEARCH

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>A.</td>
<td>Check with building occupants who have escaped</td>
</tr>
<tr>
<td>B.</td>
<td>Are others inside?</td>
</tr>
<tr>
<td></td>
<td>1. Where might they be?</td>
</tr>
<tr>
<td></td>
<td>2. What is the condition of the building?</td>
</tr>
<tr>
<td>C.</td>
<td>Check with neighbors</td>
</tr>
<tr>
<td></td>
<td>1. Occupants' habits?</td>
</tr>
<tr>
<td></td>
<td>2. Room location?</td>
</tr>
<tr>
<td></td>
<td>3. Did they see the occupants?</td>
</tr>
<tr>
<td>D.</td>
<td>Advise the officer in charge</td>
</tr>
<tr>
<td></td>
<td>1. Never begin a search without advising the IC that you are entering</td>
</tr>
<tr>
<td>E.</td>
<td>Building size-up</td>
</tr>
<tr>
<td></td>
<td>1. Gather facts before entering</td>
</tr>
<tr>
<td></td>
<td>2. Look at entire building and the surrounding area</td>
</tr>
<tr>
<td></td>
<td>3. Try to become well oriented before entering</td>
</tr>
<tr>
<td>F.</td>
<td><strong>Always</strong> use the buddy system</td>
</tr>
<tr>
<td></td>
<td>1. Safer</td>
</tr>
<tr>
<td></td>
<td>2. More efficient</td>
</tr>
</tbody>
</table>

Show "End of the Line" video.

Why should you always use the buddy system?
3. Quicker  
4. Easier to move a victim  
5. Mandated by state and federal regulations

## II. PERFORMING SEARCHES

### A. Prior to entering

1. Gather tools and equipment  
   a) Flashlight  
      1) Hand-held  
      2) Attached to helmet  
      3) Attached to turnout coat  
   b) Portable radio  
      1) Dedicated frequency for entry  
   c) Forcible entry tool  
   d) Latch straps  
   e) Safety rope, if applicable

2. Notify Incident Commander of your entry  
   a) Radio  
   b) Face-to-face

### B. Search priorities

1. The fire floor  
   a) Most immediate hazard

2. Then the floor directly above the fire  
   a) Fire can extend up much quicker  
   b) A charged hoseline is often required for crew safety
3. Place latch strap over door latch when entering room
   a) Prevents door from locking you in

C. Establishing search patterns

1. Use a system where you're going to cover the entire area

2. When entering the first room turn right or left
   a) Maintain same direction throughout entire search
   b) This establishes the pattern to be used for the rest of the building no matter how large or small

3. Maintain contact with a wall at all times
   a) Unless rope is tied to yourself and point of entry
   b) Unless hoseline brought in
   c) Allows a way to find exit

4. Periodically stop to listen for sounds of victims
   a) Don't talk
   b) Momentarily hold breath

5. Thermal imaging devices may assist in locating victims

6. Upon exiting the room, always turn in the same direction you entered

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</thead>
</table>
| 3. Place latch strap over door latch when entering room
   a) Prevents door from locking you in |

What search technique should be used for multiple room occupancies?

Why should you make this decision?

<table>
<thead>
<tr>
<th>C. Establishing search patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use a system where you're going to cover the entire area</td>
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4. Periodically stop to listen for sounds of victims
   a) Don't talk
   b) Momentarily hold breath

5. Thermal imaging devices may assist in locating victims

6. Upon exiting the room, always turn in the same direction you entered |
# Why should you always exit a room at the same door as you entered?

7. Always exit a room at the same door you entered  
   a) To ensure a complete search

---

# Why should searchers move cautiously?

D. Move cautiously  
1. Assess your surroundings  
2. Rescuers may fall  
   a) Through holes in floors  
   b) Over stairways  
   c) Off of landings or lofts  
3. Rescuers may become entangled  
   a) Wires or electrical cords  
   b) Furniture  
4. May run into walls or heavy objects  
   a) Feel ahead of yourself

---

# How can we mark rooms that have already been searched to avoid duplicating efforts?

E. Signals and markings  
1. Furniture in doorway  
2. Chalk marks on door  
3. "X" indicating primary search completed  
4. "XX" indicating secondary search completed
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Room search</td>
<td></td>
</tr>
<tr>
<td>1. If visibility is poor, crawl on your knees</td>
<td></td>
</tr>
<tr>
<td>2. Open windows if coordinated with Incident Commander</td>
<td></td>
</tr>
<tr>
<td>3. Close doors after room has been searched</td>
<td></td>
</tr>
<tr>
<td>a) To prevent fire extension</td>
<td></td>
</tr>
<tr>
<td>b) To prevent duplication of effort</td>
<td></td>
</tr>
<tr>
<td>4. Feel for hot spots</td>
<td></td>
</tr>
<tr>
<td>5. Feel for holes or weak spots in floor</td>
<td></td>
</tr>
<tr>
<td>6. Follow the walls</td>
<td></td>
</tr>
<tr>
<td>7. Stretch hands and legs toward the center of room in sweeping motion</td>
<td></td>
</tr>
<tr>
<td>8. Continue all the way around the room</td>
<td></td>
</tr>
<tr>
<td>9. May need a guideline for large areas with one fire fighter in contact with the wall and the other fire fighter branching out attached to the guideline</td>
<td></td>
</tr>
<tr>
<td>10. Then search the center</td>
<td></td>
</tr>
<tr>
<td>11. A pike pole or other long handled tool</td>
<td></td>
</tr>
<tr>
<td>a) Sweep large areas</td>
<td></td>
</tr>
<tr>
<td>b) Probe under objects, use care</td>
<td></td>
</tr>
<tr>
<td>12. Latch straps</td>
<td></td>
</tr>
<tr>
<td>a) Latch straps can be used to keep doors open that close and lock by themselves</td>
<td></td>
</tr>
<tr>
<td>b) They can be made easily using a truck inner tube</td>
<td></td>
</tr>
<tr>
<td>c) They can be carried easily</td>
<td></td>
</tr>
</tbody>
</table>

Have students cite other methods of marking.
13. If children are present, may be hiding

   a) Under beds
   b) Behind furniture
   c) In closets

G. Notify Incident Commander when exiting building
1. Report victim status
2. Report "All Clear"

H. When victims are located
1. Report immediately to officer in charge
   a) Portable radio
2. Go to a window and get fresh air and help
3. Get help from another fire fighter to move victim
4. Stabilize quickly, if possible
5. Leave the room by turning in the opposite direction you entered
   a) This maintains your system
   b) Allows you to return and continue where you left
   c) Follow a hoseline or guideline out, if used
6. Keep exit paths clear
   a) Hoselines
   b) Ladders
   c) Equipment
   d) Makes victim removal easier
   e) Prevents accidents
SUMMARY:

The two main objectives of building search are finding victims and obtaining information on the extent of fire. Do not forget, search in pairs, use a plan, maintain communications, and above all, stay alert and work in a safe manner.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CHARACTERISTICS OF PRIMARY AND SECONDARY SEARCHES IN A STRUCTURE

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.8

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the characteristics of primary and secondary searches in a structure by completing the written test

*Standard:* With a minimum 80% accuracy according to the information contained in the Firefighter's Handbook, Delmar, 2000 Edition, Chapter 16

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition

**PREPARATION:**
Search and rescue in a structure is performed in two phases: primary search and secondary search. Conducting search and rescue in this way ensures a rapid and thorough search for victims in a structure. It is important for the fire fighter to understand the difference between search and rescue and the phases of a search.
I. PRIMARY SEARCH

A. First and most dangerous
   1. In conjunction with fire attack
   2. May be done without hoselines
      a) Extreme awareness and caution is necessary

B. Rapid systematic search of the structure
   1. Focus on areas most likely to have victim(s)
      a) Search fire floor first
      b) Search above the fire floor second
   2. Residential occupancies at night
      a) Bedrooms
      b) Closets
      c) Doorways
      d) Bathrooms
   3. Commercial occupancies during operating hours
      a) Exits
      b) Offices
      c) Restrooms
   4. Advise supervisor when the search is complete or if victims are located
II. SECONDARY SEARCH

A. Conducted once the fire is well under control

B. Personnel other than those who conducted primary search
   1. To get a different perspective

C. Systematic and slower thorough search of the building
   1. Conduct a thorough search of the entire structure, leaving nothing unturned
   2. Less fire danger
   3. Improved visibility
   4. Search through fallen debris
   5. Search through rooms previously involved with fire

III. SEARCH REPORTS

A. Primary and secondary search crews report to supervisor
   1. Periodically report progress or needs during search
   2. Report status at conclusion of search
      a) Number of victims
      b) Structure clear
SUMMARY:

There are two types of searches conducted during a structure fire. The primary search is a systematic and rapid search of the structure. The secondary search is a systematic and very thorough search of the building, leaving nothing unturned. The primary and secondary search should be conducted by different personnel to ensure a different perspective and complete search. Search crews are also responsible to report findings to their supervisor and may be required to perform routine functions as well.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: HOW TO LIFT AND CARRY A VICTIM, ONE-PERSON, INCLINE DRAG METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A victim and appropriate personal protective equipment

Behavior: The student will lift and carry a victim using the one-person incline drag method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- A victim
- Appropriate personal protective equipment

REFERENCES: Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

PREPARATION: Fire fighters will have to remove nonambulatory and ambulatory victims from hazardous locations to areas of safety. In order to rescue these victims, a number of assists and victim carries must be learned by fire fighters. Your use of this carry when there is no one to help you and time is of the essence may make the difference between a successful or failed rescue.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position victim</td>
<td>1a. Supine</td>
</tr>
<tr>
<td>2. Position rescuer</td>
<td>2a. Kneeling</td>
</tr>
<tr>
<td></td>
<td>b. At the victim's head</td>
</tr>
<tr>
<td>3. Reposition victim</td>
<td>3a. For lifting</td>
</tr>
<tr>
<td></td>
<td>b. Sitting position</td>
</tr>
<tr>
<td></td>
<td>c. Rescuer still behind and supporting the victim</td>
</tr>
<tr>
<td>4. Grasp victim</td>
<td>4a. Under the arms</td>
</tr>
<tr>
<td></td>
<td>4b. Across the chest</td>
</tr>
<tr>
<td></td>
<td>b. Interlocking their fingers or grabbing the opposite wrist</td>
</tr>
<tr>
<td></td>
<td>c. Rescuer's hands will be on the victim's chest</td>
</tr>
<tr>
<td>5. Lift victim</td>
<td>5a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td>6. Drag victim</td>
<td>6a. Walking backwards</td>
</tr>
<tr>
<td></td>
<td>b. Being mindful of trip hazards</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO CARRY A VICTIM, CRADLE-IN-ARMS METHOD

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A victim and appropriate personal protective equipment
- **Behavior:** The student will carry a victim using the cradle-in-arms method
- **Standard:** Completing all operations within ________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- A victim
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

**PREPARATION:**
In the course of responding to emergencies, rescue personnel at times are faced with the task of removing ambulatory and/or nonambulatory victims from hazardous locations to areas of safety. A number of assists and victim carries must therefore be learned by fire fighters in order to equip them to deal with any type of rescue situation. The cradle-in-arms method is used for a child or small adult without leg or back injuries.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position rescuer</td>
<td>1a. Kneeling next to victim</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td>2. Grasp victim</td>
<td>2a. One arm under armpits around victim's back</td>
</tr>
<tr>
<td></td>
<td>b. Other arm under legs above knees</td>
</tr>
<tr>
<td>3. Lift victim</td>
<td>3a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Leaning victim into rescuer's body</td>
</tr>
<tr>
<td>4. Carry victim</td>
<td>4a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO DRAG A VICTIM, TURNOUT COAT OR BLANKET DRAG METHOD  

**TIME FRAME:** 0:15  

**LEVEL of INSTRUCTION:** Level II  

**AUTHORITY:** SBFS  

**BEHAVIORAL OBJECTIVE:**  
- **Condition:** A victim, turnout coat or blanket, and appropriate personal protective equipment  
- **Behavior:** The student will drag a victim using the turnout coat or blanket drag method  
- **Standard:** Completing all operations within __________ according to the job breakdown  

**MATERIALS NEEDED:**  
- Job breakdown  
- A victim  
- Turnout coat or blanket  
- Appropriate personal protective equipment  

**REFERENCES:**  
- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5  

**PREPARATION:** In the course of responding to emergencies, rescue personnel at times are faced with the task of removing ambulatory and/or nonambulatory victims from hazardous locations to areas of safety. A number of assists and victim carries must therefore be learned by fire fighters in order to equip them to deal with any type of rescue situation. The turnout coat or blanket drag method can be used for conscious or unconscious victims.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position victim</td>
<td>1a. Supine</td>
</tr>
<tr>
<td>2. Position turnout coat or blanket</td>
<td>2a. Next to victim</td>
</tr>
<tr>
<td></td>
<td>b. Gathering one edge of turnout coat or blanket near victim</td>
</tr>
<tr>
<td></td>
<td>c. Ensuring turnout coat or blanket extends above the victim's head</td>
</tr>
<tr>
<td>3. Position rescuer</td>
<td>3a. Kneel near victim</td>
</tr>
<tr>
<td></td>
<td>b. Opposite side of turnout coat or blanket</td>
</tr>
<tr>
<td>4. Roll victim</td>
<td>4a. Toward rescuer</td>
</tr>
<tr>
<td></td>
<td>b. Supporting victim</td>
</tr>
<tr>
<td>5. Gather turnout coat or blanket</td>
<td>5a. Under victim</td>
</tr>
<tr>
<td>6. Roll victim</td>
<td>6a. Back onto turnout coat or blanket and straighten</td>
</tr>
<tr>
<td>7. Wrap turnout coat or blanket</td>
<td>7a. Around the victim</td>
</tr>
<tr>
<td>8. Gather and grasp turnout coat or</td>
<td>8a. Each side of victim's head</td>
</tr>
<tr>
<td>blanket</td>
<td></td>
</tr>
<tr>
<td>9. Drag victim</td>
<td>9a. Legs flexed</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A VICTIM, TWO-PERSON, CHAIR-CARRY METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A victim, a straight back chair, and appropriate personal protective equipment

Behavior: The students will carry a victim using the two-person, chair-carry method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- A victim
- Straight back chair
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

PREPARATION: Rescue personnel will have to remove nonambulatory and ambulatory victims from hazardous locations to areas of safety. In order to rescue these victims, a number of assists and victim carries must be learned by fire fighters. The two-person, chair-carry method is used to move a victim using a chair. This method is especially useful when moving the invalid.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position victim</td>
<td>1a. Sitting position in chair</td>
</tr>
<tr>
<td></td>
<td>b. Allowing victim to grasp chair for more stability</td>
</tr>
<tr>
<td>2. Position Rescuer #1</td>
<td>2a. Behind chair</td>
</tr>
<tr>
<td></td>
<td>b. Facing back of chair</td>
</tr>
<tr>
<td>3. Grasp chair back</td>
<td>3a. With both hands</td>
</tr>
<tr>
<td></td>
<td>b. Close to seat of chair</td>
</tr>
<tr>
<td>4. Tilt chair</td>
<td>4a. Back slightly</td>
</tr>
<tr>
<td></td>
<td>b. Steadying victim using your inner arms and head, if necessary</td>
</tr>
<tr>
<td>5. Position Rescuer #2</td>
<td>5a. In front of chair</td>
</tr>
<tr>
<td></td>
<td>b. Back to victim</td>
</tr>
<tr>
<td>6. Squat down</td>
<td>6a. Keeping back straight</td>
</tr>
<tr>
<td>7. Grasp front chair legs</td>
<td>7a. With both hands</td>
</tr>
<tr>
<td></td>
<td>b. At bottom of forward chair legs</td>
</tr>
<tr>
<td>8. Rescuer #1 gives command</td>
<td>8a. &quot;READY, LIFT!&quot;</td>
</tr>
<tr>
<td>9. Lift victim</td>
<td>9a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td>10. Carry victim</td>
<td>10a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>

**ALTERNATE METHOD**

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position victim</td>
<td>1a. Sitting position in chair</td>
</tr>
<tr>
<td></td>
<td>b. On each side of chair</td>
</tr>
<tr>
<td>2. Position rescuers</td>
<td>2a. Facing each other</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>3. Squat down</td>
<td>3a. Back straight</td>
</tr>
<tr>
<td>4. Grasp chair</td>
<td>4a. Both rescuers</td>
</tr>
<tr>
<td></td>
<td>b. One hand to front leg of chair</td>
</tr>
<tr>
<td></td>
<td>c. Near base of seat</td>
</tr>
<tr>
<td></td>
<td>d. Other hand to rear leg of chair near base of seat</td>
</tr>
<tr>
<td>5. Tilt chair</td>
<td>5a. Slightly backwards</td>
</tr>
<tr>
<td></td>
<td>b. Keeping victim from falling out</td>
</tr>
</tbody>
</table>
| 6. Rescuer #1 gives command | 6a. "READY, LIFT!"
| 7. Lift victim | 7a. Both rescuers |
| | b. In unison |
| | c. Using legs |
| | d. Back straight |
| 8. Carry victim | 8a. Carefully |
| | b. Slowly |
| | c. Watching for obstructions |
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** HOW TO CARRY A VICTIM, TWO-PERSON, SEAT-CARRY METHOD

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** SBFS

**BEHAVIORAL OBJECTIVE:**

*Condition:* A victim and appropriate personal protective equipment

*Behavior:* The students will carry a victim using the two-person, seat-carry method

*Standard:* Completing all operations within _________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- A victim
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

**PREPARATION:** In the course of responding to emergencies, rescue personnel at times are faced with the task of removing ambulatory and/or nonambulatory victims from hazardous locations to areas of safety. A number of assists and victim carries must therefore be learned by fire fighters in order to equip them to deal with any type of rescue situation. The two-person seat carry is a valuable tool that provides an efficient means of removing both conscious and unconscious victims.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Position rescuers | 1a. One on each side of victim  
|  | b. Near hips of victim  
|  | c. Facing each other  
| 2. Position victim | 2a. Sitting position |
| 3. Place both rescuers’ arms | 3a. Behind victim's back  
|  | b. In the middle |
| 4. Grasp forearm of opposite rescuer | 4a. Firmly |
| 5. Position free arms | 5a. Under victim's thighs |
| 6. Clasp wrists | 6a. Rescuer's opposite wrist/or under victim's knees  
|  | b. Firmly  
|  | c. Allowing victim to put arms on rescuer's shoulders, if necessary |
| 7. Rescuer #1 gives command | 7a. "READY, LIFT!" |
| 8. Lift victim | 8a. Using legs  
|  | b. Back straight |
| 9. Carry victim | 9a. Carefully  
|  | b. Slowly  
|  | c. Watching for obstructions  
|  | d. Moving sideways through doorways |
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CARRY A VICTIM, TWO-PERSON, EXTREMITIES METHOD

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A victim and appropriate personal protective equipment

Behavior: The student will carry a victim using the two-person, extremities method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- A victim
- Appropriate personal protective equipment

REFERENCES:

- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 5

PREPARATION:

In the course of responding to emergencies, rescue personnel at times are faced with the task of removing ambulatory and/or nonambulatory victims from hazardous locations to areas of safety. A number of assists and victim carries must therefore be learned by fire fighters in order to equip them to deal with any type of rescue situation. This technique will allow two fire fighters to rescue a victim without the use of equipment.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position victim</td>
<td>1a. Supine</td>
</tr>
<tr>
<td>2. Position Rescuer #1</td>
<td>2a. At the head of victim</td>
</tr>
<tr>
<td></td>
<td>b. Facing feet</td>
</tr>
<tr>
<td>3. Position Rescuer #2</td>
<td>3a. At the feet of victim</td>
</tr>
<tr>
<td></td>
<td>b. Between legs</td>
</tr>
<tr>
<td></td>
<td>c. Facing feet</td>
</tr>
<tr>
<td>4. Rescuer #1 grasps victim</td>
<td>4a. Reaching under victim's arms and around chest</td>
</tr>
<tr>
<td></td>
<td>b. At victim's wrist, opposite hands</td>
</tr>
<tr>
<td>5. Rescuer #2 grasps victim</td>
<td>5a. Grab under victim's knees</td>
</tr>
<tr>
<td>6. Rescuer #1 gives command</td>
<td>6a. &quot;READY, LIFT!&quot;</td>
</tr>
<tr>
<td>7. Lift victim</td>
<td>7a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Backs straight</td>
</tr>
<tr>
<td></td>
<td>c. Heads up</td>
</tr>
<tr>
<td>8. Carry victim</td>
<td>8a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Watching your step</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO CARRY A VICTIM, THREE-PERSON METHOD

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A victim and appropriate personal protective equipment

Behavior: The students will lift and carry a victim using the three-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
• Job breakdown
• A victim
• Appropriate personal protective equipment

REFERENCES:
• Fire Service Rescue, IFSTA, Fifth Edition, Chapter 5

PREPARATION: Fire fighters will have to remove nonambulatory and ambulatory victims from hazardous locations to areas of safety. In order to rescue these victims, a number of assists and victim carries must be learned by fire fighters. The three-person method allows fire fighters to carry victims through narrow passageways and reduces the amount of work performed by individual fire fighters.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position victim</td>
<td>1a. Supine</td>
</tr>
<tr>
<td>2. Position rescuers</td>
<td>b. One side of the victim</td>
</tr>
<tr>
<td>3. Position Rescuer #1</td>
<td>b. At victim's head</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td>4. Position Rescuer #2</td>
<td>b. At victim's waist</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td>5. Position Rescuer #3</td>
<td>b. At victim's feet</td>
</tr>
<tr>
<td></td>
<td>c. Kneeling</td>
</tr>
<tr>
<td>6. Rescuer #1 positions hands</td>
<td>6a. One hand under the neck</td>
</tr>
<tr>
<td></td>
<td>b. Other hand under the victim's back</td>
</tr>
<tr>
<td></td>
<td>at the middle of the chest</td>
</tr>
<tr>
<td>7. Rescuer #2 positions hands</td>
<td>7a. One hand under the lower back</td>
</tr>
<tr>
<td></td>
<td>b. Other hand under the upper legs</td>
</tr>
<tr>
<td>8. Rescuer #3 positions hands</td>
<td>8a. One hand under the knees</td>
</tr>
<tr>
<td></td>
<td>8b. Other hand under the ankles</td>
</tr>
<tr>
<td>9. Rescuer #1 gives command</td>
<td>9a. &quot;READY, LIFT!&quot;</td>
</tr>
<tr>
<td>10. Lift victim</td>
<td>10a. All three rescuers standing and rolling victim against their chests</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td>11. Carry victim</td>
<td>11a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Watching for obstructions</td>
</tr>
</tbody>
</table>
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CONSTRUCT AN IMPROVISED STRETCHER
TIME FRAME: 0:15
LEVEL of INSTRUCTION: Level II
AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A large blanket, short pike poles, and appropriate personal protective equipment

Behavior: The student will construct an improvised stretcher

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Large blanket
- Two short pike poles
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Rescue, IFSTA, Fifth Edition, Chapter 6

PREPARATION:

Carrying a victim in a stretcher is safer than person carries for both the victim and the rescuer. Even when a stretcher is not available, an improvised stretcher can quickly be assembled, saving the fire fighter valuable time.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position first pole</td>
<td>1a. On unfolded blanket</td>
</tr>
<tr>
<td></td>
<td>b. 1 foot from center</td>
</tr>
<tr>
<td>2. Fold blanket</td>
<td>2a. Short side of blanket over first fold</td>
</tr>
<tr>
<td>3. Position second pole</td>
<td>3a. 2 feet from first pole</td>
</tr>
<tr>
<td></td>
<td>3b. On two layers of blanket</td>
</tr>
<tr>
<td>4. Finish folds</td>
<td>4a. Folding remaining blanket over second pole towards first</td>
</tr>
<tr>
<td></td>
<td>b. Victim on blanket will hold folds tight against poles</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: WHY STAIRWAYS ARE PREFERRED OVER LADDERS DURING RESCUE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.8

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the reasons why stairways are preferred over ladders during rescue by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Rescue, IFSTA, Sixth Edition, Chapter 6

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fire Service Rescue, IFSTA, Sixth Edition

PREPARATION:

Using a ladder is a good way to remove people from upper floors, but whenever possible, the stairway is still the easiest and safest method to remove victims from a building. This is another reason why fire fighters should protect stairways and keep them clear.
I. STAIRWAYS VERSUS LADDERS
   A. More people can be removed
   B. Much faster
   C. Safer
   D. Less fear
   E. Easier to handle the elderly and invalids
   F. No exposure to falling objects
   G. Less chance of victim falling
   H. Easier to transport unconscious victims
   I. May only have to direct them to the floor below the fire

What are some of the reasons to use stairs whenever possible?
**SUMMARY:**

Always use the stairway as the first means of egress. It is faster, safer and much more controllable than a ladder.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Rescue*, IFSTA, Sixth Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO ASSIST A CONSCIOUS VICTIM DOWN A LADDER, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A victim, ground ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The students will assist a conscious victim onto a ladder and guide them down using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED: • Job breakdown
• A victim
• Appropriate ground ladder
• Appropriate personal protective equipment
• Suitable structure

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9

PREPARATION: Fire fighters engaged in rescue operations utilizing ground ladders may find they have to assist a victim during immediate evacuation. The victim will probably be unaccustomed to climbing down a ladder and great care must be exercised to prevent accidental injury while descending. Being proficient at assisting a victim down a ladder will provide a greater margin of safety for both the victim and the fire fighter.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Position ladder | 1a. Ladder tips only to sill of window  
| | b. Proper climbing angle  
| | c. Secured on both ends, if possible  
| 2. Position Rescuer #1 | 2a. On ladder  
| | b. Feet far enough below window to provide room for victim  
| | c. Hands on beams  
| 3. Position Rescuer #2 | 3a. Inside structure  
| 4. Rescuer #2 assists victim | 4a. Onto ladder  
| | b. Facing into ladder  
| | c. Feet first  
| 5. Rescuer #1 positions arms | 5a. At waist level of victim  
| 6. Rescuer #1 grasps ladder | 6a. One hand each rail  
| 7. Rescuer #1 descends ladder | 7a. Slowly  
| | 7b. Supporting victim  
| | b. Maintaining grip for safety  
| | c. Reassuring victim  

APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO MOVE AN UNCONSCIOUS VICTIM DOWN A LADDER, TWO-PERSON METHOD

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** SBFS

**BEHAVIORAL OBJECTIVE:**

**Condition:** A victim, ground ladder, appropriate personal protective equipment, and a suitable structure

**Behavior:** The students will place an unconscious victim on a ladder and guide them down using the two-person method

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- A victim
- Appropriate ground ladder
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 9

**PREPARATION:** Fire fighters engaged in ladder rescue operations may have to move an unconscious victim down a ladder. Obviously, unconscious victims cannot assist in their own rescue, which increases the effort required by the fire fighters and increases the danger to the fire fighters. Great care and proper technique are required to prevent injury to the fire fighter and/or victim.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Ladder tips to sill of window</td>
</tr>
<tr>
<td></td>
<td>b. Proper climbing angle</td>
</tr>
<tr>
<td></td>
<td>c. Secured on both ends if possible</td>
</tr>
<tr>
<td>2. Position Rescuer #1</td>
<td>2a. On ladder</td>
</tr>
<tr>
<td></td>
<td>b. Feet far enough below window to provide room for victim</td>
</tr>
<tr>
<td></td>
<td>c. Hands on beams</td>
</tr>
<tr>
<td>3. Position Rescuer #2</td>
<td>3a. Inside building to assist victim</td>
</tr>
<tr>
<td>4. Rescuer #2 passes victim to Rescuer #1</td>
<td>4a. Feet first</td>
</tr>
<tr>
<td></td>
<td>b. Front of victim towards ladder</td>
</tr>
<tr>
<td>5. Rescuer #1 positions arms</td>
<td>5a. One through crotch</td>
</tr>
<tr>
<td></td>
<td>b. Other under chest</td>
</tr>
<tr>
<td></td>
<td>c. To support weight of victim</td>
</tr>
<tr>
<td>6. Rescuer #1 grasps rails</td>
<td>6a. Firmly</td>
</tr>
<tr>
<td></td>
<td>b. With hands</td>
</tr>
<tr>
<td></td>
<td>c. To control descent</td>
</tr>
<tr>
<td>7. Rescuer #1 descends ladder</td>
<td>7a. Slowly</td>
</tr>
<tr>
<td></td>
<td>7b. Supporting victim</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining grip with rails for safety</td>
</tr>
</tbody>
</table>

**NOTE:** If the victim awakes and begins to move, simply sandwich the victim between the ladder and Rescuer #1.
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO USE A LADDER FOR GROUND LEVEL RESCUE, THREE-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A victim, rope, roof ladder, and appropriate personal protective equipment

Behavior: The students will use a ladder for ground level rescue using the three-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- A victim
- Appropriate length of ½-inch tie rope
- 14-foot roof ladder
- Appropriate personal protective equipment

REFERENCES:

- Fire Service Ground Ladders, IFSTA, Ninth Edition, Chapter 5

PREPARATION:

The ability of people to survive for extended periods of time in cold water is very limited. The loss of body heat in water is about 25 times greater than the loss of body heat in the normal atmosphere, so fast action is necessary to prevent death. This procedure can also be used for mud, quicksand, and ice rescue situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rescuer #1 ties rope</td>
<td>1a. To the shore end of the ladder</td>
</tr>
<tr>
<td>2. Rescuers #2 and #3 support ladder</td>
<td>2a. One hand on rung, palm up</td>
</tr>
<tr>
<td></td>
<td>b. One hand on beam, palm down</td>
</tr>
<tr>
<td>3. Rescuers #2 and #3 slide ladder</td>
<td>3a. Across hazard towards victim</td>
</tr>
<tr>
<td></td>
<td>3b. Squatting or lying down if necessary for ladder to reach victim</td>
</tr>
<tr>
<td>4. Rescuers #2 and #3 steady ladder</td>
<td>4a. Both hands on beams</td>
</tr>
<tr>
<td>5. Victim grasps ladder</td>
<td>5a. Both hands on rung</td>
</tr>
<tr>
<td></td>
<td>b. Palms down</td>
</tr>
<tr>
<td>6. Rescuer #1 pulls rope</td>
<td>6a. Hand over hand</td>
</tr>
<tr>
<td></td>
<td>b. Pulling ladder and victim toward the shore</td>
</tr>
<tr>
<td>7. Rescuer #2 or #3 secures victim</td>
<td>7a. Grasping collar or other clothing</td>
</tr>
<tr>
<td>8. Rescuer #2 or #3 moves victim</td>
<td>8a. Away from hazard</td>
</tr>
<tr>
<td></td>
<td>b. To a safe area</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO TIE AND ATTACH THE RESCUE CHEST HARNESS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: Webbing, rope, carabiner, and appropriate personal protective equipment

Behavior: The student will tie and attach a rescue chest harness

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- 12-15 foot length of 1-inch webbing
- Appropriate length of ½-inch tie rope
- Carabiner
- Appropriate personal protective equipment

REFERENCES:

PREPARATION: To complete most rescue operations, a few basic skills must be mastered. A properly tied chest harness may be your only safety link in the event of a rope system failure.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tie an overhand on a bight</td>
<td>1a. At the center of the webbing</td>
</tr>
<tr>
<td>2. Place the bight</td>
<td>2a. Over the sternum</td>
</tr>
<tr>
<td>3. Drape one tail</td>
<td>3a. Over the left shoulder</td>
</tr>
<tr>
<td>b. No twists</td>
<td></td>
</tr>
<tr>
<td>4. Wrap other tail</td>
<td>4a. Under left arm first</td>
</tr>
<tr>
<td>b. Over first tail hanging down back</td>
<td></td>
</tr>
<tr>
<td>5. Pass the end of the webbing that goes around the torso</td>
<td>5a. Through the bight at the sternum</td>
</tr>
<tr>
<td>6. Tie a minimum of two hitches</td>
<td>6a. Around the bight at the sternum</td>
</tr>
<tr>
<td>b. Snug around chest</td>
<td></td>
</tr>
<tr>
<td>c. High under arm pits</td>
<td></td>
</tr>
<tr>
<td>7. Pull the end of the webbing hanging down the back</td>
<td>7a. Over the right shoulder</td>
</tr>
<tr>
<td>8. Pass end</td>
<td>8a. Through bight</td>
</tr>
<tr>
<td>b. Removing slack</td>
<td></td>
</tr>
<tr>
<td>9. Secure with minimum of</td>
<td>9a. Two half hitches</td>
</tr>
<tr>
<td>10. Tie a figure eight on a bight</td>
<td>10a. At the end of the rescue rope</td>
</tr>
<tr>
<td>b. Forming a 10-inch bight</td>
<td></td>
</tr>
<tr>
<td>c. Leaving a 6-inch tail</td>
<td></td>
</tr>
<tr>
<td>11. Attach a carabiner</td>
<td>11a. Over the bight</td>
</tr>
<tr>
<td>b. At the sternum</td>
<td></td>
</tr>
<tr>
<td>c. Not through the bight</td>
<td></td>
</tr>
<tr>
<td>d. Biting down</td>
<td></td>
</tr>
<tr>
<td>e. Flipping up</td>
<td></td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Attach the carabiner</td>
<td>12a. To the figure eight on a bight</td>
</tr>
<tr>
<td></td>
<td>12b. In the tie rope</td>
</tr>
<tr>
<td>Lock the carabiner</td>
<td></td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO WRAP A VICTIM BEFORE SECURING IN A RESCUE LITTER

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A victim, two blankets, rescue litter, and appropriate personal protective equipment
- **Behavior:** The student will wrap a victim in preparation to secure the victim in a rescue litter
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- A victim
- Two blankets
- Rescue litter
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Rescue, IFSTA, Sixth Edition, Chapter 4

**PREPARATION:** Before securing a victim to a rescue litter, rescue personnel should wrap the victim to protect from the elements and from shock. During this session, the rescuer will learn how to wrap a victim before securing to a rescue litter. This skill will increase the survivability of victims.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position first blanket</td>
<td>1a. Crossways</td>
</tr>
<tr>
<td></td>
<td>b. At head of litter</td>
</tr>
<tr>
<td></td>
<td>c. ⅓ of width extended beyond top of litter</td>
</tr>
<tr>
<td>2. Position second blanket</td>
<td>2a. Lengthwise</td>
</tr>
<tr>
<td></td>
<td>b. At bottom of litter</td>
</tr>
<tr>
<td></td>
<td>c. ¼ of length extended beyond bottom of litter</td>
</tr>
<tr>
<td>3. Fold first blanket</td>
<td>3a. Back over itself and second blanket</td>
</tr>
<tr>
<td></td>
<td>b. With fold at top of litter</td>
</tr>
<tr>
<td>4. Position victim on rescue litter</td>
<td>4a. Supine</td>
</tr>
<tr>
<td></td>
<td>4b. Gently</td>
</tr>
<tr>
<td></td>
<td>b. Placing arms to side</td>
</tr>
<tr>
<td></td>
<td>c. Feet together</td>
</tr>
<tr>
<td>5. Fold first blanket</td>
<td>5a. Corners of blanket, longer sides first, over and across victim's torso</td>
</tr>
<tr>
<td></td>
<td>b. Tucking blanket above victim's head and shoulders</td>
</tr>
<tr>
<td></td>
<td>c. Exposing face and neck</td>
</tr>
<tr>
<td>6. Fold second blanket</td>
<td>6a. Over feet first</td>
</tr>
<tr>
<td></td>
<td>b. Fold sides over and across legs and waist</td>
</tr>
<tr>
<td></td>
<td>c. Tucking excess next to legs</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.


**TOPIC:** USAR INCIDENT COMMAND SYSTEM

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the incident command system used at USAR incidents by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 3

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- Rescue Systems 1 Student Manual, SFT, 2000 Edition

**PREPARATION:**

An understanding of how the incident command system is employed during incidents requiring USAR will greatly assist in effective and safe operation. The ordering and organization of resources required at rescue incidents will go a long way towards ensuring an orderly progression of the incident leading to mitigation.
What system is used to accomplish USAR command and control?

I. CONTAINS INFORMATION RELATIVE TO FIGHSCOPE’S INCIDENT COMMAND SYSTEM (ICS)
   A. Requires knowledge of the ICS to understand the terminology and variety of ways in which the management of resources can be applied

II. MODULAR DEVELOPMENT
   A. The flexibility and modular expansion capabilities of ICS provides an almost infinite number of ways USAR resources can be arranged and managed
   B. A unified command structure may need to be used at USAR incidents due to the involvement of multiple agencies and jurisdictions having statutory or political responsibility or authority

NOTE: These examples are not meant to be restrictive or imply these are the only ways to build an ICS organizational structure to manage USAR resources.

III. ICS MODULAR DEVELOPMENT EXAMPLES
   A. Initial response organization
      1. The first fire department company officer to arrive will assume command of the incident as the Incident Commander (IC)
      2. Initial response resources are managed by the IC who will assume all command and general staff functions and responsibilities

   B. Reinforced response organization
      1. In addition to the initial response, more law enforcement, local engine and truck companies and mutual aid resources have arrived

What other agency may be necessary in a reinforced response?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. The IC has established a Safety Officer to assure personnel safety and a Public Information Officer to manage the large media presence</td>
<td></td>
</tr>
<tr>
<td>3. A staging area is established to check-in arriving resources</td>
<td></td>
</tr>
<tr>
<td>4. The incident is geographically divided into Division A and B to better manage resources</td>
<td></td>
</tr>
<tr>
<td>5. The original engine and truck companies are grouped together to form Task Force #1</td>
<td></td>
</tr>
<tr>
<td>6. Second local engine and truck companies to arrive are grouped together to form Task Force #2</td>
<td></td>
</tr>
<tr>
<td>7. Public works is removing debris from the street to improve access and egress routes</td>
<td></td>
</tr>
<tr>
<td>C. Multigroup/division response organization</td>
<td>What other operational units may be formed to make up the USAR team?</td>
</tr>
<tr>
<td>1. The IC forms a unified command with the senior ranking law enforcement official on scene, has added a Liaison Officer to the command staff to coordinate assisting agencies participation, and assigned an Operations and Planning Section Chief</td>
<td></td>
</tr>
<tr>
<td>2. Several operational units have been formed to better coordinate the large amount of resources at the incident</td>
<td></td>
</tr>
<tr>
<td>a) Law group</td>
<td></td>
</tr>
<tr>
<td>b) Medical group</td>
<td></td>
</tr>
<tr>
<td>c) Structural Engineer Technical Specialist is assisting Division B resources with structural damage assessment</td>
<td></td>
</tr>
</tbody>
</table>
d) Hand crew strike team is conducting debris removal

3. One USAR task force has arrived and is assigned to Division A

4. One USAR Technical Specialist who understands the unique complexities and resource requirements at USAR incidents has been assigned to the planning section

D. Multi-branch organization

1. The IC has assigned a Logistics and Finance/Administration Section Chief

2. The Operations Section has established five branches with similar functions to better coordinate and manage resources

3. The Planning, Logistics and Finance/Administration Sections have several units operational to support the large amount of resources at the incident
SUMMARY:

The Incident Command System has incorporated urban search and rescue operations into its design. By using the modular organization of the ICS, Incident Commanders can expand the organization to be able to handle the complexities of a USAR operation. Beginning with the arrival of the first engine company to a fully staffed ICS organization and subsequent mitigation of the incident, personnel can operate within a common framework that can provide for and support this type of incident.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the basic, light, medium, and heavy operational levels for USAR teams by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Rescue Systems 1 Student Manual*, SFT, 2000 Edition, Chapter 4

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

**PREPARATION:** The Urban Search and Rescue Operational System (USAR) description explains four different levels of operational capability and equipment. The document uses the Incident Command System to apply common terminology and resource management practices to provide supervision and control of essential functions at incidents that involve technically demanding rescue operations.
I. USAR STATE/NATIONAL TEAMS

   A. USAR teams are used at incidents where specialized training and equipment are required to mitigate an incident

   B. State Office of Emergency Services (OES) acts as primary point of contact for the Federal Emergency Management Agency (FEMA) and coordinates USAR activities

   C. USAR is a state resource that can be used without a request for federal assistance

   D. USAR teams must be able to deploy within six hours of notification

   E. Crews are multidisciplinary brought together to form five functional areas that include command, search, rescue, medical, and technical

   F. Each USAR team is comprised of 62 persons specifically trained and equipped for large and/or complex operations

   G. USAR teams are self-sufficient for the first 72 hours

      1. Transportation and logistical support provided by either state or federal resources

II. BASIC OPERATIONAL LEVEL (TYPE 4)

   A. Minimum capability for safe and effective search and rescue operations at structure collapse incidents

   B. The basic level consists of a three person company

   C. Used for nonstructural entrapment and surface rescue

   D. Equipment can be carried on an engine company
III. LIGHT OPERATIONAL LEVEL (TYPE 3)
   A. Minimum capability for safe and effective search and rescue operations involving the collapse or failure of light frame construction and basic rope rescue
   B. The light level consists of a three-person company
   C. Equipment can be carried on an engine company

IV. MEDIUM OPERATIONAL LEVEL (TYPE 2)
   A. Minimum capability for safe and effective search and rescue operations involving the collapse or failure of reinforced and unreinforced masonry, concrete tilt-up construction, and heavy timber
   B. The medium level consists of a four-person company
   C. Equipment can be carried on a truck company, large cargo vehicle, or trailer

V. HEAVY OPERATIONAL LEVEL (TYPE 1)
   A. Minimum capability for safe and effective search and rescue operations involving the collapse or failure of reinforced concrete, steel frame construction, and confined space rescue
   B. The heavy level consists of a six-person company
   C. Equipment can be carried on large cargo vehicles, trailers, or other specially designed apparatus
**SUMMARY:**

USAR teams are multidisciplinary groups that are brought together to assist in mitigating complex rescue incidents. They come in the form of a 62-person force. USAR teams are broken down into four different team capabilities. Type 4 - Basic Operational Level, Type 3 - Light Operational Level, Type 2 - Medium Operational Level, and Type 1 - Heavy Operational Level.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Rescue Systems 1 Student Manual*, SFT, 2000 Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SEARCH MARKING SYSTEMS USED BY USAR TEAMS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the different search marking systems used by USAR teams by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 7

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Rescue Systems 1 Student Manual, SFT, 2000 Edition

PREPARATION:

A common method of marking areas that either need to be searched, are being searched, or have been searched is essential to rescue operations to prevent duplication of effort, prevent rescue personnel from unnecessary exposure to danger and/or more orderly and efficient operations. The USAR system uses a simple method of marking for their search operations. In conjunction with the Incident Command System, an orderly search operation can be accomplished with a common marking system.
I. SEARCH MARKINGS
   A. Must be
      1. Easy to make
      2. Easy to read
      3. Easy to understand
   B. Orange spray paint seems to be the most easily seen color on most backgrounds
   C. Line marking or downward spray cans apply the best paint marks
      1. Lumber chalk or lumber crayons can be used to mark additional information inside the search mark itself
         a) Because they are easier to write with than spray paint

II. OUTSIDE MARKING
   A. Outside the main entrance of each building or structure searched
   B. Must be large and distinct
   C. This "main entrance" search marking will be completed in two steps
      1. A large (approximately 2 feet) single slash shall be made near the main entrance at the start of the search
      2. After the search of the entire structure has been completed, a second large slash shall be drawn in the opposite direction forming an "X"
III. SPECIFIC INFORMATION

A. Placed in all four quadrants of the main entrance "X"
B. Summarizes the entire search of the structure
C. The left quadrant is for the rescue team identifier
D. The top quadrant is for the date and time the search was completed
E. The right quadrant is for any significant hazards located in the structure
F. The bottom quadrant is for the number of "LIVE" or "DEAD" victims still inside the structure
   1. Use a small "x" in the bottom quadrant if no victims are inside the structure

IV. INSIDE MARKINGS

A. Large single slash shall be made upon entry of each room or area
B. After the search of the room or area has been completed, a second large slash shall be drawn in the opposite direction forming an "X"
C. The only information placed in any of the "X" quadrants while inside the structure shall pertain only to any significant hazards or the number of "LIVE" or "DEAD" victims
D. Spray paint used inside poorly ventilated areas can reduce search dog effectiveness

Does the paint affect search dogs in any way?
SUMMARY:

With a common search, marking system teams can communicate what their findings are and the search status for any structure or area. The concept of a simple "X" marking and then filling in certain information in each quadrant of the "X" is an easy method to identify the search team, the date and time of the search, any significant hazards, and the status of any victims inside.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: STRUCTURE AND HAZARD MARKINGS USED BY USAR TEAMS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

   Condition: A written test

   Behavior: The student will confirm a knowledge of the structure and hazard markings used by USAR teams by completing the written test

   Standard: With a minimum 80% accuracy according to the information contained in the Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapter 7

MATERIALS NEEDED:

   • Writing board with markers/erasers
   • Appropriate audiovisual equipment
   • Appropriate audiovisual materials

REFERENCES:

   • Fire Service Field Operations Guide ICS 420-1, FIRESCOPE, 1999 Edition
   • Rescue Systems 1 Student Manual, SFT, 2000 Edition

PREPARATION:

A common method of identifying structures and their hazards at the scene of rescue incidents is needed for effective and safe operation of rescue teams. The USAR system uses a simple method of structure/hazard marking for their operations. It is used in conjunction with the Incident Command System.
I.  STRUCTURE IDENTIFICATION
   A. If possible, use existing street names and addresses

   B. If address is unavailable due to damage or other cause, use existing hundred blocks
      1. Place all even numbers on one side of the street
      2. All odd numbers on the other side

   C. If name of street is unavailable due to damage or other cause, start naming the street with the letter "A" using the phonetic alphabet Alpha, Bravo, Charlie, etc.

   D. All addresses and street names should be made with orange spray paint

   E. A map of the area should be developed

II. STRUCTURE/HAZARDS MARKINGS
   A. Make a large (2 foot x 2 foot) square box with orange spray paint on the outside of the main entrance to the structure

   B. Put the date, time, hazardous material conditions, and the team or company identifier outside the box on the right hand side
      1. This information should be made with lumber crayon or lumber chalk

   C. An open box indicates the structure is accessible and safe for search and rescue operations
      1. Damage is minor with little danger of further collapse

   If addresses are unavailable due to damage, how should the buildings be addressed?

What may an open box marking mean?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D.</strong> A box with a slash indicates the structure is significantly damaged</td>
</tr>
<tr>
<td>1. Some areas are relatively safe, but other areas may need shoring, bracing, or removal of falling and collapse hazards</td>
</tr>
<tr>
<td><strong>E.</strong> A box with an &quot;X&quot; indicates the structure is not safe for search or rescue operations</td>
</tr>
<tr>
<td>1. May be subject to sudden additional collapse</td>
</tr>
<tr>
<td>2. Remote search operations may proceed at significant risk</td>
</tr>
<tr>
<td>3. If rescue operations are undertaken, safe haven areas and rapid evacuation routes should be created</td>
</tr>
<tr>
<td><strong>F.</strong> An arrow located next to the box indicates the direction to a safe entrance into the structure</td>
</tr>
</tbody>
</table>
**SUMMARY:**

With the box system of marking structural hazards and building address marking for future reference, rescue teams can operate more effectively and safely. Using orange spray paint and lumber crayons or chalk, teams can effectively communicate with each other and command their progress.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Rescue Systems 1 Student Manual*, SFT, 2000 Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SUPPORTING USAR TEAMS DURING DEPLOYMENT

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of supporting USAR teams during deployment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Rescue Systems 1 Student Manual, SFT, 2000 Edition, Chapters 2 and 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Rescue Systems 1 Student Manual, SFT, 2000 Edition

PREPARATION: In order for USAR teams to work with maximum efficiency, the local fire department must be familiar with the USAR team’s operations and requirements. If the local fire department provides the proper support functions, the USAR team will be able to work together for a smoother and more efficient rescue operation if each agency knows its roles and responsibilities.
I. RESOURCE MANAGEMENT
   A. Local fire departments must exhaust other resources before requesting USAR team(s)

   What types of resources are available other than USAR teams?

   1. Local volunteer response teams
   2. Local search and rescue teams
   3. Public works and utilities companies
   4. Mutual aid
   5. National guard

II. INCIDENT COMMAND
   A. Activate emergency operations center as needed

   Who is the Incident Commander while USAR teams are deployed?

   B. Local fire departments maintains incident command
      1. IC makes decisions based on information from USAR team
      2. USAR team works under operations
         a) Usually as rescue group

III. LOGISTICAL SUPPORT
   A. USAR teams are self-sufficient for up to 72 hours
   B. Local fire departments should provide support as soon as possible
      1. Physical area (staging area/base)

   How long should USAR teams be self-sufficient?
### How large should a staging area/base be?

- a) Large enough for personnel, equipment, and necessary facilities
- b) Far enough away from incident to allow rest for rescuers
- c) Sanitary facilities
- d) Food and drink
- e) Shelter

### What types of transportation needs would you expect a USAR team to have?

- a) From staging area/base to incident site
- b) Medical, if needed

### What jobs or functions can local personnel perform?

- a) Additional searchers
- b) Medical personnel
- c) Personnel for debris removal
SUMMARY:

Before a fire department requests a USAR team, all local resources should be exhausted. Once the USAR team is deployed, the local fire departments are responsible for providing an Incident Commander, a staging area or base with all of the necessary facilities, transportation, and additional personnel. Without the proper support, the USAR team will not be able to work to its potential.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read *Rescue Systems 1 Student Manual*, SFT, 2000 Edition, Chapters 2 and 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS DURING VENTILATION OPERATIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the safety considerations during ventilation operations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials

REFERENCES: • Essentials of Fire Fighting, IFSTA, Fourth Edition • Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION: Hazards that endanger occupants also will be a potential hazard to fire fighters. Ventilation operations will be the most hazardous operation that you will encounter as a fire fighter. Safety considerations during ventilation may determine the success or failure of any structure fire fighting operation. Your life may depend on your knowledge of safe ventilation practices. Successful ventilation will improve rescue and fire fighter operations and improve the life safety of fire fighters. Energy efficient conservation practices in modern construction cause heat, smoke, and unburned gasses to be retained longer making ventilation a key component in the fire fighting effort.
What are some safety facts to consider before ventilation?

I. VENTILATION SAFETY CONSIDERATIONS

A. Evaluate the situation
   1. Personal protection
   2. Available personnel and equipment
   3. Rescue requirements
   4. Occupancy
   5. Weather
      a) Wind direction
   6. Material burning
   7. Smoke and gas travel
   8. Fire travel
   9. Escape routes

B. Structure
   1. Observe/evaluate situation
   2. Is there a need?
      a) Have a plan?
      b) Which method of ventilation?
   3. Extent of fire
      a) Visible smoke conditions
         1) Smoke color unreliable indicator of fire involvement
   4. Location of the fire
   5. Building construction

C. Safety equipment
   1. SCBA
   2. Charged line
   3. Full personal protective equipment
## PRESENTATION

### D. Techniques for all types of ventilation practices
1. Provide firm footing on roof
2. Work in pairs
3. Provide two means of escape
4. Hoseline protection
5. Evacuate roof when ventilation is complete

## APPLICATION

### II. CAUSE AND AFFECT

#### A. Life hazards to fire fighters
1. Roof collapse
2. Explosions below
3. Extreme smoke conditions
4. Escape difficult in emergency

What would happen if ventilation was delayed?

#### B. Ventilation delayed
1. Backdraft
2. Roof unsafe
3. Entire building involved
4. Excessive property loss
5. Increased life hazard

What would happen if ventilation was started too soon?

#### C. Opening too soon
1. Lines not laid
2. Fire gets away
3. Increased property loss
4. Additional work time
5. Additional life hazard
What would happen if you ventilated in the wrong place?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Opening wrong place</td>
<td></td>
</tr>
<tr>
<td>1. No ventilation</td>
<td></td>
</tr>
<tr>
<td>2. Backdraft</td>
<td></td>
</tr>
<tr>
<td>a) Sudden rapid movement of air inward when opening is made</td>
<td>What color is smoke during backdraft conditions?</td>
</tr>
<tr>
<td>b) Occurs during smoldering phase</td>
<td></td>
</tr>
<tr>
<td>c) May be indicated by smoke conditions</td>
<td></td>
</tr>
<tr>
<td>1) Black smoke turning gray-yellow</td>
<td></td>
</tr>
<tr>
<td>2) Little or no flame</td>
<td></td>
</tr>
<tr>
<td>3) Smoke leaves building in puffs</td>
<td></td>
</tr>
<tr>
<td>3. Spread of fire</td>
<td></td>
</tr>
<tr>
<td>4. Increased property loss</td>
<td></td>
</tr>
<tr>
<td>5. Additional life hazard</td>
<td></td>
</tr>
<tr>
<td>6. Additional work time</td>
<td></td>
</tr>
<tr>
<td>7. Public criticism</td>
<td></td>
</tr>
</tbody>
</table>

What would be the hazards if the ventilation opening was insufficient?

| E. Insufficient opening                            |                                                   |
| 1. Ineffective ventilation                        |                                                   |
| 2. Backdraft                                      |                                                   |
| 3. Loss of time                                   |                                                   |
| 4. Additional property loss                       |                                                   |
| 5. Additional life hazard                         |                                                   |
F. Opening below the fire
   1. Backdraft
   2. Increase fire intensity
   3. No ventilation
   4. No value

III. VENTILATION HAZARDS
A. Considerations
   1. Time of day
   2. Occupancy
   3. Probable location of fire
   4. Contents (probable fuel involved)
   5. Composition of fire gases
   6. Type of building
   7. Anticipated action of fire burning freely
   8. Anticipated action of smoldering fires

B. Hazards in closed buildings
   1. Obscurity caused by dense smoke
   2. Presence of poisonous gases
   3. Lack of oxygen
   4. Presence of flammable gas
   5. Serious damage to the structure

C. Rooftop ventilation
   1. Spongy roof
   2. Secondary means of escape
   3. Lifeline

What would happen if you ventilated below the fire?

What are the hazards of a closed building?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Sliding and falling</td>
<td></td>
</tr>
<tr>
<td>5. Electrical wires</td>
<td></td>
</tr>
<tr>
<td>6. Protective equipment</td>
<td></td>
</tr>
<tr>
<td>7. Stand to windward side</td>
<td></td>
</tr>
<tr>
<td>8. Weakening structure</td>
<td></td>
</tr>
<tr>
<td>D. Hoseline placement</td>
<td></td>
</tr>
<tr>
<td>1. At no time should a hoseline or elevated stream be directed into a ventilation hole</td>
<td></td>
</tr>
<tr>
<td>E. Safety techniques for all types of ventilation practices</td>
<td></td>
</tr>
<tr>
<td>1. Provide firm footing on roof</td>
<td></td>
</tr>
<tr>
<td>2. Work in pairs</td>
<td></td>
</tr>
<tr>
<td>3. Provide two means of escape</td>
<td></td>
</tr>
<tr>
<td>4. Hoseline protection</td>
<td></td>
</tr>
<tr>
<td>5. Evacuate roof when ventilation is complete</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

When a fire fighter determines the need for ventilation, the precautions that may be necessary for the control of the fire and the safety of the fire fighters must also be considered. Safety considerations must always be practiced during ventilation operations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: FIREGROUND USE OF FORCED VENTILATION EQUIPMENT

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

   Condition: A written test

   Behavior: The student will confirm a knowledge of the fireground use of forced ventilation equipment by completing the written test.

   Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5.

MATERIALS NEEDED:

   • Writing board with markers/erasers
   • Appropriate audiovisual equipment
   • Appropriate audiovisual materials

REFERENCES:

   • Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION:

Forced ventilation is accomplished by mechanical blowers, fans, or fog streams. The fact that forced ventilation is effective and can be depended upon for smoke removal when other methods are not adequate proves its value and importance. The fire fighter will be called upon frequently to apply forced ventilation procedures.
I. WHEN TO USE FORCED VENTILATION
   A. There is no set rule for determining when to use
   B. Some of the situations that indicate the need for forced ventilation are
      1. When the type of construction is unsuitable for natural ventilation
      2. When the fire is below ground
      3. Tunnels, buildings, basements, and other enclosures

II. STEPS FOR SUCCESSFUL FORCED VENTILATION
   A. Start ventilation as soon as hoselines are set to attack the fire
   B. Place the ejector at an outside opening that is closest to the fire
   C. Place ejector as high as possible, for maximum effectiveness
   D. Use the wind to your advantage
   E. Place ejector the proper distance from opening to prevent recirculation
   F. Remove items such as draperies and screens which might interfere with air flow
      1. Try to prevent churning
   G. Provide unobstructed replacement - air openings

What are some essential steps for successful forced ventilation?
III. ADVANTAGES AND DISADVANTAGES OF FORCED VENTILATION

A. Advantages
1. Ensures more positive control of air movement
2. Supplements natural ventilation
3. Speeds removal of contaminants
4. Can be used where other methods fail
5. Reduces smoke damage
6. Promotes good public relations
7. Facilitates rapid rescue

B. Disadvantages
1. Can move fire along with the smoke and extend the fire laterally
2. Can cause fire spread by increasing air supply
3. Is dependent upon power
4. Requires additional personnel
5. Requires special equipment

Can you list some of the advantages of forced ventilation?

What are some of the disadvantages?

What are the primary differences between positive pressure and negative pressure ventilation?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Mechanically blowing fresh air into the space in sufficient volume to force the contaminated atmosphere out the exit opening</td>
<td></td>
</tr>
<tr>
<td><strong>NOTE:</strong> This topic is discussed in lesson plan 12 in further detail.</td>
<td></td>
</tr>
<tr>
<td><strong>B.</strong> Negative pressure ventilation</td>
<td></td>
</tr>
<tr>
<td>1. Air pressure inside the structure is less than outside</td>
<td></td>
</tr>
<tr>
<td>2. Use smoke ejectors to develop artificial circulation and pull smoke out of a structure</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

There is no set rule for determining when to use forced ventilation. There are advantages and disadvantages to forced ventilation. The fire fighter must become familiar with all types of ventilation and be able to apply them to the appropriate situation.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Ventilation*, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles and procedures of horizontal ventilation by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION: Horizontal ventilation is a method that may prove to be more effective for a particular situation or it may be used in conjunction with other methods. In addition to selecting the method of ventilation, a fire fighter must determine how, when, and where it will serve its most useful purpose.
I. DETERMINING NEED FOR HORIZONTAL VENTILATION

A. Building type, design, and occupancy
   1. Number and size of wall openings
   2. Number of stories
   3. Availability and involvement of exterior fire escapes
   4. Exposures
   5. Wind direction

B. Structures where horizontal ventilation normally applies
   1. Residential buildings in which fire has not involved attic area
   2. Buildings with windows high up the wall, near the eaves
   3. Attics of residential buildings that have louvered vents in walls
   4. Involved floors of multistoried structures
   5. Buildings with large unsupported open spaces under the roof
      a) In which fire is not contained by fire curtains
      b) In which structure has been weakened by the effects of burning
         1) Generally, when a fire has been burning for 20 minutes, the roof can be considered unsafe
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
</table>

C. Location and extent of the fire

1. Many aspects of vertical ventilation may also apply to horizontal ventilation

2. Procedures to follow will be influenced by location and extent of the fire

3. Horizontal extension may occur

   a) Through wall openings by direct flame contact
   b) Through walls and interior partitions by direct flame contact
   c) Through walls by conduction of heat through beams, pipes, and other objects
   d) Through heat transfer by convection
   e) Through corridors, halls, or passageways by convected air currents, radiation, and flame contact
   f) Through open space by radiated heat or convected air currents
   g) In all directions by explosion or flash burning of fire gases, flammable vapors, or dust
   h) Through air conditioning and heating ducts
   i) Through plenums

<table>
<thead>
<tr>
<th>APPLICATION</th>
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</thead>
</table>

What must we know regarding fire conditions in the building?

How does horizontal extension occur?
What happens if fire walls are breached?

<table>
<thead>
<tr>
<th>D. Breaching fire walls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be careful not to breach or make openings in fire walls</td>
<td></td>
</tr>
<tr>
<td>2. Possibility of drawing heat, smoke, and gases through fire walls</td>
<td></td>
</tr>
<tr>
<td>3. Keep fire walls intact</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E. Exposures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Horizontal ventilation requires some routing</td>
<td></td>
</tr>
<tr>
<td>a) Be aware of internal as well as external exposures</td>
<td></td>
</tr>
<tr>
<td>b) Do not route smoke and gases through passageways occupants will be using for evacuation</td>
<td></td>
</tr>
<tr>
<td>2. Outside exposure</td>
<td></td>
</tr>
<tr>
<td>a) As discussed in vertical ventilation</td>
<td></td>
</tr>
<tr>
<td>b) As well as those that are peculiar to horizontal ventilation</td>
<td></td>
</tr>
<tr>
<td>c) Air conditioning of adjacent buildings</td>
<td></td>
</tr>
<tr>
<td>d) Consider upper story windows, and eave openings</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F. Weather conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Primary consideration</td>
<td></td>
</tr>
<tr>
<td>2. Wind</td>
<td></td>
</tr>
<tr>
<td>a) Important role</td>
<td></td>
</tr>
</tbody>
</table>

When employing horizontal ventilation, what weather conditions should be given considerations?
b) Windward versus leeward
   1) Leeward preferred

c) When no wind is present, horizontal ventilation may not be very effective
d) If too windy, could create problem with exposures or fanning the fire

3. Humidity
   a) High humidity could hinder ventilation
   b) Tends to keep products of combustion from rising

4. Temperature inversions
   a) Also known as night inversions
   b) A layer of cool air at or just above ground level
   c) Affects behavior of smoke and fire gases
      1) Smoke will rise until its temperature matches that of the surrounding air
      2) It will then become layered and extend horizontally
   d) Air temperature increases with elevation
      1) Temperature differences may be as much as 25°F in 250 vertical feet

G. Using windows
   1. Open top windows on leeward side
   2. Open lower windows on windward side
   3. Remove screens, curtains, drapes, and blinds
H. Breaking windows

1. Always try opening a window first
2. If necessary to break a window, entire pane should be broken out and sash cleared

a) To obtain maximum effect for venting and reduce chances of injury from glass

3. Use flat side of axe blade
4. Stand to one side of window, preferably upwind
5. Hold handle of tool higher than blade
6. Use appropriate personal protective equipment
7. Upper story windows broken from a ladder

a) Fire fighter can use pike pole
8. Break top section of window first
9. Stay clear of path of escaping smoke and heat
10. Watch for crews working below
11. Break out entire pane, clear all shards from window

I. Thermoplastic windows (Plexiglas®/Lexan®)
1. Can create difficulties
2. Remove or cut by using circular saw with medium tooth blade
3. If no saw is available, try striking pane in center with sledge hammer
   a) This will not break the pane, but may bow it enough for it to slip from its frame

4. Use the point of a pick headed axe to score an "X" in the center of the pane, and strike the center of the "X" with the point of the pick head

What can obstruct horizontal ventilation?

J. Obstructions to horizontal ventilation
   1. Buildings that contain a large number of rooms
   2. Walls and partitions
   3. Stacks of stored materials

What are some precautions to protect established horizontal ventilation?

K. Precautions against upsetting established horizontal ventilation
   1. Be careful not to block or close openings that channel fresh air into the area that is being ventilated
   2. May be upset if additional openings are made that rechannel the air currents that are supposed to be ventilating the area
   3. Improper use of forced ventilation
   4. Improper direct fire streams
   5. Improper placement of salvaged contents with salvage covers covering items and obstructing air current
SUMMARY:

Horizontal ventilation can be advantageous for certain fire conditions. Building types, building design and occupancy characteristics will help to determine the best method to use. Generally, horizontal ventilation works well in residential structure fires. Weather conditions, exposures, and construction features all need to be considered before starting horizontal ventilation.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CONSEQUENCES OF IMPROPER HORIZONTAL VENTILATION

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

   Condition: A written test

   Behavior: The student will confirm a knowledge of the consequences of improper horizontal ventilation by completing the written test

   Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION: One of the first considerations of fire fighters at any emergency is the safety of fire fighters and victims. In a structure fire, restoring a tenable atmosphere in the structure through the early and effective use of ventilation will help to minimize hazards and reduce loss.
## I. CONSEQUENCES

A. Involvement of exposures
B. Life hazards to fire fighter
   1. Backdraft
   2. Flashover
C. Ventilation delayed
   1. Hampers fire fighting efforts
   2. Hampers life saving and rescue
D. Public criticism
E. Exposure of victims to heat, smoke, and toxins

## II. IMPROPER VENTILATION PROCEDURES

A. Opening too fast
   1. Hoseline not in place
   2. Horizontal ventilation should be coordinated and in conjunction with fire attack
B. Opening too slow
   1. Smoke, heat, and steam pushed back onto suppression crew
C. Opening wrong place
   1. Delay in fire fighting efforts
   2. Increased fire spread
D. Insufficient openings
E. Too many openings
   1. Lose ventilation efforts
What happens if structure is vented on windward side?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Ventilating on windward side of building</td>
<td></td>
</tr>
<tr>
<td>1. Air movement can drive fire spread</td>
<td></td>
</tr>
<tr>
<td>2. Drive smoke, heat, and fire onto suppression crew</td>
<td></td>
</tr>
<tr>
<td>G. Application of water to ventilation hole</td>
<td></td>
</tr>
<tr>
<td>1. Should never be done</td>
<td></td>
</tr>
<tr>
<td>2. Spreads fire, heat, and smoke</td>
<td></td>
</tr>
<tr>
<td>3. Can hinder rescue efforts</td>
<td></td>
</tr>
<tr>
<td>4. Hinders suppression efforts</td>
<td></td>
</tr>
<tr>
<td>H. Failure to clear ventilation openings</td>
<td></td>
</tr>
<tr>
<td>1. Windows</td>
<td></td>
</tr>
<tr>
<td>a) Screen</td>
<td></td>
</tr>
<tr>
<td>b) Curtains</td>
<td></td>
</tr>
<tr>
<td>c) Broken glass</td>
<td></td>
</tr>
<tr>
<td>I. Doors</td>
<td></td>
</tr>
<tr>
<td>1. Ensure doors are kept fully open and secure from accidental closure</td>
<td></td>
</tr>
<tr>
<td>J. Personnel</td>
<td></td>
</tr>
<tr>
<td>1. Ensure personnel are clear of ventilation openings</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

To successfully and effectively make use of horizontal ventilation techniques, one must have an understanding of proper ventilation procedures. Understanding the implications of improper ventilation will enable the fire fighter to anticipate the outcome, and make corrections needed.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Ventilation*, IFSTA, Seventh Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO PERFORM HYDRAULIC VENTILATION WITH A FOG NOZZLE

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

**Condition:** A charged hoseline with fog nozzle, a smoke-filled room with window or door opening, smoke generating device, and appropriate personal protective equipment

**Behavior:** The student will perform hydraulic ventilation using a fog nozzle

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Charged hoseline with fog nozzle
- Smoke-filled room with window or door opening
- Smoke generating device
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

PREPARATION: Forced ventilation can be accomplished by using a fog stream directed through an opening. This method, known as hydraulic ventilation, is the simplest form of forced ventilation. Although this method of ventilation may increase water damage and tax limited water supplies, it can be used to quickly improve conditions for both fire fighters and victims.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enter smoke-filled room</td>
<td>1a. Charged hoseline</td>
</tr>
<tr>
<td>2. Open window or door</td>
<td>2a. Fully</td>
</tr>
<tr>
<td>3. Chock window or door</td>
<td>4a. Standing 2 feet away</td>
</tr>
<tr>
<td>4. Open fog nozzle</td>
<td>b. Directed through window or door opening</td>
</tr>
<tr>
<td>5. Position fog stream</td>
<td>c. 30°-60° fog pattern</td>
</tr>
<tr>
<td>6. Observe ventilation effect</td>
<td>5a. Covering 85%-90% of opening</td>
</tr>
<tr>
<td></td>
<td>6a. Adjusting position of nozzle as necessary</td>
</tr>
<tr>
<td></td>
<td>b. Obtaining maximum effect</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CONSIDERATIONS GIVEN VERTICAL VENTILATION OPENINGS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of considerations given vertical ventilation openings by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION: Other than rescue, there is no step more important in fire fighting than timely, proper and adequate ventilation. A prompt and aggressive approach to ventilation is essential to control the hot, smoky, potentially large loss fire. Neglected, improperly performed, inadequate, late, or premature ventilation procedures can negate the rest of the fire fighting operation.
### I. CONSTRUCTION FEATURES

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Shaft</td>
</tr>
<tr>
<td>B.</td>
<td>Skylight</td>
</tr>
<tr>
<td>C.</td>
<td>Ducts</td>
</tr>
<tr>
<td>D.</td>
<td>Roof openings</td>
</tr>
</tbody>
</table>

**E.** Prior knowledge through pre-incident planning is essential

1. Construction
2. Occupancy
3. Fire loading

### II. ROOF STYLES

<p>| | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| A. | Three basic types
   1. Flat
   2. Pitched
   3. Arched |

**B.** Flat roofs

1. Common in mercantile, commercial, apartment and public buildings

**C.** Pitched roofs

1. Common in single family dwellings and churches

---

**Why is pre-incident planning important?**

**What are three types of basic roof styles?**

**Where are flat roofs found?**

**Where are pitched roofs found?**
Where are arched roofs commonly found?

D. Arched roofs
   1. Common on older supermarkets, warehouses, and bowling alleys

III. SPECIFIC CONSIDERATION FEATURES FOR FLAT ROOF CONSTRUCTION

A. Conventional
   1. 2"x4" or 2"x12" rafters covered by 1"x6" sheathing or plywood

B. Engineered truss joists
   1. Used in new open construction
   2. Extreme caution should be used when working on these roof supports

C. Panelized roofs
   1. Used for large areas
   2. Roof is covered plywood
   3. Usually has large laminated wood girders with steel supports
      a) Wood beams are attached to these large girders with metal hangers
   4. Usually span width of building and rest on pilasters
      a) A rectangular masonry or concrete column built into a wall

   5. You must recognize these girders by
      a) Sags in plywood
      b) Location of pilasters
      c) Where heavy items are mounted

What is a pilaster?

a) A rectangular masonry or concrete column built into a wall
IV. ROOF VENTILATION

A. Over the fire

1. If too far away, may cause spread or extension of fire

B. Highest part of the roof on the leeward side

C. Look for hot spots, melted tar, or discoloration to indicate position of fire

D. Consider existing openings

E. Select and take aloft the proper tools to effect venting

F. Coordinate with attack crews

G. Work toward safe area

1. Avoid placing hole between yourself and your escape route

H. Make sure opening is large enough

1. Minimum of 4 feet x 4 feet

I. Do not cut support beams

J. Remember to open ceilings

K. Determine factors of hole size

1. Size of building

2. Hole should be equal to 10% of the area to be vented

3. Example

   a) Room size

   1) 10'x20' = 200 square feet (total area)
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Percentage</td>
<td></td>
</tr>
<tr>
<td>1) 10% of 200 square feet = 20 square feet</td>
<td></td>
</tr>
<tr>
<td>c) Hole size</td>
<td></td>
</tr>
<tr>
<td>1) 5'x4' = 20 square feet (total area)</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Ventilation reduces heat and smoke damage, allows less water to be used, allows prompt salvage operation, reduces rescue problems, reduces exposure hazards, and reduces hazards to fire fighters.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Ventilation*, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** PRINCIPLES AND PROCEDURES FOR VENTILATING VARIOUS ROOF DESIGNS

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.11

**BEHAVIORAL OBJECTIVE:**

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of principles and procedures for ventilating various roof designs by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition

**PREPARATION:** Ventilation of fires vertically is desirable as it helps confine the fire to a given area within a building and stops horizontal spread of fire to adjoining areas. Vertical ventilation removes most smoke and heat from the building quickly and makes it much easier to approach the fire safely. To accomplish this task, it is usually necessary to open up or cut holes in the roof of the involved building.
I. DETERMINING WHERE TO VENTILATE ROOFS
   A. Location of intense fire(s)
   B. Safest, highest point on roof
   C. Direction of wind
   D. Existing exposures
   E. Extent of fire
   F. Obstructions

II. PROCEDURES
   A. Coordinate with ground and attack companies
   B. Use existing openings
      1. Skylights
      2. Monitors
      3. Stairway doors
      4. Scuttle hatches
   C. Cut one large hole rather than several small
   D. Extend blunt object to break out ceiling

III. SAFETY PRECAUTIONS
   A. Two means of escape
   B. Wind direction in relation to exposures
   C. Weight on roof
### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D.</td>
<td>Cutting main structural supports</td>
</tr>
<tr>
<td>E.</td>
<td>Work with wind to back</td>
</tr>
<tr>
<td>F.</td>
<td>Guard opening to prevent falls into building</td>
</tr>
<tr>
<td>G.</td>
<td>Maintain constant communications with Incident Commander</td>
</tr>
</tbody>
</table>
  1. | Coordinate ventilation with suppression |
| H. | Watch for spongy roofs |
  1. | Sound roof with axe, pike pole, or rubbish hook |
| I. | Overhead obstructions |
  1. | Electric wires |
  2. | Guy wires |
| J. | Firm footing |
  1. | Use roof ladder for support |
  2. | Consider lifelines |
| K. | Appropriate personal protective equipment, including SCBA |
| L. | Watch for concealed spaces |

### APPLICATION

What are some common roofs used in commercial and residential structures?

### IV. ROOF DESIGNS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Flat</td>
</tr>
</tbody>
</table>
  1. | Butterfly |
  2. | Mansard |
| B. | Pitched |
  1. | Gable |
  2. | Lantern |
  3. | Hip |
4. Shed
5. Gambrel
C. Concrete
D. Metal
E. Arched

What types of coverings may be found on residential and commercial roofs?

V. TYPES OF ROOF COVERINGS
A. Wood shingles
B. Composition shingles
C. Composition roofing paper
D. Tile
E. Slate
F. Hot mopped
G. Tar and gravel
H. Concrete
  1. Lightweight
I. Light gauge steel
J. Galvanized sheet metal
K. Aluminum

VI. OPENING DIFFERENT TYPES OF ROOFS
A. Flat type roofs
  1. Locate roof supports
     a) Sound roof with axe or rubbish hook
        1) Between rafters or joists, it will sound hollow

How would you find roof supports?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Near or on a support, it will sound dull or solid</td>
<td></td>
</tr>
</tbody>
</table>

2. Mark location  
3. Remove roof covering  
4. Cut wood decking vertically alongside joist  
a) This provides a solid base to prevent bouncing  
5. Remove cut materials  
6. Use pike pole, rubbish hook, or other blunt tool to open ceiling below

B. Pitched roofs  
1. Roof ladder on roof  
2. Sound roof  
3. Use ladder for support  
4. Either side of selected location  
5. Usually highest point of roof  
6. Remove roof covering  
a) Terrazzo tiles, etc.  
7. Cut sheathing along rafter  
8. Cut hole square or rectangular  
9. Remove sheathing  
10. Open hole in ceiling

C. Concrete roofs  
1. Precast slab  
a) Use existing openings when possible  
b) When ventilation is imperative heavy equipment will be needed  
   1) Special training and equipment is necessary  
c) Observe safety precautions
2. Lightweight concrete construction
   a) Same basic procedures as other types of roof
   b) Use power tools
   c) Use natural openings
   d) May be reinforced with steel mesh or rebar

D. Metal roofs
   1. Supported by steel framework
   2. Use metal cutting tools
   3. Prefire plans essential
   4. Normally provided with adequate openings
   5. Observe safety precautions
   6. Cut three sides
   7. Fold back

E. Arched roof
   1. Trussless
      a) Relatively short timbers uniform in length
      b) Beveled and bored at ends
      c) Bolted together
      d) Exerts horizontal pressure
      e) Exerts vertical pressure
      f) Relatively large holes can be cut

   g) Techniques are similar to those used for ventilating flat or pitched roofs, except that a roof ladder cannot always be used

Are similar techniques used for ventilating trussless roofs as ventilating flat or pitched roofs?
2. Bowstring truss roof  
   a) Arched member dependent on all members  
   b) Subjected to bending forces  
   c) Top and bottom chords  
   d) Unvented, concealed space  
   e) Roof will fail if either chord broken  
   f) Trusses connected to trusses  
      1) If one truss fails, pulls rest of trusses down  
      • Domino effect  
   g) Extremely dangerous

Where is bowstring roof construction commonly found?

h) This type of roof construction found in bowling alleys and supermarkets

3. Consider working from an aerial ladder or platform, if available
SUMMARY:

We have discussed roof design and construction. We have also discussed safety precautions and procedures used to open various types of roofs. Vertical ventilation techniques are directly related to roof construction and to vertical openings. An understanding of the more common types of roofs and their construction will allow efficient ventilation practices.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES AND PROCEDURES FOR VERTICAL VENTILATION

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles and procedures of vertical ventilation by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION: After the fire officer has sized-up the building involved, the location and extent of the fire, moved personnel and tools to the roof, observed safety precautions, and selected the place to ventilate, the operation is not yet completed. Vertical ventilation involves all of these factors and many other safety precautions and procedures that the fire officer must consider and practice if the ventilation operation is to be successful.
I. CONSIDERATIONS FOR VERTICAL VENTILATION

A. Coordinate with ground and attack companies

1. The fire may spread rapidly when the building is ventilated
2. Hose crews must be in place before ventilation

B. Observe the wind direction with relation to exposures

1. When the roof is opened, flying brands may extend the fire to other buildings

C. Note the existence of obstructions or weight on the roof

1. Don't cut openings too close to heavy objects
2. Use caution not to cut main structural supports that may be supporting heavy equipment

D. Secure a lifeline to the roof

1. Fire fighter can tie off to it while working on the roof

E. Provide a secondary means of escape

1. Well away from the fire area
2. Make sure all crew members are aware of it

F. Constant communications must be maintained with fire officer at all times during ventilation process

II. OPENINGS

A. Existing roof openings are first choice, if appropriately located

1. Skylights
2. Scuttle hatches
### If you must cut a ventilation hole, which would be better, one large hole or several small holes?

**B. Large holes are preferred**
- 1. Minimum size hole at least 4' x 4'
- 2. As close to the seat of the fire as safely as possible

### What are some visual indications of where the main fire area is?

### III. MAIN FIRE CAN BE LOCATED BY

- **A. Hot spots on roof**
- **B. Melting or bubbling tar**
- **C. "Growing" ventilation pipes**
- **D. Melting snow**

### What are some indications of a weak roof?

### IV. WEAK ROOFS

- **A. Indicators**
  - 1. Spongy roof when you walk on it
  - 2. Roof covering sags so joists can be seen as ridges
  - 3. Smoke seeping between shingles

**NOTE:** Use caution when approaching fire area. Always sound your path of travel.

- 4. Sound roof structure as you go
  - a) Locate and use roof members
If you suspect that the roof is weak, what precautions should you take?

B. Precautions for weak roof
   1. Use a roof ladder for support
   2. Roof ladder provides for secure footing on roof
   3. Avoid walking diagonally across a flat roof
      a) 90° angle rule to bearing wall(s)

C. Always work with the wind at your back
   1. Improves visibility
   2. Helps prevent heat and gases from engulfing fire fighters when the roof is opened

D. Watch roof for changing conditions

When cutting the hole, what precautions should be taken?

V. CUTTING THE HOLE
A. Precautions for cutting hole
   1. Keep other personnel out of range of axe or power tools
   2. Have a charged hoseline ready
   3. Keep firm footing
   4. Watch for weakening structure
   5. Beware of overhead obstructions
   6. Beware of electric wires
   7. Appropriate personal protective equipment, including SCBA
   8. Work towards your escape route

B. Once opened, extend a blunt object at an angle, through the opening, to break out the ceiling below
What precautions must be used when using power tools for ventilation?

C. Precautions for using power tools
   1. Start the tools on the ground first to make sure they operate properly
   2. Never transport the tool while it is running
   3. Make sure the angle of the cut is not toward body
      a) Stay out of line with the power tool

D. When roof operations are completed, evacuate the roof structure, sounding your path of travel
SUMMARY:

In many cases, vertical ventilation must be completed before fire fighting crews can attack the fire. If vertical ventilation is to be successful, the proper procedures and safety precautions must be adhered to. Always have a charged hoseline at the ready, use SCBAs when necessary, work in crews, know the signs of structural weakness, and maintain constant communication with the fire officer.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CONSEQUENCES OF IMPROPER VERTICAL VENTILATION

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the consequences of improper vertical ventilation by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 4

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION:

Ventilation is often the key to the rapid extinguishments of fire and rescue of the victims. Improper ventilation can result in the loss of life and property.
I. IMPROPER VENTILATION PROCEDURES
   A. Opening below fire
   B. Opening too slow
   C. Opening wrong place
   D. Opening into blind attic
   E. Insufficient opening size

What are some consequences of improper ventilation?

II. CONSEQUENCES
   A. Involvement of exposures
   B. Life hazards to fire fighters
   C. Ventilation delayed
   D. Public criticism
   E. Hampers life saving and rescue (first priority)
   F. Allows smoke and toxins to form, trapping victims
   G. Hampers location of seat of fire
   H. Increases chances of flashover or backdraft
   I. Increases chances of injury to fire fighters and victims

What happens when you ventilate on the windward side?

III. VENTILATION ON WINDWARD SIDE OF BUILDING
   A. Can spread fire through building
   B. Drives smoke, heat, and fire back on fire fighters and victims

IV. WATER APPLICATION DOWN VENTILATION HOLE
   A. Should never be allowed
   B. Could spread fire
C. Drives smoke, heat, and gases down on fire fighters and victims
   1. Making conditions untenable
D. Charged hoselines on roof should only be used for fire fighter protection

V. FAILURE TO PUSH OUT CEILINGS OR HIDDEN SPACES
   A. Renders ventilation useless if not completed
   B. Relieves atmosphere trapped in the attic or cockloft only
      1. Not the fire room(s) below
SUMMARY:

We are sometimes reluctant to adopt and use ventilation procedures because of the uncertainty that accompanies them. To successfully and safely perform ventilation, one must have a good understanding of what has happened, and the consequences of poor vertical ventilation.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: USING EXISTING ROOF OPENINGS FOR VERTICAL VENTILATION

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of using existing roof openings for vertical ventilation by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition
- Truck Company Fireground Operations, Harold Richman, Second Edition

PREPARATION:

Once fire fighters have made the determination that vertical ventilation is appropriate and reached the roof, they should first look to existing openings to provide the necessary ventilation. These openings will provide timely ventilation and will improve interior conditions both before and during other roof operations. Existing openings exist in many forms. Scuttle hatches, bulkheads, skylights, monitors, light shafts, and ventilation shafts are some of the more common openings that lend themselves to vertical ventilation. With the exception of light shafts and ventilation shafts, you should expect all of these features to be locked or secured in some way.
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td><strong>I. SCUTTLE HATCHES</strong></td>
<td>Can anyone describe a scuttle hatch?</td>
</tr>
<tr>
<td>A. Square or rectangular metal-covered hatches</td>
<td></td>
</tr>
<tr>
<td>B. Provide access to a roof from an attic, cockloft, or the interior of a building</td>
<td></td>
</tr>
<tr>
<td>C. May include a chase which extends through the attic into the interior of the building</td>
<td></td>
</tr>
<tr>
<td>1. To ventilate attic, chase must also be opened</td>
<td></td>
</tr>
<tr>
<td>D. Usually locked from the inside</td>
<td></td>
</tr>
<tr>
<td><strong>II. BULKHEADS</strong></td>
<td></td>
</tr>
<tr>
<td>A. Enclose top of stairways that terminate on roof</td>
<td>How should these doors be opened?</td>
</tr>
<tr>
<td>B. Usually have metal clad exterior doors</td>
<td></td>
</tr>
<tr>
<td>C. Doors may be forced in same manner as other doors of similar type</td>
<td>How should you ventilate skylights?</td>
</tr>
<tr>
<td><strong>III. SKYLIGHTS</strong></td>
<td></td>
</tr>
<tr>
<td>A. Remove rather than break, if possible</td>
<td></td>
</tr>
<tr>
<td>1. Pry flashing loose on all four sides and remove skylight</td>
<td></td>
</tr>
<tr>
<td>2. Pry three sides and use fourth side as a hinge</td>
<td></td>
</tr>
<tr>
<td>3. Plastic skylights may be cut with an axe or saw</td>
<td></td>
</tr>
<tr>
<td><strong>IV. MONITORS</strong></td>
<td></td>
</tr>
<tr>
<td>A. Square or rectangular structures that penetrate the roof of a building</td>
<td></td>
</tr>
<tr>
<td>B. Provide additional natural light or ventilation</td>
<td></td>
</tr>
</tbody>
</table>
C. May have metal, glass or louvered sides
   1. Glass can be broken
   2. Louvered sides should be cut or forced
D. Monitors with solid sides should have at least two opposite sides hinged at the bottom and held closed at the top with fusible links (open automatically when exposed to high heat)

Why do shafts pose a threat to fire fighters?

V. LIGHT AND/OR VENTILATION (AIR SHAFTS)
   A. Represent a serious hazard to fire fighters
      1. Often open
      2. May be obscured by smoke and/or darkness
   B. Usually do not need to be opened or enlarged

VI. VENTILATORS
   A. Various types
   B. Open into various locations in the building
      1. May ventilate attic, plumbing, kitchen/heating appliances, living spaces, or garages
   C. If ventilators show smoke or fire they should be left alone, as they are functioning correctly

VII. ELEVATOR HOUSES
   A. Motors and equipment used to control an elevator
   B. Usually have doors
   C. May have windows
   D. May have skylights
   E. Ventilate as other similar features
      1. Ventilating reduces accumulation of heat and smoke

What is contained in an elevator house?
SUMMARY:

Although few buildings will have all of the roof openings discussed in this lesson, most will have some of them. These existing openings can be used for rapid ventilation either in place of or in addition to other vertical ventilation operations. Prefire planning and knowledge of building construction will enable crews to efficiently choose which feature to open in order to aid in fire suppression and rescue operation.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF STRIP VENTILATION

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of strip ventilation by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 4

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION: Strip ventilation, previously referred to as trench ventilation, when done properly, will often prevent the horizontal spread of heat, smoke, and fire throughout a large building, thus reducing large property and dollar losses.
I. STRIP VENTILATION

A. Previously called trench ventilation
   1. Defensive tactic to stop the horizontal spread of fire

B. Advantages
   1. Stop the horizontal spread of
      a) Flame
      b) Smoke
      c) Heated gases
   2. Once completed, will allow heat, smoke and flame to escape from the structure
   3. Allows ventilation crew to work away from the seat of the fire

C. Disadvantages
   1. Purely defensive in design and execution
      a) Labor intensive
      b) Time consuming
      c) Based on predicted fire extension

II. SELECTION OF VENTILATION SITE

A. Structural components
   1. Common connection points for wings
   2. Area separations
   3. Cockloft or common attic

What is strip ventilation?
What are some of the advantages and disadvantages of strip ventilation?
How is the ventilation site determined?
B. Exposures

C. Heavy objects on roof
   1. HVAC equipment, etc.

D. Wind

E. Ideally, strip should be a minimum of 4 feet wide and run from exterior wall to exterior wall or from firewall to firewall

III. VENTILATION TACTICS

A. Approach area to be stripped from unburned side
   1. Sound path of travel
   2. 90° angle rule to load bearing walls
   3. Provide for escape routes

B. Ventilation crew properly equipped
   1. Appropriate personal protective equipment, including SCBA
   2. Tools
   3. Communication with IC and Interior Division

C. Monitor roof condition
   1. Sound roof surface as crew advances
   2. Watch for sagging structural members
   3. Look for blisters, smoke venting, spongy-feeling roof, and "growing" vent pipes

D. Determine type of roof construction
   1. Use inspection holes
E. Know location of fire and current extension
   1. Communicate with IC and Interior Division
   2. Use kerf cuts or inspection holes to check on fire extension

F. Choose location for strip ventilation cut
   1. Locate roof support members
   2. Make two parallel cuts
      a) Wall to wall
      b) Starting closest to fire
      c) Avoiding damage to structural support members
      d) Avoid "cutting past" your partner
   3. Remove roof covering and decking
      a) When cuts are completed
      b) Coordinate with IC and Interior Division
   4. Penetrate the ceiling below if necessary

G. Evacuate roof when tactics are competed
   1. Sound path of travel
   2. 90° rule to load bearing walls
   3. Account for all roof personnel
**SUMMARY:**

To successfully and safely perform strip ventilation, one must have a good understanding of ventilation practices, roof construction, and expected fire behavior. Properly implemented in a timely manner, strip ventilation may prohibit horizontal progress of a fire, helping to limit damage, and manage resources.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Ventilation*, IFSTA, Seventh Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:**
PRINCIPLES OF POSITIVE PRESSURE VENTILATION

**TIME FRAME:**
1:00

**LEVEL of INSTRUCTION:**
Level II

**AUTHORITY:**
1997 NFPA 1001 3-3.10

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the principles of positive pressure ventilation by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 10

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Essentials of Fire Fighting*, IFSTA, Fourth Edition
- *Fire Service Ventilation*, IFSTA, Seventh Edition

**PREPARATION:**
Positive pressure ventilation (PPV) has evolved into one of the most effective methods of forced ventilation available to fire fighters. PPV can be employed both during overhaul and during the initial attack phase of fire fighting. When used during overhaul, PPV will dramatically improve conditions within a structure. During initial attack, PPV can supplement natural airflow, significantly improve visibility, and reduce temperature. This will allow hose crews to find and extinguish fires quickly, improving conditions for victims, and reducing property damage.
I. PRINCIPLES OF PPV
   A. Use to supplement natural airflow
      1. Note prevailing wind direction
      2. Do not try to reverse convection
         a) The transfer of heat energy by the movement of heated liquids or gases (heated air and gases rise)
   B. Use high volume fans
   C. Create pressure differential
      1. High pressure inside
      2. Low pressure outside
   D. Smoke seeks an outlet through an opening controlled by fire fighters

II. LOCATION
   A. Outside of building
      1. Fans produce carbon monoxide
   B. At lowest point of building
   C. Cone of air must fully cover opening

III. MANAGING AIRFLOW
   A. Systematic process
      1. Exhaust opening should be smaller than input opening
   2. A single exhaust opening is preferred
      a) Multiple exhaust openings will reduce effectiveness
### 3. If size of exhaust openings exceeds size of input opening positive pressure will be lost

**B. Direct airflow by opening and closing doors**

1. Work one room at a time

**C. Multistory buildings**

1. Apply airflow at lowest level of building

<table>
<thead>
<tr>
<th>How can airflow be directed to floors above ground?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Use stairwells or vertical shafts to direct airflow</td>
</tr>
</tbody>
</table>

2. Work one level at a time

<table>
<thead>
<tr>
<th>How can you direct airflow within a building?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Begin with level most heavily charged with smoke</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b) Open and close doors to direct airflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Smoke can be directed out exterior openings on fire floor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What steps ensure successful PPV operations?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Smoke can be directed up vertical shafts that extend through the roof</td>
</tr>
</tbody>
</table>

### IV. SUCCESSFUL PPV

**A. Good communications**

**B. Discipline**

**C. Building occupants may compromise operations**

1. Occupants leaving building may alter airflow

2. Curious occupants open doors and interfere with operations
3. In large buildings it may be necessary to detail personnel to patrol openings

V. OPERATIONAL CONSIDERATIONS

A. Exhaust openings
   1. PPV is not effective if smoke and heat have nowhere to go
   2. Remove screens, etc.

B. Fan placement
   1. Spot fan so that cone of air covers entire opening
   2. Multiple fans can be used for large openings
      a) Arrangements include side by side, stacked, inline
   3. PPV fans will introduce small amounts of carbon monoxide into buildings (from exhaust)

VI. ADVANTAGES AND DISADVANTAGES OF PPV

A. Advantages
   1. Set up without entering building
   2. Most efficient forced ventilation technique
   3. Fan placement doesn't limit ingress/egress
   4. Effective in very large buildings

B. Disadvantages
   1. Structure must be intact (crews must have the ability to control openings)
   2. Introduces carbon monoxide into structure (exhaust)
   3. May extend hidden fires

How would you set up PPV at a large opening (e.g., roll up door)?
SUMMARY:

PPV can be used during both the initial attack and overhaul phase of structural fire fighting. This technique works by creating a pressure differential between the inside and the outside of a structure, moving the byproducts of combustion outside through openings controlled by firefighters. Positive pressure fans should be placed outside the building at the lowest point possible. Fans should be positioned so that the cone of air they generate covers the input opening, fully. PPV is a systematic process that requires good communication and discipline to be successful. Before setting up PPV, you should ensure that the attack crew is ready to enter the building and that there is an exhaust opening in the building. PPV allows very large building to be quickly ventilated and can reduce property damage and improve interior conditions.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** HOW TO OPERATE A POSITIVE PRESSURE VENTILATION FAN

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.10

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A positive pressure ventilation fan, appropriate personal protective equipment, and a suitable structure
- **Behavior:** The student will demonstrate positive pressure ventilation of a structure
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Positive pressure ventilation fan
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 10
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

**PREPARATION:** Mechanical ventilation can be an important asset to fire suppression, rescue, and overhaul activities. Positive pressure ventilation lends itself well due to control and effectiveness. When used properly, positive pressure ventilation allows crews to work effectively and safely.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place blower</td>
<td>1a. Outside &quot;point of entry&quot;</td>
</tr>
<tr>
<td></td>
<td>b. Using proper lifting methods</td>
</tr>
<tr>
<td></td>
<td>c. Considering wind current direction</td>
</tr>
<tr>
<td></td>
<td>d. Without impeding ingress or egress</td>
</tr>
<tr>
<td></td>
<td>e. Blower orientation</td>
</tr>
<tr>
<td>2. Choose exhaust opening</td>
<td>2a. Observing point of entry</td>
</tr>
<tr>
<td></td>
<td>b. Exposures</td>
</tr>
<tr>
<td></td>
<td>c. Considering wind current direction</td>
</tr>
<tr>
<td></td>
<td>d. Size</td>
</tr>
<tr>
<td>3. Open exhaust opening</td>
<td>3a. Coordinate with crews</td>
</tr>
<tr>
<td></td>
<td>b. Contact IC</td>
</tr>
<tr>
<td>4. Remove obstacles</td>
<td>4a. To air flow</td>
</tr>
<tr>
<td></td>
<td>b. Doors, curtains, windows, screens, and personnel</td>
</tr>
<tr>
<td>5. Remove loose items</td>
<td>5a. Paper, etc.</td>
</tr>
<tr>
<td>6. Start ventilation fan</td>
<td>6a. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>7. Position fan</td>
<td>7a. For maximum effectiveness</td>
</tr>
<tr>
<td></td>
<td>b. Checking cone of air</td>
</tr>
<tr>
<td>8. Demonstrate routing of air flow</td>
<td>8a. Using windows</td>
</tr>
<tr>
<td></td>
<td>b. Interior doors</td>
</tr>
<tr>
<td>9. Secure ventilation</td>
<td>9a. Coordinate with IC and Interior Division</td>
</tr>
<tr>
<td></td>
<td>b. In accordance with manufacturer's recommendations and directions</td>
</tr>
<tr>
<td>10. Restore blower</td>
<td>10a. Using proper lifting techniques</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO USE A SMOKE EJECTOR TO FORCE VENTILATION THROUGH A HORIZONTAL OPENING

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.10

BEHAVIORAL OBJECTIVE:

Condition: A smoke ejector, straight ladder, plastic sheeting, plywood or tarps, a horizontal surface with an opening, and appropriate personal protective equipment

Behavior: The student will use a smoke ejector to force ventilation through a horizontal opening

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Smoke ejector
- Straight ladder
- Plastic sheeting, plywood, or tarps (adequate to cover opening)
- Horizontal surface with an opening (3 feet x 3 feet minimum)
- Appropriate personal protective equipment

REFERENCES:


PREPARATION:

Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for negative pressure ventilation. A sound knowledge of the various ways in which these tools can be deployed will allow you to adapt the use to most situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Centered over opening</td>
</tr>
<tr>
<td></td>
<td>b. On beams</td>
</tr>
<tr>
<td>2. Position smoke ejector</td>
<td>2a. On ladder</td>
</tr>
<tr>
<td></td>
<td>b. Centered over opening</td>
</tr>
<tr>
<td></td>
<td>c. Discharge side up</td>
</tr>
<tr>
<td>3. Place plastic sheeting, plywood, or tarps</td>
<td>3a. Around smoke ejector</td>
</tr>
<tr>
<td></td>
<td>b. Covering opening</td>
</tr>
<tr>
<td></td>
<td>c. Preventing recirculation or &quot;wraparound&quot; effect</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO HANG A SMOKE EJECTOR OUTSIDE A WINDOW USING A LADDER

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3-10

BEHAVIORAL OBJECTIVE:

Condition: A smoke ejector, straight ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will hang a smoke ejector outside a window using a ladder

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Smoke ejector
- Straight ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

PREPARATION: Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for negative pressure ventilation. A sound knowledge of the various ways in which these tools can be deployed will allow you to adapt the use to most situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Top of ladder approximately 4 rungs above window top</td>
</tr>
<tr>
<td></td>
<td>b. Centered over opening</td>
</tr>
<tr>
<td></td>
<td>c. At a 45° angle</td>
</tr>
<tr>
<td>2. Open window</td>
<td>2a. From top, if possible</td>
</tr>
<tr>
<td>3. Lift and hang smoke ejector</td>
<td>3a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. At top of opening</td>
</tr>
<tr>
<td></td>
<td>d. As close to window as possible</td>
</tr>
<tr>
<td></td>
<td>e. Hooks over appropriate ladder rung</td>
</tr>
<tr>
<td></td>
<td>f. Discharge side facing out</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO HANG A SMOKE EJECTOR IN A HALL OR ARCHWAY

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3-10

BEHAVIORAL OBJECTIVE:

Condition: A smoke ejector, straight ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will hang a smoke ejector in a hall or archway

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Smoke ejector
- Straight ladder
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

PREPARATION: Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for negative pressure ventilation. Sound knowledge of the various ways in which these tools can be deployed will allow you to adapt the use to most situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position ladder</td>
<td>1a. Diagonally across opening</td>
</tr>
<tr>
<td></td>
<td>b. Top of ladder to top corner of opening</td>
</tr>
<tr>
<td></td>
<td>c. Foot of ladder to opposite lower corner</td>
</tr>
<tr>
<td>2. Lift and hang smoke ejector</td>
<td>2a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. On its side</td>
</tr>
<tr>
<td></td>
<td>d. Hook on top ladder rung</td>
</tr>
<tr>
<td></td>
<td>e. Near top of opening</td>
</tr>
<tr>
<td></td>
<td>2b. Discharge side facing out</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO HANG A SMOKE EJECTOR IN AN A-FRAME

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3-10

BEHAVIORAL OBJECTIVE:

Condition: Smoke ejectors, straight ladders, webbing or rope, and appropriate personal protective equipment

Behavior: The student will construct an A-frame and hang smoke ejectors

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Five smoke ejectors
- Two straight ladders
- Fifteen 1-foot lengths of webbing or rope
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

PREPARATION: Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for negative pressure ventilation. A sound knowledge of the various ways in which these tools can be deployed will allow you to adapt the use to most situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select location</td>
<td>1a. Area best suited for smoke removal</td>
</tr>
<tr>
<td></td>
<td>b. Do not obstruct access routes</td>
</tr>
<tr>
<td></td>
<td>c. Power source available</td>
</tr>
<tr>
<td>2. Position ladders</td>
<td>2a. Tops of ladders crossed</td>
</tr>
<tr>
<td></td>
<td>b. Ladder at approximately 45° angle</td>
</tr>
<tr>
<td>3. Lash ladders</td>
<td>3a. With rope or webbing</td>
</tr>
<tr>
<td></td>
<td>b. Joining ladder tips</td>
</tr>
<tr>
<td>4. Secure ladders</td>
<td>4a. With rope or webbing</td>
</tr>
<tr>
<td></td>
<td>b. At approximately the third rung from the bottom</td>
</tr>
<tr>
<td></td>
<td>c. Preventing ladders from spreading</td>
</tr>
<tr>
<td>5. Lift and hang first smoke ejector</td>
<td>5a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. Between ladders</td>
</tr>
<tr>
<td></td>
<td>d. As high as possible</td>
</tr>
<tr>
<td></td>
<td>e. Hooks over one rung on each ladder</td>
</tr>
<tr>
<td></td>
<td>f. Discharge side facing out</td>
</tr>
<tr>
<td>6. Lift and hang additional smoke ejectors</td>
<td>6a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. On their sides</td>
</tr>
<tr>
<td></td>
<td>d. Facing the same direction</td>
</tr>
<tr>
<td></td>
<td>e. On flat side of either ladder (against rungs)</td>
</tr>
<tr>
<td></td>
<td>f. Hooks over appropriate ladder rung</td>
</tr>
<tr>
<td></td>
<td>g. 3-4 additional smoke ejectors may be hung in this manner</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO HANG A SMOKE EJECTOR IN A DOOR OR WINDOW CASING

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3.3-10

**BEHAVIORAL OBJECTIVE:**

**Condition:** A smoke ejector, door or window casing, and appropriate personal protective equipment

**Behavior:** The student will hang a smoke ejector in a door or window casing

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Smoke ejector
- Door or window casing (with opening free of obstructions)
- Appropriate personal protective equipment

**REFERENCES:**
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

**PREPARATION:** Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for negative pressure ventilation. A sound knowledge of the various ways in which these tools can be deployed will allow you to adapt their use to most situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hooks</td>
<td>1a. Centered on handle</td>
</tr>
<tr>
<td>2. Grasp hooks</td>
<td>2a. With hook openings away from you</td>
</tr>
<tr>
<td>3. Lift and hang smoke ejector</td>
<td>3a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. With hooks on casing</td>
</tr>
<tr>
<td></td>
<td>d. To one side of opening</td>
</tr>
<tr>
<td></td>
<td>e. Discharge side facing out of the structure</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO HANG A SMOKE EJECTOR ON A LADDER IN A STAIRWAY

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3-10

BEHAVIORAL OBJECTIVE:

Condition: A smoke ejector, straight ladder, appropriate personal protective equipment, and a suitable structure

Behavior: The student will hang a smoke ejector on a ladder in a stairway

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

• Job breakdown
• Smoke ejector
• Straight ladder
• Appropriate personal protective equipment
• Suitable structure

REFERENCES:

• Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

PREPARATION: Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for Negative Pressure Ventilation. A sound knowledge of the various ways in which these tools can be deployed will allow you to adapt the use to most situations.
1. Position ladder
   1a. Appropriately sized ladder
   b. To one side of stairwell
   c. Top of ladder above door opening
   d. Approximately 45° angle
   e. Do not block access

2. Lift and hang smoke ejector
   2a. Using legs
   b. Back straight
   c. Top of smoke ejector even with top of door opening
   d. Ejector laying flat on ladder
   e. Hooks over appropriate ladder rung
   f. Discharge side facing out
   g. Electric cord to one side of stairwell
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:**
HOW TO HANG A SMOKE EJECTOR FROM THE TOP OF A DOOR

**TIME FRAME:**
0:15

**LEVEL OF INSTRUCTION:**
Level II

**AUTHORITY:**
1997 NFPA 1001 3.3-10

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A smoke ejector, door chock, appropriate personal protective equipment, and a suitable structure
- **Behavior:** The student will hang a smoke ejector from the top of an open door
- **Standard:** Completing all operations within _________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Smoke ejector
- Door chock
- Appropriate personal protective equipment
- Suitable structure

**REFERENCES:**
- Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

**PREPARATION:**
Smoke ejectors have been used in the fire service for many years. When used properly they can be valuable tools in ventilation operations. Most often, smoke ejectors are used in exit openings for negative pressure ventilation. A sound knowledge of the various ways in which these tools can be deployed will allow you to adapt their use to most situations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open door</td>
<td>1a. Perpendicular to opening</td>
</tr>
<tr>
<td>2. Chock door</td>
<td></td>
</tr>
<tr>
<td>3. Position hook</td>
<td>3a. Centered on handle</td>
</tr>
<tr>
<td>4. Lift and hang smoke ejector</td>
<td>4a. Using legs</td>
</tr>
<tr>
<td></td>
<td>b. Back straight</td>
</tr>
<tr>
<td></td>
<td>c. Centered on hook</td>
</tr>
<tr>
<td></td>
<td>d. Flat side against door</td>
</tr>
<tr>
<td></td>
<td>e. Perpendicular to door</td>
</tr>
<tr>
<td></td>
<td>f. Discharge side facing out</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** USING FLEXIBLE DUCT ATTACHMENT FOR VENTILATION

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.10

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of using a flexible duct attachment for ventilation by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Service Ventilation*, IFSTA, Seventh Edition, Chapter 5

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Fire Service Ventilation*, IFSTA, Seventh Edition

**PREPARATION:** Frequently, modern concrete and steel construction make it extremely costly, if not virtually impossible, to ventilate through the roof. With the use of a flexible duct attached to a smoke ejector, smoke can be removed from confined spaces when other methods are not feasible. Fresh air can be supplied to confined spaces to remove heat and fumes.
Under what conditions can a smoke ejector with a flexible duct attachment be used?

I. USING FLEXIBLE DUCT ATTACHMENT WITH SMOKE EJECTOR
   A. Used to remove smoke or fumes without additional contamination
      1. Hospitals
      2. Schools
      3. Shopping malls
   B. Ventilating confined areas
      1. Basements
      2. Attics
      3. Suspended ceilings
      4. Roofs
      5. Ship holds
      6. Storage bins
      7. Railroad cars, etc.
   C. Supply fresh air
      1. Silos
      2. Below grade
      3. Manholes
      4. Sewers, etc.

D. Depending on application, can be used to push or pull the smoke

NOTE: Have students form different possible applications.

Is the flexible hose attached to intake or exhaust side of smoke ejector?
II. CONSIDERATIONS WHEN USING FLEXIBLE HOSE ATTACHMENT WITH SMOKE EJECTOR
   A. Replacement air supply
   B. Wind direction
   C. Time
   D. Manpower
   E. Exhaust location
      1. Do not exhaust explosive fumes to ignition source
      2. Heavy vapors from low area to low area

III. LESS DAMAGE
   A. Roof ventilation
   B. Breaking skylights
   C. Breaking windows
**SUMMARY:**

At times ventilation can be difficult in confined and below grade areas. It is important for the fire fighter to know different methods of ventilation to handle situations in the most efficient and effective manner.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5* in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: BUILT-IN VENTILATION DEVICES

TIME FRAME: 0:45

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of built-in ventilation devices by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 7

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Manual and various pictures of automatic venting devices

REFERENCES:

- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION:

Built-in ventilation devices are common in large buildings with large expanses of floor. Without provisions for automatic ventilation, these buildings would be vulnerable to extensive, rapid, fire spread and widespread smoke damage. By removing heat and byproducts of combustion, these devices limit property loss, localize damage, and aid in the extinguishment of fires. These devices also pose a potential hazard to fire fighters because they operate automatically and may create large openings in areas where crews are operating.
# Automatic Roof Vents

**A.** Intended to limit the spread of fire

1. Open directly over seat of the fire
2. May eliminate need for additional ventilation

**B.** Activated by smoke detectors or fusible links

1. Fusible links most common
2. Equipped with locking devices to ensure that covers remain open
3. Most can also be opened manually

**C.** Work automatically

1. Heat activated vents may not open when sprinkler head discharges near them
2. May be dangerous to force open because of spring loaded mechanism

**D.** Highest point of the roof

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# Atrium Vents

**A.** Used in high rise hotels and office buildings

**B.** Located in center of building

**C.** Usually equipped with automatic vents

**D.** Serious safety hazard in dark smoky conditions

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# Monitors

**A.** Rectangular structures that penetrate roof of building

**B.** Sidewalls

1. Glass
   
   a) Break glass to ventilate, if heat has not caused glass to break
2. Solid side  
   a) Two opposite sides usually hinged at bottom  
   b) Fusible link at top  

3. Louvered  
   a) Force or cut louvers  

**IV. SKYLIGHTS**  
A. May be glass, wired glass, or thermoplastic  
   1. Glass or thermoplastic may vent due to heat  
   2. Wired glass will have to be removed  
B. May be equipped with a fusible link and open automatically  

**V. CURTAIN BOARDS (DRAFT CURTAINS)**  
A. Fire resistive material  
B. Extend down from ceiling  
   1. 20% of vertical distance from ceiling to floor  
   2. Not lower than 10 feet from floor  
C. Limit horizontal spread of smoke and heat  
D. Concentrate smoke and heat under automatic vents and other fire protection systems
SUMMARY:

Built-in ventilation devices are designed to limit damage from smoke and heat by opening automatically in the event of a fire. These ventilation devices include automatic roof vents, atrium vents, monitors, skylights, and curtain boards. These devices may be activated by heat (with a fusible link) or by smoke detectors. Most of them can also be opened manually. Automatic vents may not open if sprinklers are discharging nearby. Because these devices are spring loaded or activated by a counterweight, forcing them open may be dangerous. Curtain boards are often installed in building to control the lateral spread of heat and smoke and concentrate the products of combustion beneath the automatic devices.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CONTROLLING THE SPREAD OF SMOKE AND FIRE THROUGH DUCT SYSTEMS

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.10

**BEHAVIORAL OBJECTIVE:**

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of controlling the spread of smoke and fire through duct systems by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Protection Handbook*, NFPA, Eighteenth Edition, Chapter 6

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Fire Service Ventilation*, IFSTA, Seventh Edition

**PREPARATION:** Vertical and horizontal travel of heat, smoke, and fire gases is aided by various openings such as stairways, ductwork, and shaft ways that pierce floors while open stairways are prime extension channels. Vertical travel by other routes should always be considered. If precautions are not taken, the ducts may transport smoke and toxins throughout the area served.
I. PROBLEMS IN DUCT FIRES

A. Should be enclosed and fire stopped at each floor (outside duct housing)

B. Fires in these spaces burn dust as do fires in concealed spaces
   1. Dust and fibers collect in ducts

C. Limited accessibility
   1. Drop ceilings
   2. Crawl ways
   3. Soffits

D. Inherent venting problems
   1. Spread smoke through the system

E. May act as a flue
   1. Chimney effect

F. Can spread fire inside walls, floors, and attics
   1. Convection
   2. Conduction

G. Can carry excessive temperatures from basement to upper floors

H. May ignite flammables they come in contact with

I. Concealed space fires will grow until discovered or detected
   1. Noncombustible
   2. High melting point

What are some problem situations that can occur with duct fires?
II. OUTSIDE FIRE STOPPING MATERIALS
   A. Gypsum board
   B. Sheet metal
   C. Plaster
   D. Brick
   E. Cement grout
   F. Mineral fiber insulation
   G. Ceramic fiber boards

III. IMPROPERLY DESIGNED DUCT SYSTEMS
   A. No exit corridors
   B. Lack of smoke detection
   C. Lack of required fire and smoke dampers in walls, ceilings, and partitions

IV. FIRE DAMPERS
   A. Control spread of fire and smoke
   B. Automatic closing fire damper
   C. Dampers include
      1. Single blade
      2. Multi-blade
      3. Interlocking
      4. Actuated by fusible links
      5. Actuated by smoke detectors

V. PASSIVE AND ACTIVE SMOKE CONTROL
   A. Passive
      1. Fans shutdown
      2. Fire and smoke dampers closed in fire conditions

What materials can be used for fire stopping?
3. May be used to help ventilation
   a) Used with knowledge

B. Active
   1. Uses building
      a) Heating
      b) Ventilation
      c) Air conditioning
   2. Differential pressure
   3. Exhaust products of combustion
   4. May supply fresh air to victim(s)
   5. Integrity of system may be compromised
      a) Burn through of ducts
      b) Fans subjected to heat

VI. PRE-INcIDENT PLANNING
   A. Knowledge of system
      1. Exhaust
      2. Intake
      3. Routing
      4. Controls
      5. Active or passive
   B. Capabilities and limitation of system
      1. Systems will not operate without power
      2. System may be subjected to damage
SUMMARY:

Ducts are to an air conditioning or ventilation system what pipes are to a water system, a means of distribution. If proper design and installation precautions are taken, smoke and fire spread can be prevented. Modern HVAC can help alleviate smoke condition depending on the integrity of the system. Pre-incident planning is essential for effective use of a building's system.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: BELOW-GRADE VENTILATION

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.11

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of below-grade ventilation by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Ventilation, IFSTA, Seventh Edition

PREPARATION:
Fire and the products of combustion travel upward with heat through convection and radiation. To enter a below-grade fire requires passing through this harsh environment in order to reach the seat of the fire. Ventilation techniques for below-grade structures can be difficult, but must be accomplished.
## I. DIFFICULTIES OF BELOW-GRADE VENTILATION

### A. Access
1. Usually limited
2. Connection to first floor
3. External security hardware

### B. Windows
1. Usually small
2. Nonexistent
3. External security hardware

### C. Walls
1. Difficulty in breaching
2. Tight construction

### D. Other openings
1. Usually few
   a) Inadequate for ventilation

### E. Natural ventilation rarely an option

---

## II. OPTIONS FOR VENTILATION

### A. Positive pressure
1. May clear connecting floor of smoke
2. Ventilation crew not subjected to smoke
3. May ventilate basement if exhaust opening is made

### B. Forced ventilation
1. Place blower in opening close to fire

What are some of the difficulties of below-grade ventilation?

What are some options for ventilation of below-grade structures?
2. As high as possible
3. Use wind to advantage

C. Ducted ventilation
   1. Exhaust smoke
   2. Supply fresh air
   3. Prevents contamination of adjacent areas

D. Make ventilation openings
   1. Cut opening in existing floor
      a) Over fire
      b) Under window
   2. Open stem wall
   3. Open available windows
   4. Use other available openings
   5. Make openings opposite of point of entry

What are the guidelines for below-grade ventilation?

III. GUIDELINES FOR BELOW-GRADE VENTILATION
   A. Keep access clear
   B. Watch for exposures
   C. Plan for make-up air
   D. Use full personal protective equipment, including SCBA
   E. Avoid causing fire extension
SUMMARY:

With appropriate equipment and training, ventilation can greatly enhance the safety and performance of the fire fighters. Below-grade structures, and windowless rooms will usually require mechanical ventilation.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Ventilation, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES UNDERLYING THE VARIOUS MODES OF FIRE ATTACK

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the principles underlying the various modes of fire attack by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Command*, Alan V. Brunacini, 1985 Edition, Chapter 3

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:


PREPARATION: It is important for you to understand the principles of various fire attack methods so you can combat fires as safely and efficiently as possible. You should take a systematic approach to the fire fighting operations to eliminate confusion and inconsistency on the fire ground.
## I. MAJOR GOAL
A. To implement an aggressive, well placed, safe and adequate fire attack

## II. MODES OF ATTACK
A. Offensive strategy
   1. Interior attack with related support to quickly bring fire under control
B. Defensive strategy
   1. Exterior attack with related support to stop forward progress and then to control the fire

C. Considerations in determining mode of attack
   1. Fire extent and location
      a) How much and what part of the building is involved?
   2. Fire effect on the building
      a) What are the structural conditions?
   3. Savable victims
      a) Is there anyone alive to save?
   4. Savable property
      a) Is there any property left to save?
5. Entry and tenability
   a) Can fire forces get into building and stay in?

6. Ventilation profile
   a) Can a truck company conduct roof operations?

7. Resources
   a) Are sufficient resources available for the attack?

III. OFFENSIVE PLAN OF ATTACK

A. The purpose is to allow for an interior attack that will confine and control the fire
   1. Command
      a) Must be established and continued throughout the incident
   2. Fast, aggressive interior attack
      a) First arriving forces must immediately begin operations
   3. Support activities
      a) Ventilation, forcible entry and provision of access
   4. Primary search
      a) Rapid, thorough search of the structure and surrounding area for victims
   5. Backup initial attack
      a) Provide backup lines for initial attack crew, then cover remaining exposure
         b) Check for extension above, below, and the exterior sides of the fire

What is a basic offensive plan?
6. Water supply
   a) Provides sufficient water for continued attack

7. Evaluate operations
   a) Review attack success and modify strategy, if necessary

**IV. DEFENSIVE PLAN OF ATTACK**

A. Allows for an exterior attack that will control the fire
   1. Assume command
      a) Quick presence of management
   2. Evaluate fire spread
      a) Decide how much of the structure is a "write-off"
   3. Identify key tactical positions
      a) Decide where to make the stop and position resources accordingly
   4. Prioritize fire streams
      a) Decide the placement order and volume of attack lines necessary to make the stop
   5. Water supply
      a) Provide sufficient water for continued attack
   6. Evaluate operations
      a) Review attack success and modify strategy, if necessary
      b) Call for additional resources

What is the basic defensive plan?
**SUMMARY:**

When the proper attack method is used, the fire is attacked from the correct position with sufficient force to extinguish it. When the size and intensity of the fire are unmanageable, the fire must be attacked from the appropriate direction, with a priority on protecting endangered lives and exposures and stabilizing the forward progress of the fire.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Command*, Alan V. Brunacini, 1985 Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: TYPES OF FIRE STREAMS AND POINT OF APPLICATION FOR CLASS A FIRES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the types of fire streams and point of application for Class A fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 13 and 14

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Stream Practices, IFSTA, Seventh Edition

PREPARATION: The success or failure of a fire fighting crew often depends on the skill and knowledge of the personnel involved in initial attack operations. A well-trained crew of fire fighters with an attack plan and an adequate amount of water, properly applied, will contain most fires.
I. TYPES OF FIRE STREAMS

A. Define in terms of size or volume
   1. Low volume
      a) Small stream
      b) Less than 40 gpm
   2. Handline
      a) 1½"-1¾" handlines or 40-125 gpm
      b) 2½" handlines or 125-350 gpm
      c) Flow in excess of 350 gpm not recommended for handlines
   3. Master stream
      a) Large volume more than 350 gpm
      b) Usually fed by two or more hoselines

B. Fire stream patterns
   1. May be either solid, fog, or broken pattern
   2. Type of fire stream indicates a specific pattern of water needed for a specific job
   3. Two factors are needed to produce an effective fire stream
      a) A pressuring device, hose, an agent, and a nozzle
      b) Sufficient volume to penetrate the heated area

C. Solid steams
   1. Produced from a fixed orifice, smoothbore nozzle
   2. Designed to produce a stream as compact as possible with little shower or spray

What are the types of fire streams you will encounter on the fireground?
3. Recommended nozzle pressure
   a) 50 psi for handlines
   b) 80 psi for master streams

4. Advantages and disadvantages
   a) Advantages
      1) Greater reach
      2) Greater penetration power
      3) Maintains better visibility for fire fighters
      4) Minimizes chance of steam burns to fire fighters and victims
   b) Disadvantages
      1) Provides less heat absorption per gallon delivered
      2) Does not allow for different stream pattern selections

5. Factors affecting reach
   a) Gravity
   b) Friction of the air
   c) Wind

D. Fog streams
   1. Patterned stream composed of very fine water droplets
   2. Fire stream produced by manually adjustable or automatic (constant-pressure) nozzles
   3. May be either straight stream, narrow-angle fog, or wide-angle fog discharge patterns
   4. Straight stream setting
      a) Pattern of forward velocity
      b) Reach varies in proportion to the pressure applied
5. Narrow-angle fog setting  
   a) Greater reach and forward velocity than wide-angle fog

6. Wide-angle fog setting  
   a) Less reach and forward velocity than narrow-angle fog

7. Advantages and disadvantages  
   a) Advantages  
      1) Discharge patterns may be adjusted to suit the situation  
      2) Aids in ventilation  
      3) Dissipates heat by exposing the maximum water surface for heat absorption

   b) Disadvantages  
      1) May contribute to fire spread, create heat inversion, and cause steam burns to fire fighters and victims when improperly used during interior attacks  
      2) More susceptible to wind currents than solid streams

8. Factors affecting reach  
   a) Gravity  
   b) Water velocity  
   c) Fire stream pattern selection  
   d) Water droplet friction with air  
   e) Wind

E. Broken streams  
1. Stream of water that has been broken into coarsely divided drops as it exits the nozzle  
   a) Droplets are larger than fog stream
2. A solid stream may become a broken stream past the point of breakover

3. Fire stream produced by special stream nozzles or by directing two solid streams together in midair
   a) Examples of special broken stream nozzles
      1) Flat spoon-billed
      2) Water curtain
      3) Some rotary distributor nozzles

4. Used most often in confined spaces
   a) Belowground areas
   b) Attics
   c) Wall spaces

5. Absorbs more heat per gallon than a solid stream

6. Has greater reach and penetration than a fog stream

II. STREAM SELECTION
   A. Dependent upon
      1. Fire load and material involved
      2. Volume of water needed/available
      3. Reach needed
      4. Personnel available
      5. Mobility requirements
      6. Tactical requirements
      7. Speed of deployment
      8. Potential fire spread

How do you select the proper stream for an operation?
B. Fire stream affects on thermal layering
   1. Tendency of gases to form into layers according to temperature
      a) Hottest gases in top layer
      b) Cooler gases in lower layer
   2. Also know as heat stratification or thermal balance
   3. Fire stream may disturb thermal layering if
      a) Water is applied directly into top layer causing a rapid conversion to steam
         1) Causes swirling mix of smoke and steam

   4. Effects of disturbing thermal layering
      a) May drop the thermal layer onto fire fighters and cause burns
      b) Forced ventilation must be used to clear area

III. METHODS OF ATTACK

A. Three methods of attack
   1. Direct
   2. Indirect
   3. Combination

B. Direct attack
   1. Most efficient use of water on free-burning fires
   2. Attack made at base of fire
      a) With a solid or straight stream
      b) Using short bursts
         1) Too long of bursts will disrupt thermal layering
C. Indirect attack

1. When unable to enter structure or fire area due to intense conditions
2. Attack not desirable where victims may be trapped or where the spread of fire to uninvolved areas cannot be contained
3. Most dangerous method for personnel in nonventilated environment
4. Nozzle setting range from a 30°-90° pattern
5. Direct the fire stream toward the ceiling
   a) Using solid, straight, or narrow-angle fog pattern
   b) Direct fire stream back and forth
      1) In superheated gases at ceiling level
   c) Produces large quantities of steam that "darkens down" the fire
      1) Shutdown steam before it disturbs thermal layering
6. One cubic foot of water expands to 1,700 cubic feet of steam

D. Combination attack

1. Combines direct and indirect methods
2. Attack commonly made using the "O" pattern
3. "O" pattern
   a) Direct solid, straight, or fog stream at ceiling
   b) Rotate clockwise in circular motion
      1) Stream edge reaching the ceiling, wall, floor, and opposite wall
4. Do not crowd the nozzle fire fighter
   a) Makes nozzle manipulation difficult
SUMMARY:

The success or failure of a fire fighting crew often depends on the skill and knowledge of the personnel involved in initial attack operations. There are several types of fire streams and methods of application. They include solid streams, fog streams, and broken streams. Methods of application will include the direct, indirect, or combination attack methods.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 13 and 14 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: BASIC GUIDELINES FOR INITIAL ATTACK

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.9

BEHAVIORAL OBJECTIVE:

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the basic guidelines for initial fire attack by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Firefighter's Handbook*, Delmar, 2000 Edition, Chapter 19

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:


PREPARATION:

The actions taken in the early stages of the fire have a significant impact on the rest of the incident. The fire fighter must be familiar with basic guidelines for a successful initial attack. This includes knowledge of primary hazards one can expect to find in different types of occupancies.
# I. BASIC RULES OF INITIAL ATTACK

## A. Life safety dictates placement of first line
1. Life safety is first priority
   a) Fire fighters
   b) Civilians
2. If people are trapped
   a) Hoseline is part of rescue
      1) Protects victims and fire fighters
      2) Marks escape route
3. Deployment of lines must be done in conjunction with ventilation

## B. Keep line between fire and occupants
1. Buy time to safely get occupants out

## C. Control stairways
1. Stairs are a vital link
2. Primary means of egress
   a) Elevators not safe
   b) If stairwells are lost
      1) More extreme measures may be needed
         - Requiring additional personnel
3. Most efficient means for getting personnel and equipment to fire floor
4. Stairwells are path for fire extension
   a) Convection can carry fire to distant floors
   b) Particularly a problem with
      1) Unenclosed stairwells
      2) Enclosed stairwells
         • If doors are open

D. If fire is burning out a building keep it moving in same direction
   1. Push a free burning fire that has already vented out a building in the same direction
   2. Trying to force it back
      a) Is slow and difficult
      b) May push fire toward uninvolved areas
   3. Avoid endangering exposures

E. Do vertical and/or horizontal ventilation as appropriate
   1. Type of ventilation depends on
      a) Type of structure
      b) Condition and location of fire
   2. Small fire may only need opening windows
   3. Large fire or attic fire requires cutting hole in roof
   4. Determine how to best remove smoke
      a) While minimizing damage to the structure

F. If hoseline is not advancing
   1. Interior attacks depend on advancing hoselines
      a) If hose is stalled fire will grow
      b) No such thing as a standoff
2. Things that may stop or slow an advancing line
   a) Excessive heat and smoke
      1) Ventilation needed to progress further
   b) Limitations of operations and equipment
      1) Hose too short
      2) Hose too heavy for personnel available
      3) Hose too small for required fire flow
      4) Hose tangled somewhere
      5) Engineer having trouble delivering required volume or pressure

3. Determine problem and keep line advancing

G. Use appropriate size hose from the start
   1. Seldom appropriate to start small and work up

2. Large hose stream applied immediately is
   a) More effective than a small line
   b) Safer for fire fighters

3. If resources are limited it may be necessary to start with smaller lines
   a) Example
      1) Working fire in a remote area with
         • Limited water supplies
         • Extended response time for other units
### Possible problems

#### a) Fire in a high life-hazard occupancy (hospital or nursing home)

1. Serious rescue problem
2. Extinguishing fire quickly can:
   - Eliminate need for rescue
   - Buy time to safely relocate patients to uninvolved areas

#### b) Reduces need for exposure protection

### Normally rescue and exposure protection are higher priorities

What are considered to be high priorities when mitigating a fire incident?
SUMMARY:

A successful initial attack can make a significant impact on the overall operations at an incident. The student must also recognize how actions taken in the first few minutes affect activities that may be required later.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: WHY WATER EXTINGUISHES CLASS A FIRES

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of why water extinguishes Class A fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Stream Practices, IFSTA, Seventh Edition

PREPARATION: The knowledge of proper application of water for extinguishments is vital if a fire fighter is to be successful in safely extinguishing Class A fires.
### I. FIRE TETRAHEDRON

A. The "fire triangle" was used to teach the components of fire for many years
   1. While this simple example was useful, it was not technically correct

B. Extinguishment by cooling

C. Extinguishment by smothering

D. Extinguishment by removal of fuel

E. Interference with the chemical chain reaction

F. Fire tetrahedron versus fire triangle

G. The following four components are actually necessary.
   1. Oxygen
   2. Fuel
   3. Heat
   4. Self-sustained chemical reaction

H. Extinguishment
   1. Extinguishment by cooling
   2. Extinguishment by smothering
   3. Extinguishment by removal of fuel
   4. Interference with the chemical chain reaction

### II. PHYSICAL PROPERTIES OF WATER

A. Water is the most used extinguishing agent

B. Heavy, stable liquid

C. Easily stored and transported

D. Nontoxic

---

**What is the "Fire Tetrahedron?"**

**Differentiate between the "fire triangle" and the "fire tetrahedron."**
E. Noncompressible
F. Ability to absorb large amount of heat

III. LAW OF SPECIFIC HEAT
A. British Thermal Unit (BTU)
   1. Amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit
      a) 970.3 BTUs to convert 1 pound of water to steam
B. Measure of heat absorbing capacity of a substance
   1. Water has specific heat of 1.0

IV. LATENT HEAT OF VAPORIZATION
A. Quantity of heat absorbed by a substance when it changes from a liquid to a vapor
B. Vaporization occurs when fuel gases are generated from the action of heat and the vapors then mix with the air producing an ignitable mixture
C. At 212°F, 1 cubic foot expands approximately 1,700 times its original volume
   1. Greater the temperature the higher the expansion
D. Steam generation will displace smoke and gasses
E. Steam produced also can be an aid to fire extinguishments by smothering
   1. Accomplished when the expansion of steam reduces oxygen in a confined space
V. ADVANTAGES AND DISADVANTAGES OF WATER AS AN EXTINGUISHING AGENT

A. Advantages
   1. Smothering agent when it floats on liquids
      a) Carbon disulfide
      b) Other components that are heavier than water
   2. Greater heat absorbing capacity than any other common extinguishing agent
   3. Relatively large amount of heat required to change into steam
   4. The greater the surface area of the water that is exposed, the more rapidly heat will be absorbed
   5. Water converted into steam occupies several hundred times its original volume

B. Disadvantages
   1. Surface tension
   2. Reactivity with certain materials
   3. Low opacity and reflectivity
   4. Freezing temperature
   5. Low viscosity and conductivity
SUMMARY:

There are several properties of water that must be identified in order to use water as an extinguishing agent. The limitations of water, such as surface tension, reactivity, conductivity, viscosity, opacity, and reflectivity, freezing temperature and specific gravity, need to be clearly understood. Even though there are these limitations, water, when properly used on a Class A fire, is the most available and cost effective extinguishing agent.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY PRECAUTIONS WHEN USING WATER TO EXTINGUISH A FIRE

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of safety precautions when using water to extinguish a fire by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 13

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Fighter Occupational Safety, IFSTA, Second Edition

PREPARATION: Fire fighter safety is of utmost importance when fighting fires. It is critical that everyone observe all safety precautions to ensure that injuries and loss of life are kept to a minimum. There are situations where the use of water can result in unsafe conditions. You must be able to recognize those situations.
What are some of the potential hazards involved with using water in fire suppression?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. HAZARDS</td>
<td></td>
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<tr>
<td>A. Electrical conductivity</td>
<td></td>
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<tr>
<td>B. Reactivity with some fuels</td>
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<tr>
<td>1. Chemicals</td>
<td></td>
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<td>2. Metals</td>
<td></td>
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<tr>
<td>C. Steam generation</td>
<td></td>
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<tr>
<td>D. Slipping</td>
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<tr>
<td>1. Wet surfaces</td>
<td></td>
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<td>2. Ice in freezing weather</td>
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<tr>
<td>E. Fire streams may push fire</td>
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<tr>
<td>II. PRECAUTIONS</td>
<td></td>
</tr>
<tr>
<td>A. Wear appropriate personal protective equipment</td>
<td></td>
</tr>
<tr>
<td>1. SCBA especially important</td>
<td></td>
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<tr>
<td>B. Electrical hazards</td>
<td></td>
</tr>
<tr>
<td>1. Shut-off power</td>
<td></td>
</tr>
<tr>
<td>2. Be careful of where water is sprayed</td>
<td></td>
</tr>
<tr>
<td>C. Reactivity hazards</td>
<td></td>
</tr>
<tr>
<td>1. Chemicals</td>
<td></td>
</tr>
<tr>
<td>a) Water</td>
<td></td>
</tr>
<tr>
<td>1) May actually cause ignition</td>
<td></td>
</tr>
<tr>
<td>2) May spread materials</td>
<td></td>
</tr>
<tr>
<td>3) May cause release of toxic vapor</td>
<td></td>
</tr>
<tr>
<td>b) Watch for placards and labels</td>
<td></td>
</tr>
<tr>
<td>c) Be aware of runoff pollution</td>
<td></td>
</tr>
</tbody>
</table>
What are some examples of a chemical that it might not be advisable to spray water on?

1. Examples
   - Sodium
   - Many pesticides
   - Herbicides
   - Gasoline

2. Metals
   a) May explode or react violently
      1) Sulfuric acid
      2) Magnesium
      3) Calcium carbide
      4) Quicklime
      5) Charcoal
      6) Liquefied chlorine
      7) Sodium
   b) Watch for extremely bright flames
      1) Lithium – red
      2) Zinc – green
      3) Magnesium and most others – white
   c) Do not attack with smaller than 1½” hoselines

D. Steam hazards
   1. Helps to extinguish confined fire but may also hinder rescue activities

Why can steam generation be called a "two-edged sword?"
### PRESENTATION

2. May obscure vision  
3. May burn fire fighters and victims  
4. Wear personal protective equipment  
5. Use only short bursts on indirect attack  
6. Do not use more water than necessary

### APPLICATION

What are some examples of situations where water can cause slippery footing?

#### E. Slip hazards

1. Ice on stairways, curbs, sidewalks  
2. Water on cement or tile can be slippery  
3. May contribute with materials present to cause slip hazards  
   a) Cooking oils  
   b) Soaps  
   c) Produce  
   d) Plasctics  
4. Make sure boots have good soles  
5. Be careful of fire streams that may break containers  
6. Watch where you step

#### F. Fire stream hazards

1. Push fire to unburned areas  
   a) To different parts of structure  
   b) May ignite flammable liquids  
      1) Especially gas  
2. Damage from straight stream to contents
SUMMARY:

There are several hazardous conditions that can be created when using water as an extinguishing agent. The fire fighter must recognize these situations in order to operate in a safe manner. Some of these conditions are electrical, reactivity to chemicals and metals, and slippery products such as soap and oils.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 13 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY PRECAUTIONS WHEN HANDLING HOSELINE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.9 and CCR Title 8, Section 5144

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the safety precautions when handling hoseline by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Various sizes of hoseline
- Couplings

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Fire fighters are injured, at times permanently, from the use of hoseline. You will use hose rolls, carries, and drags everyday. If done improperly, you can hurt others or yourself. Every effort should be made to practice safe hoseline handling.
I. SAFETY PRECAUTIONS WHILE COUPLING AND UNCOUPLING HOSELINE OR NOZZLES
   A. Wear gloves
      1. Avoids cutting hands on exposed male threads
      2. Prevents brass slivers from burrs
   B. Wear appropriate footwear to avoid bruised or crushed toes from dropped coupling(s)
   C. Avoid back injury by lifting with legs when it is necessary to pick up coupling(s)
   D. Do not uncouple hoseline under pressure

II. SAFETY PRECAUTIONS WHILE ROLLING HOSELINE
   A. Wear gloves
   B. Avoid dragging coupling(s)
   C. Be aware of glass in hoseline from parking lot or streets
   D. Ensure proper footing
      1. Holes
      2. Curbs
      3. Slippery surfaces
   E. Be aware of surrounding hazards
      1. Tree branches
      2. Poles
      3. Fences
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Observe traffic conditions if being done in street</td>
</tr>
<tr>
<td>G. Proper lifting techniques</td>
</tr>
<tr>
<td>1. Back straight</td>
</tr>
<tr>
<td>2. Knees bent</td>
</tr>
<tr>
<td>3. Head up</td>
</tr>
<tr>
<td>H. Do not jerk</td>
</tr>
<tr>
<td>1. Use constant pull</td>
</tr>
<tr>
<td>I. Do not attempt to force</td>
</tr>
<tr>
<td>J. Maintain proper grip on hoseline or nozzle</td>
</tr>
<tr>
<td>K. Walk, don't run</td>
</tr>
<tr>
<td>L. Anticipate the hoseline snagging on obstructions</td>
</tr>
</tbody>
</table>

What are some of the safety precautions required while moving a charged hoseline?

<table>
<thead>
<tr>
<th>APPLICATION</th>
</tr>
</thead>
</table>

**III. SAFETY PRECAUTIONS WHILE MOVING CHARGED HOSELINES**

| A. Do not twist back while dragging hoseline                                |
| 1. Lean forward                                                            |
| 2. Use legs                                                                |
| B. Get assistance while pulling hoseline through doorways or around objects|
| 1. Back straight                                                           |
| 2. Knees bent                                                             |
| 3. Head up                                                                |
| C. Proper lifting techniques for lifting couplings                         |
| 1. Easier to extend                                                        |
| 2. Sufficient hoseline to drag                                             |
| 3. Use recognized procedures                                               |
IV. SAFETY PRECAUTIONS WHILE CARRYING HOSELINE

A. Proper lifting techniques
   1. Back straight
   2. Knees bent
   3. Head up

B. Maintain control of coupling(s)
   1. To prevent damage
   2. To prevent injury

C. Balance load to eliminate twisting back

V. SAFETY PRECAUTIONS WHILE WASHING HOSELINE

A. Solid footing on wet ground

B. Wear gloves
   1. To protect hands
   2. Will become slippery when wet

C. Be aware of where hoseline cleaning stream is directed
   1. Wear eye protection
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. In accordance with the manufacturer's recommendations and directions for commercial hoseline washers</td>
</tr>
<tr>
<td>APPLICATION</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Fire fighting is a dangerous job and a good portion of our time is spent handling hoseline, rolling, coupling or uncoupling, moving, carrying, and washing. If a sound heads-up attitude is maintained while dealing with hoseline, injuries can be reduced and/or prevented.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO SAFELY ATTACK AN INTERIOR AND EXTERIOR CLASS A FIRE

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A fire engine with water, charged hoseline with appropriate nozzle, appropriate personnel, appropriate personal protective equipment, and a suitable structure

Behavior: The student will demonstrate how to safely attack an interior and exterior Class A fire

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Fire engine with water
- Charged hoseline with appropriate nozzle
- Appropriate personnel (2 fire fighters required for interior attack)
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 14

PREPARATION: The basic tactics of structural fire fighting are to locate, confine, and extinguish the fire. Improper extinguishment methods can result in a simple room and contents fire becoming a fully involved structure fire or may result in serious injury.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTERIOR ATTACK</strong></td>
<td></td>
</tr>
<tr>
<td>1. Drag hoseline</td>
<td>1a. To objective</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Watching for hazards</td>
</tr>
<tr>
<td>2. Open nozzle bale</td>
<td>2a. To check hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Bleeding air from line</td>
</tr>
<tr>
<td></td>
<td>c. Nozzle pattern set at 30° fog</td>
</tr>
<tr>
<td></td>
<td>d. Adequate volume/pressure for attack</td>
</tr>
<tr>
<td>3. Crouch against building</td>
<td>3a. Near door</td>
</tr>
<tr>
<td></td>
<td>b. Opposite side of hinges</td>
</tr>
<tr>
<td></td>
<td>c. Beneath heat, smoke vapors overhead</td>
</tr>
<tr>
<td></td>
<td>d. In event of backdraft, door will not crush you</td>
</tr>
<tr>
<td>4. Determine entry</td>
<td>4a. At point that limits fire extension or intensification</td>
</tr>
<tr>
<td>5. Feel door</td>
<td>5a. With back of exposed wrist or hand</td>
</tr>
<tr>
<td></td>
<td>b. Special attention to top of door</td>
</tr>
<tr>
<td>6. Open door</td>
<td>6a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. With one hand on nozzle bale</td>
</tr>
<tr>
<td>7. Enter building</td>
<td>7a. With partner</td>
</tr>
<tr>
<td></td>
<td>b. Close to floor</td>
</tr>
<tr>
<td></td>
<td>c. On same side of hoseline</td>
</tr>
<tr>
<td></td>
<td>d. Remaining close to floor throughout attack</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<td>------------</td>
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</tr>
<tr>
<td>8. Locate seat of fire</td>
<td>8a. Looking into every room on the way to the area of fire</td>
</tr>
<tr>
<td></td>
<td>b. Checking for victims or undetected fires that may block your escape route if not dealt with</td>
</tr>
<tr>
<td>9. Probe area ahead of you</td>
<td>9a. With hands or feet</td>
</tr>
<tr>
<td></td>
<td>b. Checking for shafts, holes, or structural weakness</td>
</tr>
<tr>
<td>10. Apply short burst of water</td>
<td>10a. On seat of fire</td>
</tr>
<tr>
<td></td>
<td>b. Using 30° narrow fog pattern</td>
</tr>
<tr>
<td></td>
<td>c. Not splashing or scattering fuels</td>
</tr>
<tr>
<td></td>
<td>d. Until fire darkens or is extinguished</td>
</tr>
<tr>
<td>11. Close nozzle bale</td>
<td></td>
</tr>
<tr>
<td>12. Report on conditions to supervisor</td>
<td></td>
</tr>
<tr>
<td>13. Check area</td>
<td>13a. For burning materials</td>
</tr>
<tr>
<td></td>
<td>b. For hazards to personnel</td>
</tr>
<tr>
<td></td>
<td>c. For hazards to hoseline</td>
</tr>
<tr>
<td>15. Exit building</td>
<td>15a. With partner</td>
</tr>
<tr>
<td></td>
<td>b. Remaining close to the floor</td>
</tr>
</tbody>
</table>

**EXTERIOR ATTACK**

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Drag hoseline</td>
<td>1a. To objective</td>
</tr>
<tr>
<td></td>
<td>b. Using legs</td>
</tr>
<tr>
<td></td>
<td>c. Watching for hazards</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<td>-------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>2. Open nozzle bale</td>
<td>2a. To check hoseline</td>
</tr>
<tr>
<td></td>
<td>2b. Bleeding air from line</td>
</tr>
<tr>
<td></td>
<td>2c. Nozzle pattern set at 30° fog</td>
</tr>
<tr>
<td></td>
<td>2d. Adequate volume/pressure for attack</td>
</tr>
<tr>
<td>3. Apply water</td>
<td>3a. On seat of fire</td>
</tr>
<tr>
<td></td>
<td>3b. Adjusting stream pattern</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding excessive water application</td>
</tr>
<tr>
<td></td>
<td>c. Avoiding disruption to possible evidence</td>
</tr>
<tr>
<td></td>
<td>d. Until fire darkens or is extinguished</td>
</tr>
<tr>
<td>4. Close nozzle bale</td>
<td></td>
</tr>
<tr>
<td>5. Check area</td>
<td>5a. For burning materials</td>
</tr>
<tr>
<td></td>
<td>b. For hazards to personnel</td>
</tr>
<tr>
<td></td>
<td>c. For hazards to hoseline</td>
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</tbody>
</table>
**APPLICATION:**
The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**
The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: METHODS USED TO PROTECT EXPOSURES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the methods used to protect exposures by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Firefighter's Handbook, Delmar, 2000 Edition, Chapter 19

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: After rescue, exposure protection should be a fire fighter's top priority. To be effective, a fire fighter must know the methods for protecting exposures. Protecting exposures may prevent further extension of the fire.
I. FIRE EXPOSURE
   A. An exposure is anything which could be damaged or destroyed by the advance of the fire
   B. Two basic types of exposures
      1. Interior exposures
         a) The areas and contents of a building which are not yet involved
            1) Additional rooms or floors
            2) Stock
            3) Furnishings
      2. Exterior exposures
         a) Those objects beyond the involved structure which are immediately threatened

1) Examples
   • Other buildings
   • Vehicles
   • Vegetation

II. METHODS OF PROTECTING EXPOSURES

A. Aggressive attack on seat of small fire
   1. Usually this will simultaneously protect all interior and exterior exposures
2. May not be effective if fire is extensive and is threatening exposures
3. Exposure protection can be higher priority on larger fires

B. Direct a hose stream on a threatened exposure
   1. Very effective
   2. Presence or absence of steam after water is applied will indicate surface temperature of exposure

3. Be careful heated glass breaks, if suddenly cooled
   a) Cool glass slowly

4. Do not apply water through a window to protect exposures when crews are working inside

What happens to glass if you cool it to quickly?

C. Water curtain between the fire and the exposure
   1. May be effective for cooling brands
   2. Will allow much radiant heat to pass through
   3. Is not effective for cooling exposures unless water is applied to exposure

Where is a water curtain effective?

D. Move the exposure, if possible
   1. Vehicle
   2. Furnishings
   3. Stock

Are there any methods to protect exposures without applying water?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Place salvage covers over haystack or cotton bales for protection from fire brands</td>
<td></td>
</tr>
<tr>
<td>1. The best way to protect haystack is to move the uninvolved hay</td>
<td></td>
</tr>
<tr>
<td>F. Take a hoseline inside an exposed building</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What ways can we protect haystack fires?</td>
</tr>
<tr>
<td>1. Position where fire is likely to enter</td>
<td></td>
</tr>
<tr>
<td>a) Windows and doors</td>
<td></td>
</tr>
<tr>
<td>1) Radiant heat</td>
<td></td>
</tr>
<tr>
<td>b) Any openings</td>
<td></td>
</tr>
<tr>
<td>1) Attic vents</td>
<td></td>
</tr>
<tr>
<td>2) Trailer skirts</td>
<td></td>
</tr>
<tr>
<td>2. Check concealed spaces above and below your position often</td>
<td></td>
</tr>
<tr>
<td>G. Check fire protection systems for proper operation</td>
<td></td>
</tr>
<tr>
<td>1. Close a blocked fire door or shutter</td>
<td></td>
</tr>
<tr>
<td>2. Support a sprinkler system, if necessary</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Show students different exposure situations. Have them select the best method of protecting the exposures.
SUMMARY:

Fire fighters must know the methods used to protect exposures to be effective in reducing the spread of fire. There are many priorities that must be addressed on the fireground. One of the priorities is limiting the spread of the fire to exposures surrounding the fire.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: HOW TO PROTECT EXPOSURES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.7 and 3-3.9

BEHAVIORAL OBJECTIVE:

Condition: A fire engine with water, hoseline with nozzle, appropriate personal protective equipment, and a suitable structure

Behavior: The student will protect an exposure

Standard: Completing all operations within ________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Fire engine with water
- Hoseline with attached nozzle
- Appropriate personal protective equipment
- Suitable structure

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 14

PREPARATION:
It is essential that you as a fire fighter know how to protect exposures. This is for your safety and the safety of interior crews. It is not uncommon for new fire fighters to inappropriately place a nozzle into a window and steam burn interior crewmembers. This is why it is important for you to understand the basics of exposure protection.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position hoseline</td>
<td>1a. Between exposure and fire</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining a safe distance</td>
</tr>
<tr>
<td>2. Charge hoseline</td>
<td>2a. Signaling operator for water</td>
</tr>
<tr>
<td></td>
<td>b. Bleeding air from nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Setting nozzle pattern</td>
</tr>
<tr>
<td>3. Advance hoseline</td>
<td>3a. To exposure</td>
</tr>
<tr>
<td></td>
<td>b. Using fog pattern as protection from radiant heat if necessary</td>
</tr>
<tr>
<td>4. Direct fire stream</td>
<td>4a. Extinguishing fire on exposure</td>
</tr>
<tr>
<td>5. Cool down heated exposures</td>
<td>5a. Until steam evaporation has stopped</td>
</tr>
<tr>
<td></td>
<td>b. Cooling windows slowly</td>
</tr>
<tr>
<td>6. Use fire stream</td>
<td>6a. As a water curtain</td>
</tr>
<tr>
<td></td>
<td>b. Knocking down fire brands</td>
</tr>
<tr>
<td></td>
<td>c. Running a sheet of water on exposure</td>
</tr>
<tr>
<td>7. Shutdown nozzle</td>
<td>7a. Checking exposure for steam</td>
</tr>
<tr>
<td></td>
<td>b. Applying water only as needed</td>
</tr>
<tr>
<td>8. Inspect concealed spaces</td>
<td>8a. Attic vents</td>
</tr>
<tr>
<td></td>
<td>8b. Trailer skirts</td>
</tr>
<tr>
<td>9. Remove combustibles</td>
<td>9a. Separating from exposure</td>
</tr>
<tr>
<td>10. Maintain position</td>
<td>10a. Until directed to draw back</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: BASIC CONSIDERATIONS FOR VEHICLE FIRES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.6

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic considerations for vehicle fires by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION:

Vehicle fires are no longer usual and routine. Because of innovations, vehicle fires now present extremely dangerous conditions for the fire fighter. In the past, gas shocks and struts posed a risk and injured numerous fire fighters. Today, air bag and explosive devices make vehicle fires more dangerous than ever before.
I. OVERVIEW

A. Vehicle fires are the most common fire response
   1. Vehicle fires account for over 20% of all reported fire calls

B. Inherent hazards
   1. Smoke and flame
      a) Heat and visibility problems
      b) Exposures
   2. Toxic gases
      a) Increased use of plastics
         1) Produce hydrogen cyanide
      b) Batteries contain hydrochloric acid
   3. Flammable liquid fires/spills
      a) Fire destroys fuel lines especially in engine compartment
   4. Explosion hazards
      a) Gas tanks
      b) Liquefied propane gas (LPG)
      c) Compressed natural gas (CNG)
      d) Batteries
      e) Gas/hydraulic filled components
   5. Undeployed air bags
      a) Driver
      b) Passenger

How common are vehicle fires as opposed to other types?

What are some of the inherent hazards of vehicle fires?
6. Alternative fuels
   a) LPG
   b) CNG
   c) Methanol
   d) Electric (high voltage up 360 volts)
   e) Hybrid gas/electric vehicles
   f) Methyl tertiary butyl ether (MTBE)

**NOTE:** Add current safety information pertaining to electric powered vehicles.

7. Exotic metal fires
   a) Magnesium
   b) Magnesium alloys
   c) Lithium
      1) Used to reduce vehicle weight

8. Unknown contents
   a) Trunk contents

**II. FIRE FIGHTING TACTICS**

A. Apparatus position

**NOTE:** Please insert your department's SOPs for distance. If none, consider 75-100 feet.
### What are some other considerations for apparatus placement?

1. Uphill, upwind
2. In front of vehicle
   a) Fuel tanks are usually located to the rear of most vehicles
3. Position apparatus to provide protection of fire fighters from oncoming traffic

### B. Rescue

1. Is everyone out of the car/area?
   a) Consider rapid removal of victims using portable fire extinguisher for quick knock down
2. Establish safety zone around vehicle

### C. Exposures

1. Knockdown fire around or under vehicle

### D. Confinement

1. Full personal protective equipment

### What size hoseline does your department/company use for vehicle fires?

2. Minimum 1½", 100 gpm hoseline

### Does your apparatus have the capability to connect to a Class B foam outlet?

1. a) Connect to Class B foam outlet, if applicable
   1) Flammable liquids are Class B fires
   b) Charge
   c) Bleed air from line
d) Adjust pattern  
   1) Start with a medium fog  
      • Protect personnel

3. Look for signs of alternative fuel vehicles  
   a) Labels  
   b) Insignias  
   c) High voltage warnings  
   d) Compressed gas warnings

4. Approach at 30°-45° angle from the corners  
   a) Exploding shock-absorbing bumpers, struts, hatchback pistons, etc. tend to travel in line with the vehicle  
   b) Use low crouch
5. Engine compartment fires may need indirect method before opening hood
   a) Through grill or under wheel wells
   b) Through hole made in hood
   c) Small engine compartment fires may be knocked down with a dry chemical portable fire extinguisher
   d) Magnesium engine fires may be extinguished using copious amounts of water
      1) Usually more than your apparatus can carry

6. Fires involving electric vehicles may involve hazardous chemicals/exotic metals
   a) Sulfuric acid
   b) Potassium hydroxide
   c) Organic electrolytes
   d) Lithium

E. Extinguish
1. Cool hazard areas
   a) Fuel tank(s)
   b) Shock absorbing bumpers
   c) Other piston/cylinder assemblies and other sealed components
      1) Hatchbacks
      2) Hoods
   d) Tires
   e) Catalytic converter
   f) Batteries
   g) Driveline
F. Overhaul

1. Open hood
2. Disconnect 12 volt battery(s)

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Overhaul</td>
<td>Which terminal should you disconnect first? Why?</td>
</tr>
<tr>
<td></td>
<td>Where are the manual disconnects?</td>
</tr>
<tr>
<td>a) Negative terminal first</td>
<td>Should you cut the cables if you are unable to locate the manual disconnect?</td>
</tr>
<tr>
<td>1) Prevents sparking</td>
<td></td>
</tr>
<tr>
<td>b) Disconnect high voltage system in electric vehicles</td>
<td></td>
</tr>
<tr>
<td>1) Ground fault monitoring</td>
<td></td>
</tr>
<tr>
<td>2) Inertia switches, etc.</td>
<td></td>
</tr>
<tr>
<td>3) Manual disconnects are vehicle specific</td>
<td></td>
</tr>
<tr>
<td>• Check with vehicle 's owner for location</td>
<td></td>
</tr>
<tr>
<td>• There may be multiple batteries</td>
<td></td>
</tr>
<tr>
<td>• On newer BMWs and other expensive cars, the batteries may disconnect on impact</td>
<td></td>
</tr>
<tr>
<td>4) Never cut high voltage cables</td>
<td></td>
</tr>
</tbody>
</table>
What color are most of these high voltage cables?

- Orange cables are SAE standard for air bag or other safety devices
- Not all vehicles use this system

3. Open doors
   a) Ventilate and check for extension
      1) Under dash
      2) Concealed spaces
      3) Interior upholstery

4. Continue to cool hazard areas
5. Check for fuel leaks
6. Check trunk compartment
7. Do not allow vehicle to be towed until fire is fully out
**SUMMARY:**

Vehicle fires are never routine. The advances in new safety technology in vehicles make for safer vehicles on impact. After the impact, these devices become extremely dangerous to us as rescuers whether we are extricating victims or extinguishing a vehicle fire.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

**TOPIC:** SAFETY PRECAUTIONS FOR VEHICLE FIRES

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.6

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the safety precautions for vehicle fires by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Vehicle Rescue*, Harvey Grant, Second Edition, Chapter 4, and *Firefighter's Handbook*, Delmar, 2000 Edition, Chapter 19

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- *Vehicle Rescue*, Harvey Grant, Second Edition

**PREPARATION:** Vehicle fires present fire fighters with multiple hazards. The relative size and duration of vehicle fires can lead to a casual attitude towards safety, when in fact vehicle fires represent many hazards in a small package. They consist of approximately 20% of all fire calls in the United States.
## SAFETY PRECAUTIONS FOR VEHICLE FIRES

### A. Approaching a burning vehicle

1. **From uphill**
   - a) To keep burning fuels away from fire fighters
2. **From upwind**
   - a) To keep smoke and combustion gases blowing away from fire fighters
3. **Full PPE must be worn for safety**
4. **Hoselines charged and ready**
5. **Back up line or dry chemical extinguisher**

### B. Safety precautions for attacking and extinguishing vehicle fires

1. **Open hood compartment and prop open**
2. **Make entry to involved part of vehicle**
3. **If forcible entry is necessary, be cautious of glass, sharp metal objects**
4. **Work as a team/crew in a minimum of pairs**
5. **Call additional help as needed**
6. **Provide adequate traffic and scene control measures**
   - a) Use flares or appropriate safe warning devices
7. **Provide portable lighting for proper safe visibility**
8. Consider wide range of vehicle fire involvement and precautions
   a) Passenger vehicle
   b) Transport carrier vehicle

   c) Hazardous materials
      1) Chemicals, fuels, gases
      2) Radioactive
      3) Explosives
      4) Corrosives
      5) Combustible/flammables
      6) Radiological agents
      7) Oxidizers
      8) Poisons, pesticides
      9) Cryogenics

9. Remove or cut battery cables
   a) Consider electric door locks, windows, seats, etc., first
   b) Sparks can create a large amount of fire
   c) Negative first, then positive

What types of substances could be encountered with a hazardous materials carrier that present additional danger to the fire?

In what order do you cut the battery cables?
10. Battery safety
   a) Be aware of possible battery explosion, electrical arching, spillage of hydrochloric acid from battery
   b) Batteries can be found in different locations throughout different makes of vehicles

11. Airbag safety
   a) Airbag equipped vehicles contain a capacitor which takes 5-45 minutes to discharge

NOTE: On board or easel chart, provide students with sketch of passenger vehicle. Draw in the possible hazards.

C. Specialized problems in dealing with modern day vehicle fires
   1. Vehicles are composed of a large amount of plastic components
      a) Creates large amount of fire
      b) Extreme temperature variation
      c) Production of vast amounts of toxic, thick black smoke and gases which can cause fire fighter fatality and disability
### Inherent dangers caused by construction materials and innovations

2. Inherent dangers caused by construction materials and innovations
   - **a)** Catalytic converters, emission control systems, (ERG)
   - **b)** Polyethylene/fiberglass fuel tanks
     - 1) Fuel tanks
     - 2) Pressurized fuel tanks
     - 3) Venting fuel caps
     - 4) LPG fuel tanks
   - **c)** Safety 5 mph bumpers – shock absorber type activation
     - 1) Filled with fluid that expands and projects with force
     - 2) Cause injuries to fire fighter knees and lower extremities
     - 3) May be disabling

### Can we "wash down" spilled vehicle fluids into the street drains?

3. It is no longer permissible for fire fighters to "wash down" spilled fuels
   - **a)** Treat such spills as hazardous materials incidents
**SUMMARY:**

Modern day vehicle designs and fuel transportation are not done with fire fighter safety in mind. Fire fighters must also be aware that the danger and hazards multiply under fire conditions. It is difficult, but the fire fighter must keep abreast of these potential or probable safety problems through knowledge and training.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: ACCESSING PASSENGER VEHICLE COMPARTMENTS DURING A FIRE

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.6

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of accessing passenger vehicle compartments during a fire by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 14

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Vehicle fires make up 20% of our nation's fire calls. Rapid entry into burning vehicles can be life saving and reduce property damage significantly. We normally expect people to be located in the passenger compartments of a vehicle, but we must always check the trunk and be able to access all the compartments rapidly and safely.
## I. SIZE-UP

A. Determine the size and location of the fire

1. Passenger compartment
2. Engine compartment
3. Undercarriage
4. The vehicle may have one or more, or all, compartments involved in fire

B. Determine if a rescue problem exists

C. Tactics for gaining access to the fire do not change with a rescue; but your priorities will

## II. PROTECTING EXPOSURES

A. Exposures are a priority before confinement and extinguishment of the fire

1. Attached trailers
2. Nearby structures

B. Put any fire in the brush out before attacking vehicle fire

## III. APPROACHING THE VEHICLE

A. Ensure you have a safe zone from traffic hazards

B. Approach the front or rear corner at a 30°-45° angle

C. Stay away from the front and rear bumpers

1. Hydraulic fluid-filled bumper systems undergo great stress when heated
   a) Can cause the bumper to be propelled off the car
   b) Can cause severe injury

Where are the three locations fires are usually located on a vehicle fire?

What exposures may you need to protect?
IV. ACCESSING THE PASSENGER COMPARTMENT

A. Primary dangers
   1. Materials used in construction
   2. Air bags

B. Attempt to gain access though the door

   1. First try to open it by using the handle
      a) "Try before you pry"
   2. Driver may have the key

C. If normal entry through a door is not possible
   1. Break a window
      a) Apply a punch or pointed object to the corner of the window
   2. Unlock the door

D. Pull any victims out

E. Extinguish the fire

F. If the vehicle doors will not open due to damage, attempt to pull victim out through the window

V. ACCESSING THE ENGINE COMPARTMENT

A. Primary dangers
   1. Very hot metal filled with flammable liquids
   2. Fuel leaks
   3. Batteries

When attempting to gain access, what should be your first attempt?

What is the minimum size hoseline to attack a vehicle fire?
B. Avoid standing in front of a bumper after it has been heated

C. If possible, gain access to the passenger compartment and release the hood latch

D. If latch is inaccessible or does not work, pry the hood
   1. Best pried above the front tire between the quarter panel and the hood
      a) On most hoods, a crumple exists at this point to absorb a frontal impact
   2. The hood can be "tented"
      a) Giving you 3-6 inches of space
   3. This can be repeated on the opposite side of the vehicle hood

E. Extinguish the fire

VI. ACCESS TO TRUNK COMPARTMENT

A. Primary dangers
   1. Storage of unknown substances
      a) Flammable liquid or gas containers
      b) Ammunition
      c) Explosives

B. Check for occupants
   1. People may be in the trunk area after an accident

C. Gain access
   1. If possible, release the trunk latch in the passenger compartment
   2. Driver may have the key
   3. Unlatch the rear seats

What is the best way to access the trunk?
4. Last resort is to pry the trunk

   a) Halligan tool
   b) Flat-head axe
   c) Screwdriver
   d) Other prying tools

D. Forcible entry
   1. Place the pick end of the Halligan tool up to the keyway of the trunk lock
   2. Strike with the flat-head axe to remove lock assembly
   3. Place the screwdriver into keyway and twist to open the trunk

E. Pull any victims out

F. Extinguish any fire

VII. SALVAGE AND OVERHAUL
   A. Preserve evidence
   B. Secure vehicle

   1. Set emergency brake or chock vehicle
   2. Disconnect battery
**SUMMARY:**

You may need to rapidly access compartments in order to rescue trapped victims or extinguish the fire. Remember the safety steps to perform in extinguishing a vehicle fire and rescuing trapped victims.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 14* in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PHYSICAL PROPERTIES OF COMBUSTIBLE AND FLAMMABLE LIQUIDS AND GASES

TIME FRAME: 1:45

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.15, 4-3.1, 4-3.3, and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the physical properties of combustible and flammable gases by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Stream Practices, IFSTA, Seventh Edition

PREPARATION: A basic understanding of physical properties of combustible and flammable liquids and gases includes proper identification of a flammable gas leak. You never know when combustible and flammable liquids and gases may be suddenly released.

Safety for yourself, fellow fire fighters, and bystanders is the goal of any incident. Proper safety precautions will prevent injury or death allowing quick intervention and mitigation of the incident.
### FLAMMABLE AND COMBUSTIBLE LIQUIDS

**A.** They burn rapidly and are sometimes difficult to extinguish

1. Due to certain chemical and physical properties they all possess
   a) Flash point
   b) Fire point
   c) Ignition temperature
   d) Flammable/explosive limits
   e) Vapor density
   f) Boiling point
   g) Specific gravity
   h) Water solubility

### FLASH POINT

**A.** The relative ease of ignition of a flammable or combustible liquid is expressed as its flash point

**B.** Lowest temperature at which a liquid fuel gives off sufficient vapors to form an ignitable mixture with air near the surface of the liquid

**C.** A liquid must be under pressure for flash point to occur
   1. A pure flammable gas (e.g., natural gas, etc.) does not have this physical property

**D.** Can vary from below zero for gasoline to several hundreds degrees above zero for vegetable oils
**What is flash point used for?**

E. Used as the primary basis for classifying flammable and combustible liquids

**What burns, the liquid or the vapor?**

F. At this temperature, the ignited vapors will flash, but will not continue to burn
   1. If the temperature of a liquid is above the liquid's flash point, the vapors from that liquid can be ignited by a flame, spark, or other source of heat
   2. If the temperature is below, the vapors cannot be ignited

**G. The open cup test method**
   1. An open cup over which the test flame is applied

**What is the closed cup test and its use?**

H. Closed cup test
   1. More easily used to determine flash points
   2. Recommended for determining flash points below 200° F (93°C) for other than viscous liquids or film forming liquids
   3. Liquid is placed into a test cup and submerged in water
   4. The water is then heated slowly
   5. Thermometers, one in the water and one in the liquid permit control of the heating rate
   6. The test flame is periodically lowered into the vapor space of the test cup
7. When the liquid being tested first reaches a temperature where it is giving off vapors fast enough to create a burnable mixture immediately above the liquid, there will be a visible flash as the test flame is applied and lowered into the vapor space
   a) The temperature on the thermometer in the liquid being tested is the flash point

III. FIRE POINT
   A. Temperature at which a liquid fuel will produce vapors sufficient to support combustion once ignited
      1. Usually a few degrees above the flash point

IV. IGNITION TEMPERATURE
   A. Minimum temperature to which a liquid must be heated where it will ignite without an ignition source
      1. Sometimes called auto-ignition temperature or spontaneous ignition temperature

   B. Molten metal bath method
      1. Liquid is placed into a flask and submerged in a molten metal bath
      2. The molten metal is then heated, which in turn heats the liquid in the flask
      3. The temperature of the liquid when fire spontaneously occurs in the vapors in the ignition temperature
C. There are many variables in the determination of ignition temperatures
   1. Practical situations present different conditions than those found in a laboratory
   2. Thus, a hot exhaust pipe, a pan, or a hot surface in the presence of unconfined flammable vapors may yield different results than those determined by laboratory tests

V. FLAMMABLE/EXPLOSIVE LIMITS

A. The percentage of substance in air that will burn once it is ignited
   1. Most substances have an upper (too rich) and a lower (too lean) flammable limit

B. Flammable or explosive limits are usually expressed in terms of percent by volume of gas or vapor in air

C. As an example, consider the gasoline engine
   1. For it to start there must be at least 1.4 parts of gasoline vapors mixed with 98.6 parts of air
   2. Less than 1.4 parts of gasoline vapor in air would not burn and is called "too lean" a mixture
      a) The smallest amount of vapor that can be ignited is the lower flammable limit

NOTE: Briefly, show the different flammable/explosive limits between acetone, ethyl alcohol, and gasoline.

   3. The upper flammable limits for gasoline is 7.6 or 7.6 parts of gasoline vapor mixed with 92.4 parts of air
      a) Over this amount of vapor, the mixture would be "too rich" to burn or above the upper flammable limit

Can anyone define the term "flammable / explosive limits?"
<table>
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<tr>
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</table>
| 4. The flame spread of all flammable and combustible liquids is slow where the mixture is near the lower or upper flammable limits.  
   a) However, when the vapor-air mixture is in the middle of the flammable range, or halfway between the lower and upper flammable limits, there is rapid combustion in the form of an explosion. | |
| D. The wider the flammable range of liquid, the greater the chance for ignition and a fire. | |
| E. The narrow flammable/explosive range of gasoline explains why there are not more fires involving gasoline. | What is vapor density? |

VI. VAPOR DENSITY

A. Density of vapor in relation to air with air given a value of one.  
B. If the vapor density of a product is less than one, the vapor will rise into the atmosphere.  
C. Conversely, if the density is over one then the vapors will tend to hug the ground and travel as directed by the terrain.  
D. Flammable liquid vapors are heavier than air with some being heavier than others.  
E. When most flammable liquid vapors are within the flammable range, the vapor-air mixture will have close to the same density as air itself and will not sink.  
   1. Because of this, the diffusion of the flammable vapors will extend to the top of a tank, drum, or room.  
   2. This demonstrates the importance of providing ventilation at floor level to prevent the accumulation of vapors within the flammable range.
VII. **BURNING POINT**

A. Before we can thoroughly understand boiling point we must first define evaporation vapor pressure

B. Because molecules of a liquid are always in motion (with the amount of motion depending on the temperature of the liquid) the molecules are continually escaping from the free surface of the liquid to the space above
   1. Some remain in space while others, due to random motion, stay with the liquid

C. If a liquid is in an open container, molecules (collectively called vapor) escape from the surface and the liquid is said to evaporate

D. If the liquid is in a closed container, the motion of the escaping molecules are confined to a vapor space above the surface of the liquids

E. The pressure exerted by the escaping vapor at the point of equal is called vapor pressure

F. As the temperature of a liquid increases its vapor pressure increases and approaches atmospheric pressure

G. At the temperature which vapor pressure equals atmospheric pressure, the opposition to evaporation exerted by the atmosphere is neutralized and boiling takes place

H. When the vapor pressure exceeds the external atmospheric pressure by any amount, the liquid will boil
   1. Take an uncovered pan of water heating on a stove
   2. At sea level, it is being covered by a lid which weighs 14.7 psi (atmospheric pressure)

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you increase molecular activity?</td>
<td></td>
</tr>
<tr>
<td>What is boiling point?</td>
<td></td>
</tr>
</tbody>
</table>

| How do you increase molecular activity? | |
| What is boiling point? | |
3. As the water is heated, its vapor pressure increases until it is equal to atmospheric pressure (the 14.7 psi lid)

4. As the vapor pressure exceeds the weight of the lid (by amount) the lid is pushed up and the water boils

I. The boiling point temperature indicates the volatility and consequent hazard of the liquid

J. The lower the boiling point the greater the volatility

VIII. SPECIFIC GRAVITY

Can anyone define specific gravity?

A. The density of liquids in relation to water, with water given the value of one

B. Liquids with a specific gravity less than one will be lighter than water

C. Liquids with a specific gravity greater than one will be heavier than water

D. Most flammable liquids have a specific gravity of less than one and are, therefore, lighter than water

1. They will float to the surface if mixed with water

E. Some flammable liquids are heavier than water

1. Carbon disulfide

   a) Has a specific gravity of 1.3

IX. WATER SOLUBILITY

A. The ability of a liquid fuel to mix with water

B. If a liquid will mix with water, it may diluted to the point where it will not burn

C. Hydrocarbon liquids as a rule will not mix with water

D. Alcohols and polar solvents will mix with water
X. NFPA CLASSIFICATIONS

A. The NFPA subdivides flammable and combustible liquids into three major groupings
   1. Class I
      a) Flammable liquids
         1) Due to low flash points
   2. Class II
      a) Combustible liquids
         1) Due to higher flash points
   3. Class III
      a) Combustible liquids
         1) Due to higher flash points

B. Class I flammable liquids
   1. Have flash points below 100°F (37.8°C)
   2. Three subdivisions
      a) Class IA
         1) Usually stored in pressure vessels or tanks
         2) Flash point below 73°F (22.8°C)
         3) Boiling point below 100°F (37.8°C)
         4) The low boiling point makes these liquids doubly hazardous because of their volatility
         5) When Class IA liquids are likely to be present in the atmosphere, explosion-proof electrical equipment is used to prevent ignition of the vapors by sparks

Does anyone know how they are subdivided?
6) Examples
   - Ethyl ether
   - Ethylene oxide
   - Pentane

b) Class IB
   1) Flash point below 73°F (22.8°C)
   2) Boiling point above 100°F (37.8°C)
   3) This boiling point makes them less volatile
   4) Examples
      - Gasoline
      - Acetone
      - Ethyl (grain) alcohol

c) Class IC
   1) Flash point above 73°F (22.8°C) and below 100°F (37.8°C)
   2) Boiling point is not taken into consideration with Class IC
   3) Examples
      - Turpentine
      - Varnish
      - Brandy

C. Class II combustible liquids

What is the difference between a Class IC flammable liquid and a Class II combustible liquid?

1. Flash point 100°F (37.8°C) or above but below 140°F (60°C)
2. Examples
   a) Many cleaning solvents
   b) Some paint thinners
   c) Kerosene

D. Class III combustible liquids
   1. Two subdivisions
      a) Class IIIA
         1) Flash point 140°F (60°C) or above but below 200°F (93.3°C)
      b) Class IIIB
         1) Flash points at/above 200°F (93.3°C)

XI. FLAMMABLE AND COMBUSTIBLE GASES
   A. Gases and vapors that burn in air when the concentration of the gas or vapor is within the range of concentration where combustion can occur

What type of hazards must we be aware of when handling flammable gases?

B. Health hazards when not involved in fires
   1. Vapor
      a) Inhaled
         1) Dizziness
         2) Difficulty breathing
         3) Can cause loss of consciousness
         4) Can easily ignite from an ignition source
      b) Is heavier than air and will flow downhill and can flash back to leak
### Physical Properties Of Combustible And Flammable Liquids And Gases

#### 2. Liquid
   a) Can cause frostbite
   b) Floats and boils on water
      1) Flammable visible vapor cloud is produced

#### C. Types of flammable gases
   1. LPG (liquefied petroleum gas)
      a) A great number of flammable gases originate as a LPG
      b) Heavier than air
      c) Examples
         1) Propane
         2) Butane
   2. CNG (compressed natural gas)
      a) Lighter than air
      b) Example
         1) Natural gas
            - No odor
            - Mercaptan added for odor/safety

#### D. Hazards when involved with fire
   1. Boiling liquid expanding vapor explosion (BLEVE)
      a) The explosive release of vessel pressure, two or more pieces of the tank, and a characteristic fireball with radiant heat

What are the two types of flammable gases?

What is a BLEVE?
### Physical Properties Of Combustible And Flammable Liquids And Gases

**2. Both LPG and CNG can be part of a BLEVE**
- a) A liquid must be present, not a gas
- b) Flammability is not a prerequisite
- c) Any liquid, even water, can produce a BLEVE
- d) If a nonflammable liquid is involved, there will not be a fireball

  e) The liquid must be in a tightly closed or otherwise confined container
    1) The container may be an aerosol can, or a railroad tank car, or even water sealed in a container
    2) Size does not matter
    3) The important point is that the container is closed

  4) Do not overlook the possibility of a BLEVE in a vented tank
      - Especially if the vent is inadequate under fire conditions

**Could a hot water heater BLEVE?**

**3. Flammable range**
- a) Ratio of gas to air that will sustain fire if exposed to flame or spark

**4. Flammable limits**
- a) The concentration level of a substance at which it will burn

**Can a vented tank BLEVE?**

**What is the difference between flammable range and flammable limits?**
b) Lower flammability limit (LFL)
   1) The minimum concentration of fuel valor and air that supports combustion

c) Lower explosive limit (LEL)
   1) The lowest concentration (lowest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc, flame) is present
   2) At concentrations lower than the LEL, the mixture is too "lean" to burn

d) Upper flammability limit (UFL)
   1) The concentration above which combustion cannot take place

e) Upper explosive limit (UEL)
   1) The highest concentration (highest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, arc, flame) is present
   2) At higher concentrations, the mixture is too "rich" to burn

5. Flash back may occur along vapor trail

6. Vapor may explode if ignited in an enclosed area

E. Control of a flammable gas fire

1. In an incident involving flammable liquids and/or gases, large quantities of water should be applied on the flame area at once
   a) 500 gpm at each point of flame impingement with unstaffed monitors

2. If ignition has not yet occurred, we should evacuate and eliminate ignition sources
### What is the length of time before an explosion is likely to occur with flame impingement?

3. Explosion can occur within 10 minutes or up to 20 hours

4. The very nature of the materials and their storage conditions thus fulfill the requirements for a BLEVE that we have discussed thus far

### What situations can lead to a container failure?

**F. There must be a failure of the container**

1. Possible causes of failure
2. Remember that the definition of BLEVE dictated that the container must break into two or more pieces
3. Although there has been an escape of vapor and possibly even ignition, a BLEVE HAS NOT OCCURRED

2. Possible causes of failure
   a) Direct flame impingement is probably the primary cause of structural failure
   b) Metal fatigue
   c) Inadequate relief valves which may allow a pressure increase within the tank to the point of failure
   d) Mechanical damage from impact, collision, and corrosion are other possible causes of structural failure

3. Can an incident in which a tank has been punctured be classified as a BLEVE?
a) The propelled fragments are lacking

XII. SAFETY CONSIDERATIONS
A. Full personal protective equipment
B. A Safety Officer should be appointed as soon as possible
C. Fires burning around relief valves, piping ruptures, or tank leaks should not be extinguished unless the leaking product can be shut-off
   1. Unburned vapor clouds can extend for miles before finding an ignition source and flashing back to the fuel source
D. Work uphill, upwind, and upstream
E. Maintain ignition source control in the leak area.
F. BLEVE- Boiling Liquid Expanding Vapor Explosion
   1. Fire conditions can cause rupture and explode violently
   2. Failure of the cylinder results in the ends becoming missile-like projectiles
      a) Safety zones should be established to prevent personnel from being in these areas
      b) Signs of a potential pressurized vessel failure
         1) Increasing pitch and/or fire volume coming from relief valves
         2) Any stresses, bulges, or cracks in the tank body

Where is the most dangerous area to avoid when fighting a flammable gas fire?

What are several signs of vessel failure?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3) Noise generated as the containers expand in size</td>
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</tr>
</tbody>
</table>
SUMMARY:

Characteristics of flammable gases are important to know in order to properly mitigate an incident and provide safety to yourself and others. Without proper knowledge of flammable and explosive limits and flammable range, one cannot understand the precautions necessary when handling combustible and flammable liquids and gases.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:** EXTINGUISHING CLASS B FIRES

**TIME FRAME:** 1:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.15, 4-3.1, and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of extinguishing Class B fires by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the NFPA Standard #325, NFPA, 1994 Edition

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- NFPA Standard #325, NFPA, 1994 Edition

**PREPARATION:** Flammable and combustible liquids are a part of our everyday lives. The potential for emergencies involving these materials is often underestimated; an underestimation that may lead to injury or even death. Fire fighters must have a basic understanding of the classification and properties of flammable and combustible liquids to safely and effectively manage these types of incidents.
I. WATER AS AN EXTINGUISHING AGENT

A. Water may be ineffective in fighting fires with low flash points
   1. The lower the flash point the less, effective water will be

B. Frothing
   1. When water is used to put out a fire in an open-top tank of some fuel oils
      a) There is a good possibility that frothing will occur and cause the liquid to overflow the tank
   2. This frothing occurs when water mixes with the burning oil
   3. The heat from the burning oil rapidly converts the water to steam
   4. Can be quite violent and could endanger the life of the fire fighter
      a) Particularly when solid streams are directed below the surface of the hot burning liquid

C. Fog streams
   1. When carefully applied, have frequently been used with success by causing the frothing to occur only on the surface
      a) This frothing action of the water blankets and extinguishes the fire

D. Much of the effectiveness of using water will depend on the method of application

<table>
<thead>
<tr>
<th>What affect does water have on Class B fires?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How effective can fog streams be if carefully applied?</td>
</tr>
</tbody>
</table>
1. **Sweep the flames**
   a) Using the correct nozzles and coordinating the hoselines, it is possible to sweep the flames off the surface of the burning liquid

2. **Blanket the flames**
   a) Water may be used to blanket and extinguish the fire
   b) The water must be applied gently to the surface of the liquid
   c) Flammable liquid must have a specific gravity of 1.1 or heavier and is not water soluble

**E. Specific gravity**

1. The weight of a substance compared to water
   a) Water = 1

2. Most flammable liquids are lighter than water and will float to the surface if mixed with water

3. Some flammable liquids are heavier than water, such as carbon disulfide which has a specific gravity of 1.3 and a flash point of -22°F (-30°C)
   a) Since carbon disulfide is heavier than water, water gently sprayed onto the surface of burning carbon disulfide would cover the surface
      1) Excluding the air needed for combustion

Can you sweep the fire off a flammable liquid?

What is specific gravity?
### F. Water soluble flammable liquids

1. Fires in water soluble flammable liquids, (i.e. ethyl alcohol) can be extinguished by diluting with water or by applying an alcohol-type foam.

2. Alcohol-type foams resist the breakdown that occurs with regular foams.

### G. Exposures

1. Fire streams (solid or straight) can be used to keep tanks and other equipment exposed to flammable liquid fires cool or to wash burning spills away from danger points.

2. Improperly used fire streams can cause a fire to spread and will serve to intensify a fire when directed into open containers of flammable and combustible liquids.

### H. With the possible exception of carbon disulfide, water is not the most effective method of extinguishing Class B fires.

### II. EFFECTIVELY EXTINGUISHING CLASS B FIRES

**A.** The smothering or blanket effect of oxygen exclusion is most effective.

**B.** Types of agents

1. Halon

   a) Liquefied compressed gas that does not support combustion is discharged to smother and terminate flame propagation.
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Carbon dioxide (CO₂)</td>
<td></td>
</tr>
<tr>
<td>a) An inert gas that normally will not support combustion is discharged and smothers the fire</td>
<td></td>
</tr>
<tr>
<td>3. Dry chemical</td>
<td></td>
</tr>
<tr>
<td>a) Chemical compound of sodium bicarbonate, potassium bicarbonate, ammonium phosphate, or potassium chloride has been chemically processed to make it moisture resistant and free flowing</td>
<td></td>
</tr>
<tr>
<td>1) Smothering process is used</td>
<td></td>
</tr>
<tr>
<td>4. Foam (AFFF)</td>
<td></td>
</tr>
<tr>
<td>a) Has the ability to make water float on fuels that are lighter than water</td>
<td></td>
</tr>
<tr>
<td>1) The vapor seal created extinguishes the flame and prevents reignition</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

The NFPA classifications of flammable and combustible liquids and gases and their physical properties and hazards are all vital factors to be considered when choosing the proper extinguishing agent and/or methods.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *NFPA Standard #325*, NFPA, 1994 Edition in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO CONTROL A FLAMMABLE GAS CYLINDER FIRE WHILE OPERATING AS A MEMBER OF A CREW

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-3.3 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A fire engine with water, FLAG trailer, charged hoselines with attached nozzles, appropriate personal protective equipment, and a suitable location

Behavior: The students will control a flammable gas cylinder fire while operating as a member of a crew

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Fire engine with water
- FLAG (Flammable Liquids and Gas) trailer
- Two 1½" charged hoselines with attached nozzles
- Appropriate personal protective equipment
- Suitable location

REFERENCES:


PREPARATION: Knowing simple manipulative techniques make our job easier and more efficient. Proper handling techniques will save lives and prevent injury. This operation should only be used for controlling an open valve. With broken valves and breached containers, fire should be allowed to burn in most cases until hazardous materials units arrive. Exposure protection and cylinder cooling is a priority in this situation.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assign crew leader</td>
<td>2a. One crew leader</td>
</tr>
<tr>
<td>2. Lay hoseline</td>
<td>b. Maintaining safe distance from radiant heat</td>
</tr>
<tr>
<td>3. Position fire fighters</td>
<td>3a. On hoseline</td>
</tr>
<tr>
<td></td>
<td>b. Three fire fighters on each hoseline</td>
</tr>
<tr>
<td></td>
<td>(1) Nozzle person</td>
</tr>
<tr>
<td></td>
<td>(2) Support person</td>
</tr>
<tr>
<td></td>
<td>(3) Kinker</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining safe distance from radiant heat</td>
</tr>
<tr>
<td>4. Assign Safety Officer</td>
<td>5a. Two hoselines recommended</td>
</tr>
<tr>
<td>5. Lay safety hoseline(s)</td>
<td>b. Three fire fighters on each hoseline</td>
</tr>
<tr>
<td></td>
<td>(1) Nozzle person</td>
</tr>
<tr>
<td></td>
<td>(2) Support person</td>
</tr>
<tr>
<td></td>
<td>(3) Kinker</td>
</tr>
<tr>
<td></td>
<td>c. Maintaining safe distance from radiant heat</td>
</tr>
<tr>
<td>6. Set fog pattern</td>
<td>6a. Two 30°-45° angle cones</td>
</tr>
<tr>
<td></td>
<td>b. Forming a &quot;V&quot; towards the center by keeping two hoselines approximately 5 feet apart</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7. Approach prop</td>
<td>7a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Shuffle step method</td>
</tr>
<tr>
<td></td>
<td>c. Crew leader commanding the step method and cadence for entire operation</td>
</tr>
<tr>
<td>8. Maintain distance</td>
<td>8a. Crew leader between hoselines</td>
</tr>
<tr>
<td></td>
<td>b. Water cones providing protection</td>
</tr>
<tr>
<td>9. Spot valve</td>
<td>9a. In the protected area where the two &quot;Vs&quot; make an air void</td>
</tr>
<tr>
<td>10. Advance safety hoselines</td>
<td>10a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Shuffle step method</td>
</tr>
<tr>
<td></td>
<td>c. Crew leader commanding the step method and cadence for entire operation</td>
</tr>
<tr>
<td></td>
<td>d. Safety Officer observing all perimeter areas for flame over/under/around the water cones</td>
</tr>
<tr>
<td>11. Turn valve</td>
<td>11a. Safely</td>
</tr>
<tr>
<td></td>
<td>b. Without reaching through fog pattern to shut-off valve</td>
</tr>
<tr>
<td></td>
<td>c. Reducing and ending flow</td>
</tr>
<tr>
<td>12. Back away</td>
<td>12a. Kinkers move back 15 feet under the command of the crew leader</td>
</tr>
<tr>
<td></td>
<td>b. Preventing hoseline from kinking</td>
</tr>
<tr>
<td></td>
<td>c. Shuffle step method</td>
</tr>
<tr>
<td></td>
<td>d. Backing out in the same manner as you entered</td>
</tr>
<tr>
<td></td>
<td>b. From danger area</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: PURPOSE AND VALUE OF SALVAGE OPERATIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the purpose and value of salvage operations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 4 and Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

PREPARATION: Salvage can be one of the most important operations the fire service performs. By the use of salvage operations, much dollar loss and additional distress to occupants may be avoided. Salvage operations are one of the important tools the fire service has in building good public relations. The firefighter may be called upon to perform salvage at any time during or after a fire in order to reduce loss to the occupants or owners of the property.
I. PURPOSE AND VALUE OF SALVAGE

A. When salvage work was first considered at fires, it was thought that this was not the fire department's responsibility

1. The first salvage work was done by Insurance Company Salvage Patrols

2. Early salvage patrol operations consisted of water removal after the fire department had extinguished the fire

B. Eventually, progressive fire departments began to realize that much of the loss contributed to fire came from water damage

1. On a national average, 75% of annual fire damage is caused by water damage

C. After the fire was out, progressive departments began to apply water more carefully, ventilate, spread salvage covers over furniture and goods, floor runners, and generally protect property from causes other than the direct result of burning
1. This was so well accepted by the public and the insurance companies, that it has become the sole responsibility of the fire departments.

2. Insurance losses were reduced to the extent that when fire agencies are graded by the Insurance Services Offices for insurance classification, the salvage work, and materials for salvage and overhaul work are an important factor in the fire department grading schedule.

D. One of the fire department's hardest jobs is to create and maintain good public relations.

1. Good salvage operations is one of our best assets in this area.

How was this accepted by the public? And by insurance companies?

How does salvage affect public relations?
SUMMARY:
Salvage is the fire department's responsibility. The protection of personal property in our communities must be a continuing process that starts when the fire department arrives on the scene or at any other time during the incident. Loss to businesses of product and production resources can have a serious affect in the community. Good public relations are a direct result of fire service salvage operations.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 4 and Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS DURING SALVAGE AND OVERHAUL OPERATIONS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.12

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the safety considerations during salvage and overhaul operations by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapters 5 and 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

PREPARATION: Once a fire has been brought under control, time is usually available to plan and organize safe overhaul activities. The plan for overhaul should be made to provide the highest degree of safety for fire fighters and others who may be allowed on the scene.
I. SALVAGE SAFETY CONSIDERATIONS

A. Dangerous building conditions

1. Before starting a search for hidden fires or salvage operations it is important to determine the condition of the building.

2. Areas to inspect
   a) Weakened floors due to floor joints and subfloor having been burned away or fire damaged
      1) Holes in floor areas marked or barricaded
   b) Wall out of plumb
      1) Area identified and marked
   c) Weakened structural members
      1) Identified and marked
   d) Weakened ceilings and wood coverings
      1) Pull down before cleanup operations
   e) Veneer wall tiles weakened
      1) Identified and marked
   f) Inspect stairs for structural integrity before use
   g) Debris/rubble on floor
      1) Clear path free of nails, glass, etc., before use
   h) Wet, icy, or slippery areas
      1) Identified and secured before use
i) Utilities checked and secured
   1) Exposed wiring
   2) Broken pipes
   3) Television antenna

j) Chimneys
   1) Falling hazard

II. OVERHAUL SAFETY CONSIDERATIONS

A. Routes
   1. Establish routes or traffic lanes when hauling debris out of a structure

B. Night-time operations require light

   1. Lights should be placed where they can illuminate tripping hazards, holes, or other dangers
   2. Stairways, halls, and routes also require lighting

C. Establish designated work areas
   1. Fire fighters have been injured during overhaul operations when struck by tools used by other fire fighters

D. Clear area
   1. Before pulling ceilings and walls, make sure the area is clear of personnel
### III. PERSONNEL CONSIDERATIONS DURING SALVAGE AND OVERHAUL OPERATIONS

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Why should fire fighters wear appropriate PPE during salvage and overhaul?</td>
</tr>
</tbody>
</table>

**A. Personal protective equipment**

1. Appropriate PPE must be worn at all times
2. Fire fighters are exposed to the same possibility of injury during salvage and overhaul operations as they are during fire fighting
3. Toxic atmospheres exist during salvage and overhaul operations
   a) This is actually one of the worst times to remove SCBA because of the abundant presence of toxic gases such as carbon monoxide
   b) Because of the cumulative effects of toxic gases, the wearing of SCBA during salvage and overhaul operations should be strictly enforced

4. Fire fighters exhausted from fire fighting operations are more susceptible to injury than relief crews
   a) Overworked or fatigued fire fighters are more likely to injure themselves with strains and sprains
### Why should fresh fire fighters be used for salvage and overhaul operations?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Salvage and overhaul operations require hard work and should be done with fresh, alert crews</td>
<td>Why should fresh fire fighters be used for salvage and overhaul operations?</td>
</tr>
</tbody>
</table>
SUMMARY:

Salvage and overhaul operations can be exceptionally hazardous to fire fighters and require careful preparation before they are performed. Their success or failure can be directly attributed to the degree to which the fire fighter follows safety considerations during these operations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 5 and 6 in order to prepare yourself for the upcoming test. Study for our next session.
BEHAVIORAL OBJECTIVE:

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of considerations for atmospheric monitoring by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Confined Space Entry & Rescue*, CMC Rescue Inc., 1996 Edition, Chapter 5

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**


**PREPARATION:**

There are several types of atmospheric monitors available that test for oxygen, flammable, and toxic atmospheres. An understanding of these monitors, how they function, and their limitations is important for fire fighter safety. Fire fighters have a tendency to remove their respiratory protection during salvage and overhaul, a stage in the fire when air quality is at its worst. Using atmospheric monitors to confirm safe environments will reduce the likelihood of fire fighter injury and identify when it is safe to remove respiratory protection.
I. REASONS FOR ATMOSPHERIC MONITORING
   A. Selecting level of respiratory protection
   B. Determining areas where protection is needed
   C. Assessing the potential health affects of exposure

II. GAS MONITORING INSTRUMENTS
   A. Variety of monitors is available
      1. Most are "real time" direct read-out
      2. Single gas monitors
         a) Monitors for presence of one gas only
      3. Multiple gas monitors
         a) Monitors for more than one gas simultaneously

B. Monitoring characteristics
   1. Portable
   2. Reliable
   3. Simple to use
   4. Sensitive
   5. Intrinsically safe

C. Monitor testing
   1. Oxygen level

How will atmospheric monitoring help us during salvage and overhaul operations?

What characteristics should monitoring equipment have?

What conditions should monitors measure and in what order?
### III. MONITORING FOR OXYGEN

#### A. First priority for monitoring

- Detect and identify percentage of oxygen in the atmosphere

#### B. How do most monitors "read" oxygen concentration?

1. Most monitors are calibrated for concentrations between 0%-25%

#### C. Advantages

1. Quick response time
2. Portable

#### D. Disadvantages

1. Must calibrate on start-up
   a) Ambient temperature, humidity, and elevation
2. Adversely affected by certain gases

### IV. MONITORING FOR FLAMMABLE ATMOSPHERES

#### A. Second monitoring priority

1. Check oxygen level first since oxygen is required to "burn" combustible gas
2. Most monitors will give inaccurate readings below 10% oxygen
B. Monitor must be capable of measuring flammable atmospheres

V. MONITORING FOR TOXICS
A. Third priority for monitoring
B. Accomplished by using a variety of instruments
   1. PID (Photo Ionization Device)

   2. Colorimetric detector tubes
      a) Gas tube filled with chemical reagent
      b) Specific volume of air is drawn through tube
         c) Toxin is determined by length of "stain"

VI. APPLICATION OF DETECTION DEVICES
A. No one monitor can detect all hazards
B. Monitors must be calibrated, maintained, and operated by qualified personnel

C. Factors that directly affect readings
   1. Proper operation
   2. Proper calibration
   3. Equipment detection range
   4. Detection response time
   5. Inherent safety
   6. Nature of the hazard
   7. Environmental conditions
SUMMARY:

There are a variety of monitors on the market today. Generally, multiple gas detectors are the best for monitoring atmospheres during salvage and overhaul. Monitors should test for oxygen, flammable and combustible levels, and toxins, in that order. Monitors can be damaged or produce inaccurate reading if not properly calibrated, used, and cared for. Used and maintained correctly, atmospheric monitors provide a greater margin of safety during fire fighting efforts.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry & Rescue, CMC Rescue Inc., 1996 Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** COMMONLY PERFORMED OVERHAUL PROCEDURES AND THEIR PURPOSE

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.12

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the commonly performed overhaul procedures and their purpose by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Service Loss Control*, IFSTA, First Edition, Chapter 5

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Fire Service Loss Control*, IFSTA, First Edition
- *Salvage and Overhaul*, IFSTA, Seventh Edition

**PREPARATION:**
Discovering and extinguishing hidden fires as well as restoring premises are essential to complete fireground operations. This phase of operations, called overhaul, requires standard procedures to be effective and safe. In a suspicious fire, overhaul should be delayed until an investigator can be called.
I. PURPOSE OF OVERHAUL PROCEDURES
   A. Extinguishment of remaining hidden fires
   B. Prevent rekindle
   C. Minimize damage
   D. Provide safety in fire area
      1. Inspect premises
      2. Develop sound operational plan
      3. Provide suitable equipment
      4. Eliminate obvious hazards
   E. Determine cause of fire
   F. Improve public relations

II. SAFETY REQUIREMENTS
   A. Safety
      1. Full personal protective equipment, including SCBA
      2. Charged hoseline
      3. Infrared scanner/thermal imaging equipment

III. COMMONLY PERFORMED OVERHAUL PROCEDURES
   A. Search for hidden fire
      1. Determine stability of building area
      2. Check all routes of fire spread
      3. Remove debris rather than search through

Why is overhaul an important part of the whole fire fighting process?

What procedures should be followed in the overhaul phase of fire fighting?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Extinguish hidden fires</td>
</tr>
<tr>
<td>C. Handle debris</td>
</tr>
<tr>
<td>1. Use carryall</td>
</tr>
<tr>
<td>a) Take outside building</td>
</tr>
<tr>
<td>b) Debris pile versus salvage pile</td>
</tr>
<tr>
<td>2. Look for evidence when removing</td>
</tr>
<tr>
<td>3. Extinguish small burning objects</td>
</tr>
<tr>
<td>D. Determine cause of fire</td>
</tr>
<tr>
<td>1. Note information for investigator during overhaul</td>
</tr>
<tr>
<td>2. Preserve evidence</td>
</tr>
<tr>
<td>a) Keep where found, untouched if possible</td>
</tr>
<tr>
<td>b) Properly remove, identify and safeguard evidence that cannot be left as discovered</td>
</tr>
<tr>
<td>c) Post security guard</td>
</tr>
<tr>
<td>E. Restore building to safe condition</td>
</tr>
<tr>
<td>1. Check structural integrity of building</td>
</tr>
<tr>
<td>2. Cover roofs</td>
</tr>
<tr>
<td>3. Make contents safe</td>
</tr>
<tr>
<td>4. Place contents in proper order</td>
</tr>
<tr>
<td>5. Remove dangerous structural conditions</td>
</tr>
<tr>
<td>6. Restore sprinkler systems, standpipe systems</td>
</tr>
<tr>
<td>7. Control electrical, gas and water service</td>
</tr>
<tr>
<td>8. Deodorize premises</td>
</tr>
<tr>
<td>a) Good public relations</td>
</tr>
<tr>
<td>9. Release premises, if safe for occupancy</td>
</tr>
</tbody>
</table>

What steps need to be taken to restore a safe condition?
SUMMARY:

Overhaul is of value to extinguish remaining fire, prevent rekindle, minimize damage, provide safety, determine cause of fire, and improve public relations. Common overhaul procedures are search for hidden fire, extinguish fire, handle debris, determine fire cause, and restore building.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SERVICE SALVAGE EQUIPMENT

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of fire service salvage equipment by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 7

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Examples of equipment such as salvage covers
- Salvage kits
- Sprinkler kits
- Carryalls
- Floor runners
- Mops
- Wringers
- Buckets
- Squeegees
- Water vacuum

REFERENCES:
- Essentials of Fire Fighting, IFSTA. Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition
- Truck Company Fireground Operations, Harold Richman, Second Edition
PREPARATION: Salvage work is considered part of the fire service's responsibility. Much of the damage done at fires is done by water. The fire service uses various tools and equipment to aid in salvage work. Many tools can be used for several purposes. The fire fighter must know when and what type of salvage equipment to use.
I. SALVAGE EQUIPMENT
   
   A. Most of the tools in the department could be considered as salvage tools

   B. Tools specially designed for salvage work
      1. Salvage covers
      2. Salvage kits
      3. Sprinkler kits
      4. Carryalls
      5. Floor runners
      6. Mops/wringers
      7. Buckets
      8. Squeegees
      9. Water vacuum
     10. Pumps
         a) Portable
         b) Submersible
     11. Visqueen rolls

II. SALVAGE COVERS

   A. Sizes
      1. 12 feet x 16 feet
      2. 14 feet x 18 feet

   B. Construction
      1. Double stitched on the sides, seams, and corners for strength
2. Grommets provided in the ends and on the sides
   a) Permit hanging without damage to covers

   What materials are used to make conventional salvage covers?

C. Materials
   1. Made from closely woven canvas that has been waterproofed
   2. Rubber-coated cotton duck covers are also used
   3. Plastic covers are also popular

      a) Made from 100% polyethylene film

D. Plastic salvage covers
   1. Advantages
      a) Are extremely lightweight and easily handled
      b) Economical
      c) Practical for indoor and outdoor use
      d) Chemically inert
         1) Not generally affected by alkalines, oils, acids, caustics, or solvents

      What are some problems encountered when using plastic covers?

   2. Disadvantages
      a) Tendency to slip from high-piled merchandise
### Characteristics And Functions Of Fire Service Salvage Equipment

**PRESENTATION**

- b) Not well adapted to bagging by rolling the edge
- c) Plastic covers should not be used in areas where sparks or hot embers may be present

---

**APPLICATION**

When should salvage covers be used?

### E. Uses

1. **Covering objects**
   - a) General rule
     - 1) If there is any doubt as to their need, cover the object
     - 2) Not only protect items from water damage but also from contamination by falling debris and/or smoke
   - b) Furniture, merchandise, machinery, and other objects that might be damaged by water or debris
   - c) Will cover all the furniture in an average size room
     - 1) Living room
     - 2) Bedroom
     - 3) Den

2. **Covering walls or holes in roof**
3. **Making chutes for diverting water outside of a building or down a stairway**
4. **Covering an engine or truck to help keep the equipment dry and free from falling debris**
### III. MISCELLANEOUS SALVAGE EQUIPMENT

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Salvage kit</td>
<td>What types of tools are found in a salvage kit?</td>
</tr>
<tr>
<td>1. Nails/staples</td>
<td></td>
</tr>
<tr>
<td>2. Hammer/staple gun</td>
<td></td>
</tr>
<tr>
<td>3. S-hooks for hanging salvage covers</td>
<td></td>
</tr>
<tr>
<td>B. Sprinkler kit</td>
<td>What types of tools are found in a sprinkler kit?</td>
</tr>
<tr>
<td>1. Wooden pegs and wedges used to shut-off sprinkler flow until the control valve can be located</td>
<td></td>
</tr>
<tr>
<td>2. An assortment of sprinkler heads and wrenches for replacing sprinkler heads</td>
<td></td>
</tr>
<tr>
<td>C. The carryall</td>
<td>What is a carryall?</td>
</tr>
<tr>
<td>1. Heavy canvas carrier</td>
<td></td>
</tr>
<tr>
<td>2. Usually 4 feet x 4 feet</td>
<td></td>
</tr>
<tr>
<td>3. With rope handles for removing debris</td>
<td></td>
</tr>
<tr>
<td>D. The floor runner</td>
<td>How do you use a floor runner?</td>
</tr>
<tr>
<td>1. Usually 2 feet x 16 feet</td>
<td></td>
</tr>
<tr>
<td>2. Rolled across a carpet to permit walking across the carpet without tracking dirt</td>
<td></td>
</tr>
</tbody>
</table>
### Characteristics And Functions Of Fire Service Salvage Equipment

**What types of hand-powered equipment is used for water removal?**

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Water removal equipment</td>
<td>What types of hand-powered equipment is used for water removal?</td>
</tr>
<tr>
<td>1. Mops</td>
<td></td>
</tr>
<tr>
<td>2. Buckets</td>
<td></td>
</tr>
<tr>
<td>3. Squeegees</td>
<td></td>
</tr>
<tr>
<td>4. Water vacuums</td>
<td></td>
</tr>
<tr>
<td>5. Pumps</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Salvage equipment is an important part of the salvage operations. Such equipment as covers and floor runners protect building contents from further damage. Squeegees, mops, and water vacuums control and remove water from buildings, while carryalls are used to remove debris. Sprinkler kits aid in restoring sprinkler systems back to service. Salvage kits aid in hanging or attaching covers as needed.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROCEDURES FOR DETECTING HIDDEN FIRES

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.12

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of how hidden fires are detected by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition
- Truck Company Fireground Operations, Harold Richman, Second Edition

PREPARATION:

Overhaul procedures may not necessarily follow a specific pattern plan due to varying conditions found at every fire scene. However, one of the first routine operations should be a search for hidden fires. In order to prevent rekindle and loss of property and life, we should know where to look for hidden fires. To prevent rekindle and possible further building damage, all hidden fires must be discovered and extinguished. There are a number of standard techniques for discovering hidden fires.
## I. CONCEALED SPACES FOR HIDDEN FIRES

A. Walls  
B. Partitions  
C. Attics  
D. Cockloft  
E. Basements  
F. Above ceilings  
G. Below floors  
H. Air shafts  
I. Shafts  
J. Pipe chases  
K. Ducts  
L. Façade  
M. Under debris  
N. Around merchandise  
O. Around duct systems  
P. In appliances  
   1. Oven  
   2. Dishwasher  
Q. Behind large furnishings  
   1. Hutches  
   2. Dressers  
   3. Bed headboards
II. SEARCHING FOR HIDDEN FIRES

A. Fire fighters can often detect hidden fires through using their senses
   1. Sight
   2. Sound
   3. Touch
   4. The sense of smell is no longer listed as a reliable means to detect hidden fires
      a) SCBA should be worn during most overhaul activities
         1) Presence of toxic gases
         2) Odorless products of combustion

   B. Sight - look for
      1. Discoloration of materials
      2. Peeling paint
      3. Smoke emission from cracks
      4. Cracked plaster
      5. Rippled wallpaper

   C. Sound - listen for
      1. Popping or cracking of burning material
      2. Hissing of steam

   D. Touch - feel with the back of the hand
      1. Walls
      2. Ceilings
      3. Floors

How do we use sight to find hidden fires?

How do we use sound to find hidden fires?

How do we use touch to find hidden fires?
What else can we use to find hidden fires?

E. Electronic instruments
   1. Infrared scanners/thermal imaging equipment
      a) Hand-held
      b) Helmet mounted

III. CHECK ALL ROUTES OF FIRE SPREAD

A. Check for vertical extension
   1. Partitions, walls, and hidden vertical shafts
   2. Along pipe work and duct work
   3. Remodeled buildings
      a) Between false ceilings
      b) Decorative walls

B. Check for horizontal extension
   1. Along top plates
   2. Headers
   3. Attic spaces

C. Open all suspected areas until no sign of fire extension
   1. No char in wood members
   2. No discoloration from smoke
   3. Spider webs intact

What are several routes of vertical fire spread?

Where might horizontal fire spread occur?

When may you stop opening up suspected fire areas?
SUMMARY:

It is essential that all areas of possible concealed fires be checked and that they are confirmed to be free of fire. During these operations, full personal protective equipment, including SCBA, is necessary. Check all routes for possible fire spread, open all suspected areas, and look for signs of fire extension. When in doubt, open up and inspect.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: PRINCIPLES AND PROCEDURES FOR USING AN INFRARED SCANNER

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.12

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles and procedures for using an infrared scanner by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 5

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials
• Technical reference sheets, locally produced and brand specific
• Infrared scanner technical information sheets

REFERENCES: • Fire Service Loss Control, IFSTA, First Edition

PREPARATION: One of the first routines in overhaul is to search for hidden fires. It is the responsibility of the fire department to use available tools to prevent a devastating rekindle. An infrared scanner is one such tool.
## I. DEFINITION
A. An infrared scanner is an electronic instrument used to detect heat
B. It works by measuring and comparing surface temperatures

## II. DEVICE CHARACTERISTICS
A. Converts radiation energy (heat) into a displayed audible signal, meter reading, or visual image
B. Operates on the amount of infrared energy radiated from objects based on temperature variances
C. Only reads surface temperatures
D. Will not show fires which do not transmit heat to the surface being scanned
E. Operating temperature
   1. Usually 15°F-150°F

## III. USING AN INFRARED SCANNER
A. Reasons for using
   1. To locate hidden fires
   2. Reduce fire spread, rekindle

B. Locations to use
   1. Concealed spaces
   2. Attics
   3. Cocklofts
   4. Basements
   5. Pipe chases
   6. Ducts
   7. Below floors
   8. Overhead lighting

Where would the infrared scanner be applicable?
9. Vehicle fires
10. Wildland fires
11. Refuse fires
12. Haz Mat

C. Using infrared scanner
   1. Turn infrared scanner on, if applicable
   2. Scan large area with side-to-side motion with each horizontal sweep pointing higher than the previous sweep until the area has been scanned and hot spot located
   3. Upon locating hot spot
      a) Audible alarm will sound, or
      b) Meter reading will indicate hot spot

IV. STORAGE
   A. Clean after every use
   B. Store in a cool, dry location
   C. Verify on/off switch is off
   D. Ensure batteries are recharged/changed
   E. Ensure unit is placed in its proper storage container
SUMMARY:
An infrared scanner is a tool to assist in locating hidden fires and help prevent rekindle of fires.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROCEDURES FOR EXTINGUISHING HIDDEN FIRES

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.12

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the procedures for extinguishing hidden fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 5

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

PREPARATION:

When called upon to fight fire, most fire fighters will do a good job of extinguishing the main body of fire. Along with that, you must make sure hidden fires in walls, shafts, hay bales, etc. are completely extinguished. There is nothing more embarrassing than leaving a fire you have extinguished and being called back to put that same fire out again. As a professional, you should do a thorough and efficient overhaul job and complete the job you started.

If you have an indication that the fire may be of suspicious origin, overhaul should be delayed or kept to a minimum until an investigator can be called.
I. PROTECTION
   A. PPE and SCBA should be worn during overhaul operation

   B. SCBA is worn until area is clear of all products of combustion

II. HOSEINES
   A. Charged hoselines should always be available
   B. Smaller hoselines can be used during overhaul
   C. When conditions permit, hoselines can be disconnected from pumper and charged directly from hydrant
      1. Use larger hoseline from hydrant
      2. Reduce to smaller hoseline for inside use
   D. Depending upon materials to be extinguished, you may use
      1. Straight stream for penetrating tightly packed materials
      2. Fog stream for most overhaul
         a) Will not scatter material like a straight stream
   E. Garden hose, if available

III. REMOVAL OF BURNING DEBRIS FROM STRUCTURE
   A. Small objects
      1. Place small burning objects in a container of water if possible, rather than trying to drench
         a) Sink
         b) Tub
         c) Sump basin
      2. Pillows, clothing, draperies, pieces of upholstery can be soaked in the same way

When can SCBA be taken off?
B. Large items
   1. Should be moved outside where they can be
      more easily and thoroughly extinguished
      a) Mattresses
      b) Furniture
      c) Bedding

C. Notify investigators before anything is moved or altered

IV. WETTING AGENTS
A. Can be very useful on hidden fires
   1. Cotton
   2. Baled goods
   3. Upholstery goods
   4. Other such materials
B. Can be applied directly if fire apparatus design
   allows induction at pump
C. Can be added directly to water tank
   1. In accordance with manufacturer's
      recommendations and directions

V. SPECIAL HAZARDS
A. Dust laden areas
   1. Require overhaul be carried out in a careful
      manner
   a) If care is not exercised, you could
      dislodge dust and create dust explosion

Should debris be moved out of building right away?

What special problems might you incur in a dust-laden area?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Smoldering fires could cause ignition</td>
<td></td>
</tr>
<tr>
<td>3. When using water in dust laden areas, apply light fog streams, take care to minimize dust movement</td>
<td></td>
</tr>
<tr>
<td>4. Wetting agents can be helpful in this area</td>
<td></td>
</tr>
<tr>
<td>B. Grain bins or product storage bins that emit dust</td>
<td></td>
</tr>
<tr>
<td>1. Wet down sufficiently</td>
<td></td>
</tr>
<tr>
<td>C. Baled hay or livestock feeds</td>
<td></td>
</tr>
<tr>
<td>1. May have to use heavy equipment to pull bales apart</td>
<td></td>
</tr>
</tbody>
</table>

2. Wetting agents can be very helpful in penetrating materials

What type of extinguishing agent is very useful in these materials?
SUMMARY:

Extinguishing hidden fires is very important on any fire you may fight. There is a variety of ways to put these fires out. Wetting agents, water, and common sense, if applied, will get the job done. It is important to remember that safety procedures must be maintained throughout this task. Many fire fighters have suffered painful and needless injuries due to negligence during this phase of fire fighting. Do not let that happen to you. Think safety at all times.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROVIDING PROTECTION DURING CHIMNEY FIRES

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of providing protection during chimney fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Salvage cover

REFERENCES:
- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION: At times, the interior of a room must be protected from the ashes and debris found in a fireplace. Usually this occurs when fire fighters are controlling a chimney fire from the roof or chimney top.
# PROTECTION DURING CHIMNEY FIRES

A. One method of protecting the interior during chimney fire control requires the use of a canvas to cover the fireplace opening.

B. After reducing the fire using a minimal water spray in the fireplace, canvas is hung or supported over the fireplace opening to prevent smoke and ashes from drifting into the room.

C. Once this is accomplished, dry chemical may be applied by opening the canvas slightly and operating the extinguisher momentarily into the fireplace opening.
   1. Many fire departments carry canvas 6 feet x 8 feet rectangle which can be used for this purpose.
   2. A salvage cover may also be used.

D. When a mantel is present, the canvas can be hung in front of the fireplace by placing weights on the canvas laid on the mantel.

If there is no mantel, how might you cover the fireplace with canvas?

1. In the absence of a mantel, the canvas will have to be held or propped against the face of the fireplace.
**SUMMARY:**

The protection of room interiors is an important step in reduction of fire losses. It creates a positive public relations image and demonstrates professionalism.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Salvage and Overhaul*, IFSTA, Seventh Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:**
INSPECTION AND MAINTENANCE OF FIRE SERVICE SALVAGE COVERS

**TIME FRAME:**
0:45

**LEVEL OF INSTRUCTION:**
Level II

**AUTHORITY:**
1997 NFPA 1001 3-5.3

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the damage, inspection, and maintenance of fire service salvage covers by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 7

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Salvage cover

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

**PREPARATION:**
Salvage covers cost a great deal of money. Given the number each fire department has, a considerable investment has been made. The establishment of an agency policy for salvage covers can reduce damage by improper use. Recognizing the causes of damage will allow the fire fighter to avoid damaging the cover. Proper inspection and maintenance can extend the life of the covers, thus helping to keep cost under control and thus helping to keep cost under control and ensuring that covers are always ready for use.
## I. HOW SALVAGE COVERS CAN BE DAMAGED

### A. Lack of use

1. Canvas covers should be taken from the apparatus and refolded periodically
   a) Per agency policy
2. Synthetic and Visqueen covers are less likely to be damaged by not refolding

### B. Freezing weather

1. Frozen covers should be thawed, cleaned, and dried before folding

### C. Mechanical damage

1. Care must be exercised when moving covers over sharp projections, stock, or machinery to prevent tearing

### D. Heat and sparks

1. Synthetic and Visqueen covers are more susceptible to damage from hot embers and sparks
   a) Limitations of these covers should always be considered before placing

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<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>I. HOW SALVAGE COVERS CAN BE DAMAGED</td>
<td>How often should salvage covers be refolded?</td>
</tr>
<tr>
<td>A. Lack of use</td>
<td></td>
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<tr>
<td>1. Canvas covers should be taken from the apparatus and refolded periodically</td>
<td></td>
</tr>
<tr>
<td>a) Per agency policy</td>
<td>How should frozen covers be handled?</td>
</tr>
<tr>
<td>2. Synthetic and Visqueen covers are less likely to be damaged by not refolding</td>
<td>How should covers be handled to prevent mechanical damage?</td>
</tr>
<tr>
<td>B. Freezing weather</td>
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</tr>
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<td></td>
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</tbody>
</table>
E. Mildew

1. Covers should be washed and hung on drying racks as soon as possible after returning from fires to prevent mildew
2. Synthetic and Visqueen covers require less attention to immediate cleaning and drying

II. INSPECTION AND MAINTENANCE

A. Once the salvage cover is cleaned, the cover should be thoroughly dried before it is folded and placed in service
   1. This practice is essential in order to prevent mildew and rot
   2. When using synthetic covers, drying prior to folding is less critical

B. Drying salvage covers
   1. An indoor, well-ventilated area should be provided for drying salvage covers
   2. Outside drying of salvage covers is objectionable because wind tends to blow and whip the covers, causing excessive stress upon the cover
### What should be done before final folding of salvage covers?

3. After covers are dry, they must be examined for holes and mended before they are folded and placed in service.

C. Prior to placing in service, the cover should be examined for holes or tears and any damage repaired:
   1. Extend patch at least two inches beyond rip or hole
   2. Large holes, patch both sides of cover
   3. Iron-on for quick patch jobs
   4. Use contact cement for permanent repair
   5. Duct or masking tape

D. Salvage covers that have been properly cleaned, dried, and repaired are now ready to be folded and placed in service:
   1. Most departments carry their covers on the apparatus, folded and ready for use

E. Proper cleaning, drying, and repairing of salvage covers will increase their span of service.

### What washing method is most often used on salvage covers?

1. Ordinarily, the only cleaning that is required for salvage covers is washing with water and scrubbing with a broom
2. A mild solution of soap and water may be used for excessively soiled salvage covers

F. Permitting salvage covers to dry while dirty is not a good practice:
   1. Carbon and ash stains become difficult to remove
2. Wood ash and other products of combustion may have a chemical effect upon the fabric
3. Synthetic covers are generally not affected by carbon and ash

If unable to clean salvage cover immediately, what should you do?

G. If it is necessary to postpone the cleaning of dirty covers, it is recommended that the dirty covers be wet down so that they will remain damp until they can be cleaned

H. The type of salvage cover fold is dependent on department policy
   1. A number of these folds can be found in Fire Service Loss Control, IFSTA, First Edition, Chapter 4
   2. The covers should be located on the apparatus so that they will be readily accessible and protected against damage and the weather

I. All salvage equipment needs care and upkeep, especially salvage covers which are more susceptible to damage

Where should covers be located on apparatus?

J. Covers should be located on the apparatus so that they will be readily accessible to the fire fighter and protected against injury and contamination from other fire department equipment

What are two practices that should be avoided when using salvage covers?
K. The following practices should be prohibited

1. Throwing covers from roofs or above ground openings
2. Unnecessary walking on covers
**SUMMARY:**

Sharp objects, hot ambers, and mildew all damage salvage covers. Salvage covers allowed to sit on apparatus too long may develop mildew and create a weak spot in the cover which water can penetrate. Falling hot embers can damage any salvage cover, therefore, placement of covers must always be considered. Covers should be properly cleaned and dried before folding, then stored in clean, dry, and well-ventilated areas. Examination for damage takes place before the cover is placed in service. The repair of covers depends on the type of construction. Properly maintained and cleaned salvage covers last longer.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Loss Control*, IFSTA, First Edition, Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROCEDURES FOR MAKING BUILDINGS AND AREAS SAFE AFTER AN EMERGENCY

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.12

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the procedures for making buildings and areas safe after an emergency by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 8

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Loss Control, IFSTA, First Edition
- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION: One of the first objectives of restoring the premises is making the building safe. Checking the structural condition of the building should be done to prevent injuries to occupants who take possession of the premises after the fire department leaves. Not all structures can be made safe and occupants should be kept out.
I. INSPECTION

A. All portions of the building should be carefully inspected for
   1. Sagging floors
   2. Sagging ceilings
   3. Sagging roofs
   4. Bulging or cracked walls
   5. Weakened roofs
   6. Loose cornices
   7. Chimneys weakened

II. STRUCTURE SAFETY

A. Areas of uncorrected weakness should be placed off limits to all personnel
   1. Correct the condition
   2. Isolate the problem

B. Unstable ceilings and walls can be shored or braced
   1. Provides temporary stability

C. Holes in floors and stairways should be marked, barricaded or covered
   1. To prevent accidental access
D. Utilities (gas and electrical services) should be disconnected if any safety hazard is suspected
   1. Gas shut-off at the meter
      a) The quarter-turn shut-off valve should be crosswise on the pipe to indicate gas is shut-off
   2. Electrical shut-off is near the meter
      a) Meter switch to be in "off" position
      b) If in doubt, turn all electrical switches to the "off" position
      c) Make notes for investigators of switches moved
   3. Utilities should be turned back on by utility company personnel to ensure they are in proper working order

E. Sharp, exposed objects
   1. Nails
   2. Metal
      a) Structural steel
      b) Pipes
   3. Broken glass

III. MAKING THE CONTENTS SAFE
   A. The damaged contents of a building can present serious safety hazards

   1. Examples
      a) High-piled stock
      b) Unpalletized storage
      c) Stock from shelves
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>d) Wet material that absorbs water, adding weight to the contents</td>
<td></td>
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<tr>
<td>e) Unstable or reactive liquids, solids</td>
<td></td>
</tr>
<tr>
<td>f) Etiologic or radioactive materials</td>
<td></td>
</tr>
<tr>
<td>g) Opened or closed tanks of liquids</td>
<td></td>
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<tr>
<td>h) File cabinets, safes</td>
<td></td>
</tr>
<tr>
<td>i) Heavy machinery</td>
<td></td>
</tr>
<tr>
<td>j) Overhead hazards</td>
<td></td>
</tr>
<tr>
<td>1) Signs</td>
<td></td>
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<tr>
<td>2) Marquees</td>
<td></td>
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<tr>
<td>3) Roof-mounted equipment</td>
<td></td>
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<tr>
<td>4) Antennas</td>
<td></td>
</tr>
<tr>
<td>5) Light fixtures</td>
<td></td>
</tr>
<tr>
<td>6) Unstable ceilings</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

The fire department must be concerned with removing dangerous conditions in the areas surrounding the building. This is done to ensure safety of fire fighting personnel and to protect the public in general. Buildings cannot always be made safe for occupancy.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: ARRANGING BUILDING CONTENTS FOR COVERING

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the ways to arrange building contents for covering with salvage covers without causing further damage by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

PREPARATION: Arranging building contents is a very important part of salvage work. Well-arranged contents are easier to cover and require using fewer salvage covers.
## I. ARRANGING HOUSEHOLD FURNISHINGS TO BE COVERED

A. If care is taken, one average size salvage cover can usually protect the contents of one room

B. Arranging furniture in a bedroom
   1. Group furniture in the center of the room
   2. Be aware of overhead lighting
      a) May leak
   3. Place dresser, chest, or high object at the end of the bed
   4. If you have removable rugs, slip the rug from under the furniture as it is moved, then roll it
      a) Place on top of arrangement to form a ridge pole

5. Group other furniture close by, away from walls

6. Place pictures, curtains, lamps and clothing upon the bed
   a) Heavy items on bottom, lighter items on top

7. Check top of bureaus, dressers, and tables
   a) Place all small items found on these into drawers for safekeeping

8. Position furniture with drawers facing toward center of arrangement
   a) Reduces possibilities of water leakage

9. Valuable items should be reported to your officer
   a) Never put items in your pockets
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. At times it may be necessary to place the salvage cover in position before some articles are placed on the bed</td>
<td></td>
</tr>
<tr>
<td>11. Place other items under the salvage cover one at a time</td>
<td></td>
</tr>
<tr>
<td>a) Care should be taken to reduce damage</td>
<td></td>
</tr>
<tr>
<td>12. Careless handling can be more destructive than water damage</td>
<td></td>
</tr>
<tr>
<td>C. Arranging furniture in living room</td>
<td></td>
</tr>
<tr>
<td>1. Use the largest and heaviest pieces of furniture as a base for the grouping</td>
<td></td>
</tr>
<tr>
<td>2. Before other articles are piled on them, protect fabric coverings and wood finishes with rugs, blankets, cushions, or pillows</td>
<td></td>
</tr>
<tr>
<td>3. Do not build close to a wall</td>
<td></td>
</tr>
<tr>
<td>a) Spreading salvage covers will be difficult</td>
<td></td>
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<tr>
<td>4. Roll up any rugs and place in same manner as in bedroom, if possible</td>
<td></td>
</tr>
<tr>
<td>5. Do not overlook closet contents</td>
<td></td>
</tr>
<tr>
<td>6. Do not overlook paintings and wall tapestries</td>
<td></td>
</tr>
<tr>
<td>a) Place on pile after larger and heavier pieces have been grouped</td>
<td></td>
</tr>
<tr>
<td>7. As in all cases, after the salvage cover has been placed, tuck under the edges</td>
<td></td>
</tr>
<tr>
<td>a) Prevents pooling of water on the salvage cover</td>
<td></td>
</tr>
<tr>
<td>What problem may you have if you build too close to a wall?</td>
<td></td>
</tr>
<tr>
<td>Why are edges tucked under?</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

If care is taken, one salvage cover can usually cover the contents of one room. Items should be placed in the center of the room, going from the heaviest or largest to the lightest. Careless handling can be more destructive than water damage itself.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: USING SALVAGE COVERS TO COVER SHELVES

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of using salvage covers to cover shelves by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION:
Covering shelves is often difficult and challenging. Good salvage work in this respect can cut the content loss significantly, especially in libraries.
I. SHELF CONSTRUCTION
   A. Shelves are not always constructed to permit proper covering
   B. Shelving is frequently built directly to the wall
   C. It may be necessary to fasten the salvage cover to the wall
   D. It may be necessary to fasten the cover to the top of the shelf
   E. Some free standing shelves may be anchored to the wall for earthquake standards

II. SAFETY
   A. Do not climb on the shelving
   B. Do not use the shelving as a ladder

III. EQUIPMENT NEEDED FOR OPERATION
   A. Adequate personnel to accomplish the task at hand
   B. Ladders
      1. Attic
      2. Combination
      3. A-frame
      4. Roof ladder
   C. Sufficient amount of salvage covers or visqueen rolls
   D. Staples and staple gun
   E. Firring strips

IV. ANCHOR THE COVER
   A. Anchor the salvage cover in place with articles of sufficient weight

What are two short ladders that could be used?
<table>
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<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>B. Cover may be anchored by tucking it behind the shelf, if possible</td>
<td></td>
</tr>
<tr>
<td>C. Visqueen may be anchored with staples and firring strips</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

It is important you learn to do salvage operations fast and effectively. You must also learn to do salvage operations safely and not do more damage than good.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Salvage and Overhaul*, IFSTA, Seventh Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PROTECTING FLOORS AND WALLS USING SALVAGE COVERS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of protecting floors and walls using salvage covers by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 4

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Fire Service Loss Control, IFSTA, First Edition

PREPARATION:

When water collects in a building, most of it will obviously be on floors. Salvage operations should reflect an understanding of the effects of water accumulation on floor coverings. Although damage to the finish of wood floors is always a concern, a greater problem is that wood floors react to severe or prolonged dampness by warping, swelling, and buckling. Various types of composition and tile coverings will often separate from the floor when the water seeps under the coverings. These situations require the use of many types of salvage equipment and methods.
I. METHODS OF PROTECTING FLOORS AND FLOOR COVERINGS

A. Floors and floor coverings (carpeting and rugs) in the majority of buildings may be greatly damaged by water and debris
   1. This is a serious salvage problem
   2. Salvage operations must be initiated without delay in order to limit damage to the floor and floor coverings caused by water and debris

B. Water on floors
   1. Any water which reaches the floor should be removed immediately
   2. Necessary equipment
      a) Salvage covers
      b) Runners
      c) Shovels
      d) Squeegees
      e) Brooms
      f) Mops and buckets
      g) Water vacuum
   3. Every effort must be made to prevent excessive water from reaching the floor, carpets, stairways, hallways

C. Routing water
   1. Removing water from a building must be done quickly and safely without damage to unaffected portions of the building
   2. Numerous avenues can be used to route water
      a) Floor drains
      b) Soil pipe opening
c) Stairways

d) Salvage covers

e) Breaching walls

f) Holes cut in floor

g) Elevator shafts

D. Carpeting

1. Water on carpeting presents a serious problem if allowed to reach the carpeting or remain on it

2. Equipment necessary for removal
   a) Scoop shovels
   b) Brooms
   c) Squeegees
   d) Mops
   e) Water vacuum

3. If soaked, it is sometimes a good policy to take the carpet off the floor
   a) Prevent tearing
   b) Remove to safe place

4. Rugs may be rolled up and placed out of danger on furniture or under salvage covers

II. METHODS OF PROTECTING WALLS AND WALL COVERINGS

A. The major problem is protecting walls and wall coverings from water damage which originates in attics and upper floors

B. Water from aloft generally follows down the inside of partitions, causing plaster to fall and damaging wallpaper, tapestry, fixtures, bookshelves, permanently attached pictures, etc.
1. Salvage operations should begin in attics or upper floors where efforts should be made to divert water before it has a chance to seep down

C. Control methods to prevent water damage to walls and wall coverings is as follows
   1. Bagging of salvage covers
   2. Constructing drains
   3. Absorbing moisture with sawdust
   4. Protection of walls and wall coverings from water, smoke and heat can be accomplished by
      a) Hanging salvage cover with the aid of S-hooks, nails, or cord

Where should salvage operations begin?
**SUMMARY:**

During this period of instruction, we have covered the methods to protect floors and walls from water damage. Salvage is one of the best public relations activities going for the fire service. It is important that you understand these methods and practice them during fire operations.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
PROCEDURES FOR CONSTRUCTING A SMOKE CURTAIN

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:
Condition: A written test
Behavior: The student will confirm a knowledge of the procedures for constructing a smoke curtain by completing the written test
Standard: With a minimum 80% accuracy according to the information contained in the Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Salvage cover

REFERENCES:
- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION:
On the fireground, the efficient fire fighter will be called on to use whatever is available to help with salvage. Smoke in a structure can be controlled by the use of smoke curtains. Other areas or floors may be protected from the spread of smoke with smoke curtains. Much time and damage may be saved if the fire fighter can recognize the need for smoke curtains.
I. CONSTRUCTION OF SMOKE CURTAINS

A. Construction of smoke curtains with salvage covers is most effective in narrow spaces, such as halls and stairways
   1. Covers hung in halls and stairways are used to channel smoke for removal through windows, doors, or other vents

B. Curtains are also effectively used to prevent smoke from entering stairways or to block smoke from passing into uninvolved sections of the building

C. All of the basic ventilation principles apply when smoke curtains are to be used

D. Covers used as smoke curtains can be secured in place with the use of extendable bars or smoke ejector holders designed to fit across door openings

E. Covers may also be suspended by nails, S-hooks, or cord placed through the grommets
   1. Important consideration must be given to not damaging the cover during the hanging process
   2. Never drive nails through the cover
   3. When overlapping covers, the overlap should be one grommet past the corner

Where would a smoke curtain be most effective?

How would you secure a smoke curtain?
SUMMARY:

Smoke curtains made of salvage covers hung in stairways can prevent the spread of smoke to other floors. Curtains hung in halls will also be useful in preventing smoke spread horizontally. Smoke covers can be secured by use of extendable bars in doorways or attached to walls.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO ROLL A SALVAGE COVER FOR A ONE-PERSON THROW

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, broom, bands, and appropriate personal protective equipment

Behavior: The students will roll a salvage cover for a one-person throw

Standard: Completing all operations within _________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Salvage cover
- Broom
- Bands (rubber bands, Velcro® straps, or tie cords)
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16
- Fire Service Loss Control, IFSTA, First Edition, Chapter 4

PREPARATION:

You will soon be joining a fire company. The effective use of salvage covers is an important part of fire company operations. The one-person throw is a time and personnel saving evolution. Preparing the cover for the one-person throw is an essential step in the overall efficiency of the salvage operation.

NOTE:

All folds and rolls are usually prepared by two people. The "one-person" and "two-person" designations refer to how many individuals are required to THROW or SPREAD the cover by unfolding or unrolling.
<table>
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<th>OPERATIONS</th>
<th>KEY POINTS</th>
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</thead>
<tbody>
<tr>
<td>1. Lay out cover</td>
<td>1a. Flat</td>
</tr>
<tr>
<td></td>
<td>b. On clean floor</td>
</tr>
<tr>
<td></td>
<td>c. Finished side up</td>
</tr>
<tr>
<td>2. Position fire fighters</td>
<td>2a. Midway between edge and center</td>
</tr>
<tr>
<td></td>
<td>b. At each long end</td>
</tr>
<tr>
<td></td>
<td>c. Facing each other</td>
</tr>
<tr>
<td></td>
<td>d. Kneeling position</td>
</tr>
<tr>
<td>3. Grasp cover</td>
<td>3a. With outside hand</td>
</tr>
<tr>
<td></td>
<td>b. Midway between center and edge to be folded</td>
</tr>
<tr>
<td>4. Place other hand</td>
<td>4a. On the cover</td>
</tr>
<tr>
<td></td>
<td>b. As a pivot between the outside hand and the center</td>
</tr>
<tr>
<td>5. Make first fold</td>
<td>5a. Bringing the outside hand toward the center</td>
</tr>
<tr>
<td></td>
<td>b. Crossing over the pivot hand</td>
</tr>
<tr>
<td></td>
<td>c. Creating an inside fold at the center and an outside fold</td>
</tr>
<tr>
<td>6. Grasp outside fold and edge of cover</td>
<td>6a. With outside hand</td>
</tr>
<tr>
<td>7. Place other hand</td>
<td>7a. On the cover</td>
</tr>
<tr>
<td></td>
<td>b. As a pivot between the outside hand and the center</td>
</tr>
<tr>
<td>8. Make second fold</td>
<td>8a. Bringing outside hand toward the center</td>
</tr>
<tr>
<td></td>
<td>b. Crossing over pivot hand</td>
</tr>
<tr>
<td></td>
<td>c. Placing it on top and in line with the first fold</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>9. Repeat Operations 3-8</td>
<td>9a. To fold the other half</td>
</tr>
<tr>
<td>10. Sweep cover</td>
<td>10a. With broom</td>
</tr>
<tr>
<td></td>
<td>b. Removing air</td>
</tr>
<tr>
<td></td>
<td>c. Towards ends</td>
</tr>
<tr>
<td>11. Straighten folds</td>
<td>11a. With ends of broom handle</td>
</tr>
<tr>
<td>12. Fold cover</td>
<td>12a. 12 inches</td>
</tr>
<tr>
<td></td>
<td>b. At both ends</td>
</tr>
<tr>
<td></td>
<td>c. Making the ends even</td>
</tr>
<tr>
<td>13. Reposition fire fighters</td>
<td>13a. Both at one end</td>
</tr>
<tr>
<td></td>
<td>b. Tucking in any wrinkles formed as roll progresses</td>
</tr>
<tr>
<td>15. Secure cover</td>
<td>15a. With rubber bands, Velcro® straps, or tie cords</td>
</tr>
</tbody>
</table>
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO FOLD A SALVAGE COVER FOR A ONE-PERSON THROW

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

*Condition:* A salvage cover, broom, and appropriate personal protective equipment

*Behavior:* The students will fold a salvage cover for a one-person throw

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Salvage cover
- Broom
- Appropriate personal protective equipment

**REFERENCES:**

- Essential of Fire Fighting, IFSTA, Fourth Edition, Chapter 16
- Fire Service Loss Control, IFSTA, First Edition, Chapter 4

**PREPARATION:** The one-person salvage cover throw is an efficient way to spread covers quickly. Two people must correctly fold the cover so that when needed, one person can readily place it into service. Every fire fighter should know how this fold is made.

**NOTE:** All folds and rolls are usually prepared by two people. The "one-person" and "two-person" designations refer to how many individuals are required to **THROW** or **SPREAD** the cover by unfolding or unrolling.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Lay out cover                | 1a. Flat  
|                                 | b. On clean floor  
|                                 | c. Finished side up  |
| 2. Position fire fighters       | 2a. Midway between edge and center  
|                                 | b. At each long end  
|                                 | c. Facing each other  
|                                 | d. Kneeling position  |
| 3. Grasp cover                  | 3a. With outside hand  
|                                 | b. Midway between center and edge to be folded  |
| 4. Place other hand             | 4a. On the cover  
|                                 | b. As a pivot between the outside hand and the center  |
| 5. Make first fold              | 5a. Bringing the outside hand toward the center  
|                                 | b. Crossing over the pivot hand  
|                                 | c. Creating an inside fold at the center and an outside fold  |
| 6. Grasp outside fold and edge of cover | 6a. With outside hand  |
| 7. Place other hand             | 7a. On the cover  
|                                 | b. As a pivot between the outside hand and the center  |
| 8. Make second fold             | 8a. Bringing outside hand toward the center  
|                                 | b. Crossing over pivot hand  
<p>|                                 | c. Placing it on top and in line with the first fold  |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Repeat Operations 3-8</td>
<td>9a. To fold the other half</td>
</tr>
<tr>
<td>10. Sweep cover</td>
<td>10a. With broom</td>
</tr>
<tr>
<td></td>
<td>b. Removing air</td>
</tr>
<tr>
<td></td>
<td>c. Towards ends</td>
</tr>
<tr>
<td>11. Straighten folds</td>
<td>11a. With ends of broom handle</td>
</tr>
<tr>
<td>12. Reposition fire fighters</td>
<td>12a. Both at one end</td>
</tr>
<tr>
<td>13. Grasp cover</td>
<td>13a. Both fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. Same end</td>
</tr>
<tr>
<td>14. Stand up</td>
<td>14a. Both fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. Without releasing cover</td>
</tr>
<tr>
<td>15. Fold cover</td>
<td>15a. Bringing end to a point just short of the center</td>
</tr>
<tr>
<td>16. Place one hand</td>
<td>16a. Both fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. On the cover</td>
</tr>
<tr>
<td></td>
<td>c. As a pivot in the middle of first fold</td>
</tr>
<tr>
<td>17. Fold cover</td>
<td>17a. Bringing folded end over</td>
</tr>
<tr>
<td></td>
<td>b. On top of first fold</td>
</tr>
<tr>
<td>18. Reposition fire fighters</td>
<td>18a. At other end</td>
</tr>
<tr>
<td>19. Repeat Operations 13-17</td>
<td>19a. Leaving about 4 inches between the two folds</td>
</tr>
<tr>
<td>20. Place one fold</td>
<td>20a. On top of the other</td>
</tr>
</tbody>
</table>
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
How To Perform The Accordion Fold

**TOPIC:** HOW TO PERFORM THE ACCORDION FOLD

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

*Condition:* A salvage cover, broom, and appropriate personal protective equipment

*Behavior:* The students will perform the accordion fold

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Salvage cover
- Broom
- Appropriate personal protective equipment

**REFERENCES:**

- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

**PREPARATION:**

Not only must salvage covers be carefully maintained, but they must also be folded correctly to ensure their successful use in emergencies. One of the most applicable folds used in the fire service is the accordion fold.

**NOTE:**

All folds and rolls are usually prepared by two people. The "one-person" and "two-person" designations refer to how many individuals are required to THROW or SPREAD the cover by unfolding or unrolling.
## Operations

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out cover</td>
<td>1a. Flat</td>
</tr>
<tr>
<td></td>
<td>b. On clean floor</td>
</tr>
<tr>
<td></td>
<td>c. Finished side up</td>
</tr>
<tr>
<td>2. Position fire fighters</td>
<td>2a. Midway between edge and center</td>
</tr>
<tr>
<td></td>
<td>b. At each long end</td>
</tr>
<tr>
<td></td>
<td>c. Facing each other</td>
</tr>
<tr>
<td></td>
<td>d. Kneeling position</td>
</tr>
<tr>
<td>3. Turn in corners</td>
<td>3a. To be folded</td>
</tr>
<tr>
<td></td>
<td>b. Approximately 10 inches</td>
</tr>
<tr>
<td></td>
<td>c. For easier reach during folding</td>
</tr>
<tr>
<td>4. Place outside hand</td>
<td>4a. On the cover</td>
</tr>
<tr>
<td></td>
<td>b. As a pivot between the center and outside edge</td>
</tr>
<tr>
<td>5. Reach over</td>
<td>5a. The pivot hand</td>
</tr>
<tr>
<td></td>
<td>b. With the inside hand</td>
</tr>
<tr>
<td>6. Grasp turned-in corner</td>
<td>6a. With inside hand</td>
</tr>
<tr>
<td>7. Make first fold</td>
<td>7a. Bringing the outside edge to the center</td>
</tr>
<tr>
<td></td>
<td>b. Crossing over the pivot hand</td>
</tr>
<tr>
<td></td>
<td>c. Aligning the entire edge along the center line</td>
</tr>
<tr>
<td>8. Place outside hand</td>
<td>8a. On the cover</td>
</tr>
<tr>
<td></td>
<td>b. As a pivot between the center and outside edge</td>
</tr>
<tr>
<td>9. Reach over</td>
<td>9a. The pivot hand</td>
</tr>
<tr>
<td></td>
<td>b. With the inside hand</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>10. Grasp corner of the fold</td>
<td>10a. With inside hand</td>
</tr>
<tr>
<td>11. Make second fold</td>
<td>11a. Bringing outside fold toward the center</td>
</tr>
<tr>
<td></td>
<td>b. Crossing over pivot hand</td>
</tr>
<tr>
<td></td>
<td>c. Aligning the entire fold along the center line</td>
</tr>
<tr>
<td>12. Repeat Operations 3-11</td>
<td>12a. To fold the other half</td>
</tr>
<tr>
<td>13. Sweep cover</td>
<td>13a. With broom</td>
</tr>
<tr>
<td></td>
<td>b. Removing air</td>
</tr>
<tr>
<td></td>
<td>c. Towards ends</td>
</tr>
<tr>
<td>14. Straighten folds</td>
<td>14a. With ends of broom handle</td>
</tr>
<tr>
<td>15. Reposition fire fighters</td>
<td>15a. Both at one end</td>
</tr>
<tr>
<td>16. Place thumb</td>
<td>16a. Of outside hand</td>
</tr>
<tr>
<td></td>
<td>b. Under the cover</td>
</tr>
<tr>
<td></td>
<td>c. Approximately 9 inches from the end (desired pleat width)</td>
</tr>
<tr>
<td></td>
<td>d. Palm down, over the cover</td>
</tr>
<tr>
<td>17. Place thumb</td>
<td>17a. Of inside hand</td>
</tr>
<tr>
<td></td>
<td>b. Over the cover</td>
</tr>
<tr>
<td></td>
<td>c. As a pivot approximately 18 inches from the end (twice desired pleat width)</td>
</tr>
<tr>
<td></td>
<td>d. Palm up, under the cover</td>
</tr>
<tr>
<td>18. Make first pleat (fold)</td>
<td>18a. Bringing inside hand over the outside hand</td>
</tr>
<tr>
<td></td>
<td>b. Aligning fold with edge of cover</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>19. Repeat Operations 16-18</td>
<td>19a. Until cover is completed folded</td>
</tr>
<tr>
<td></td>
<td>b. Last finished edge in same direction as first</td>
</tr>
<tr>
<td></td>
<td>c. Nine to eleven folds</td>
</tr>
<tr>
<td></td>
<td>d. Keeping straight, flat, and neat</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO SPREAD A ROLLED SALVAGE COVER

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A rolled salvage cover, arrangement of furniture, and appropriate personal protective equipment

Behavior: The student will spread a rolled salvage cover

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Rolled salvage cover
- Arrangement of furniture
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Firefighting, IFSTA, Fourth Edition, Chapter 16
- Fire Service Loss Control, IFSTA, First Edition, Chapter 4

PREPARATION: The placing of salvage covers is an important part of a fire fighter's skill. The ability to cover building contents properly is an important skill for the fire fighter to know.
### OPERATIONS | KEY POINTS
--- | ---
1. Take position | 1a. Standing at one end of the objects to be covered  
 | b. Facing objects  
2. Remove bands | 2a. From cover  
3. Position cover | 3a. On one end of objects  
4. Unroll cover | 4a. Sufficient amount to cover one end  
5. Continue to unroll cover | 5a. Moving toward opposite end  
 | b. Over objects  
 | c. End of roll falling into place at opposite end  
6. Take position | 6a. Standing at either end  
 | b. Facing cover  
7. Grasp cover | 7a. At open edges  
 | b. Where convenient  
 | c. One edge in each hand  
8. Open sides of cover | 8a. Over objects  
 | b. Snapping both hands up and out  
9. Take position | 9a. At other end of the objects  
 | b. Facing cover  
10. Repeat Operations 7 and 8  
11. Tuck all bottom edges | 11a. Under and in  
 | b. Keeping water out
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO SPREAD A FOLDED SALVAGE COVER

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A folded salvage cover, arrangement of furniture, and appropriate personal protective equipment

Behavior: The student will spread a folded salvage cover

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
• Job breakdown
• Folded salvage cover
• Arrangement of furniture
• Appropriate personal protective equipment

REFERENCES:
• Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16
• Fire Service Loss Control, IFSTA, First Edition, Chapter 4
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: The placing of salvage covers is an important part of a fire fighter's skill. The ability to cover building contents properly is an important skill for the fire fighter to know.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Take position</td>
<td>1a. Standing at the center of the objects to be covered</td>
</tr>
<tr>
<td></td>
<td>b. Facing objects</td>
</tr>
<tr>
<td>2. Position cover</td>
<td>2a. On top of and near the center of the objects</td>
</tr>
<tr>
<td>3. Separate cover</td>
<td>3a. At first fold</td>
</tr>
<tr>
<td>4. Grasp end of cover</td>
<td></td>
</tr>
<tr>
<td>5. Continue to unfold cover</td>
<td>5a. Moving toward the end of the objects</td>
</tr>
<tr>
<td>6. Grasp end of cover</td>
<td>6a. Near the center</td>
</tr>
<tr>
<td></td>
<td>b. With both hands</td>
</tr>
<tr>
<td></td>
<td>c. Preventing corners from falling outward</td>
</tr>
<tr>
<td>7. Bring end of cover</td>
<td>7a. Into position</td>
</tr>
<tr>
<td></td>
<td>b. Over the end of the objects</td>
</tr>
<tr>
<td>8. Take position</td>
<td>8a. Standing at the center of the objects</td>
</tr>
<tr>
<td></td>
<td>b. Facing objects</td>
</tr>
<tr>
<td>9. Repeat Operations 4-7</td>
<td>9a. To unfold opposite side</td>
</tr>
<tr>
<td>10. Take position</td>
<td>10a. Standing at one end of the objects</td>
</tr>
<tr>
<td></td>
<td>b. Facing cover</td>
</tr>
<tr>
<td>11. Grasp cover</td>
<td>11a. At open edges</td>
</tr>
<tr>
<td></td>
<td>b. Where convenient</td>
</tr>
<tr>
<td></td>
<td>c. One edge in each hand</td>
</tr>
<tr>
<td>12. Open sides of cover</td>
<td>12a. Over objects</td>
</tr>
<tr>
<td></td>
<td>b. Snapping both hands up and out</td>
</tr>
<tr>
<td>13. Take position</td>
<td>13a. At other end of objects</td>
</tr>
<tr>
<td></td>
<td>b. Facing cover</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<td>--------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>14. Repeat Operations 11 and 12</td>
<td></td>
</tr>
<tr>
<td>15. Tuck all bottom edges</td>
<td>15a. Under and in</td>
</tr>
<tr>
<td></td>
<td>b. Keeping water out</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO SPREAD AN ACCORDION FOLDED SALVAGE COVER

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

**Condition:** An accordion-folded salvage cover, a counter-like object, and appropriate personal protective equipment

**Behavior:** The student will spread an accordion folded salvage cover over a counter-like object

**Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Accordion folded salvage cover
- Counter-like object
- Appropriate personal protective equipment

**REFERENCES:**
- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

**PREPARATION:**
This one-person throw should be used only when covering unbreakable materials. It is a rapid method for spreading accordion-folded covers, and is particularly advantageous when personnel are limited.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position cover</td>
<td>1a. On one forearm</td>
</tr>
<tr>
<td></td>
<td>b. Visible center line folds towards body</td>
</tr>
<tr>
<td>2. Grasp two bottom pleats</td>
<td>2a. With ring and little fingers of the bottom hand</td>
</tr>
<tr>
<td></td>
<td>b. Holding the index and middle fingers firmly against the remaining pleated</td>
</tr>
<tr>
<td></td>
<td>edges</td>
</tr>
<tr>
<td>3. Grasp three top pleats</td>
<td>3a. Nearest the body</td>
</tr>
<tr>
<td></td>
<td>b. With thumb and fingers of throwing hand</td>
</tr>
<tr>
<td>4. Hold bundle</td>
<td>4a. Firmly</td>
</tr>
<tr>
<td></td>
<td>b. With bottom hand</td>
</tr>
<tr>
<td>5. Flip three top pleats</td>
<td>5a. Over the back of throwing hand</td>
</tr>
<tr>
<td></td>
<td>b. Arm moving back into throwing position</td>
</tr>
<tr>
<td>6. Throw top pleats</td>
<td>6a. Directly overhand</td>
</tr>
<tr>
<td></td>
<td>b. Over the object</td>
</tr>
<tr>
<td>7. Retain grip</td>
<td>7a. On bottom pleats</td>
</tr>
<tr>
<td></td>
<td>b. Applying pressure with index and middle fingers</td>
</tr>
<tr>
<td></td>
<td>c. Controlling speed of throw</td>
</tr>
<tr>
<td>8. Grasp fold or folds</td>
<td>8a. One side at a time</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td>9. Spread cover</td>
<td>9a. Both sides</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Fully open</td>
</tr>
<tr>
<td></td>
<td>d. Without dragging</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
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<tr>
<td>----------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>10. Tuck all bottom edges</td>
<td>10a. Under and in</td>
</tr>
<tr>
<td></td>
<td>b. Keeping water out</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO SPREAD A SALVAGE COVER USING THE BALLOON THROW, TWO-PERSON METHOD

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A salvage cover, arrangement of furniture, and appropriate personal protective equipment
- **Behavior:** The students will spread a salvage cover over an arrangement of furniture using the balloon throw, two-person method
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Salvage cover
- Arrangement of furniture
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16
- Fire Service Loss Control, IFSTA, First Edition, Chapter 4

**PREPARATION:** The two-person balloon method of spreading a salvage cover can be used to an advantage when the object to be covered is fairly open and unobstructed. This throw is a common one used in the fire service and all fire fighters should know how to use it.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position Fire Fighter #1</td>
<td>1a. Holding two corners of the cover</td>
</tr>
<tr>
<td></td>
<td>b. Near the objects to be covered</td>
</tr>
<tr>
<td>2. Position Fire Fighter #2</td>
<td>2a. Facing Fire Fighter #1</td>
</tr>
<tr>
<td></td>
<td>b. Holding remaining two corners</td>
</tr>
<tr>
<td>3. Extend cover</td>
<td>3a. Along one side of objects to be covered</td>
</tr>
<tr>
<td>4. Separate last half-fold</td>
<td>4a. Grasping each side near the ends</td>
</tr>
<tr>
<td>5. Lay side of cover closest to the object</td>
<td>5a. On the ground</td>
</tr>
<tr>
<td>6. Make several accordion folds</td>
<td>6a. In the inside hand</td>
</tr>
<tr>
<td>7. Place outside hand</td>
<td>7a. Midway down the end hem</td>
</tr>
<tr>
<td>8. Place inside foot</td>
<td>8a. On the corner of the cover</td>
</tr>
<tr>
<td></td>
<td>b. To hold in place</td>
</tr>
<tr>
<td>9. Pull cover</td>
<td>9a. Tightly</td>
</tr>
<tr>
<td></td>
<td>b. Between each fire fighter</td>
</tr>
<tr>
<td>10. Swing folded part</td>
<td>10a. Down, up, and out</td>
</tr>
<tr>
<td></td>
<td>b. One sweeping movement</td>
</tr>
<tr>
<td></td>
<td>c. Pocketing as much air as possible</td>
</tr>
<tr>
<td>11. Carry accordion folds</td>
<td>11a. Across the objects</td>
</tr>
<tr>
<td></td>
<td>b. When cover is as high as each fire fighter can read</td>
</tr>
<tr>
<td></td>
<td>c. Causes the cover to float over the objects</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>13. Hang smooth side down</td>
<td>13a. Folds up</td>
</tr>
<tr>
<td></td>
<td>b. Center fold</td>
</tr>
<tr>
<td></td>
<td>c. Both fire fighters</td>
</tr>
<tr>
<td></td>
<td>d. Corners down</td>
</tr>
<tr>
<td>14. Straighten sides</td>
<td></td>
</tr>
<tr>
<td>15. Tuck all bottom edges</td>
<td>15a. Under and in</td>
</tr>
<tr>
<td></td>
<td>b. Keeping water out</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO SPREAD A SALVAGE COVER USING THE SINGLE-EDGE SNAP THROW, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, arrangement of furniture, and appropriate personal protective equipment

Behavior: The students will spread a salvage cover over an arrangement of furniture using the single-edge snap throw, two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Salvage cover
- Arrangement of furniture
- Appropriate personal protective equipment

REFERENCES:
- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

PREPARATION: The single-edge snap throw, two-person method is best used in narrow spaces where the balloon throw cannot be used. It is especially effective where counters or other objects are near a wall or stacked closely together. For these reasons, firefighters should know how to use this throw.
## How To Spread A Salvage Cover Using The Single-Edge Snap Throw, Two-Person Method

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position Fire Fighter #1</td>
<td>1a. Holding two corners of the cover</td>
</tr>
<tr>
<td></td>
<td>b. Near the objects to be covered</td>
</tr>
<tr>
<td>2. Position Fire Fighter #2</td>
<td>2a. Facing Fire Fighter #1</td>
</tr>
<tr>
<td></td>
<td>b. Holding remaining two corners</td>
</tr>
<tr>
<td>3. Extend cover</td>
<td>3a. Along one side of objects to be covered</td>
</tr>
<tr>
<td>4. Drop fold and edge</td>
<td>4a. Closest to the objects</td>
</tr>
<tr>
<td>5. Gather several small folds</td>
<td>5a. In the throwing hand</td>
</tr>
<tr>
<td></td>
<td>b. Forming a bulk to be thrown</td>
</tr>
<tr>
<td>6. Pull cover</td>
<td>6a. Tightly</td>
</tr>
<tr>
<td></td>
<td>b. Between each fire fighter</td>
</tr>
<tr>
<td>7. Allow cover to dip</td>
<td>7a. Toward the floor</td>
</tr>
<tr>
<td></td>
<td>b. To start momentum for an upward thrust</td>
</tr>
<tr>
<td>8. Snap cover</td>
<td>8a. Upward</td>
</tr>
<tr>
<td></td>
<td>b. As high as possible</td>
</tr>
<tr>
<td></td>
<td>c. In one movement</td>
</tr>
<tr>
<td>9. Moved gathered folds</td>
<td>9a. In throwing hand</td>
</tr>
<tr>
<td></td>
<td>b. Across the objects</td>
</tr>
<tr>
<td></td>
<td>c. With a snapping motion</td>
</tr>
<tr>
<td>10. Guide cover</td>
<td>10a. Into position</td>
</tr>
<tr>
<td>11. Straighten sides</td>
<td></td>
</tr>
<tr>
<td>12. Tuck all bottom edges</td>
<td>12a. Under and in</td>
</tr>
<tr>
<td></td>
<td>b. Keeping water out</td>
</tr>
</tbody>
</table>
APPLICATION:

Have the students pair up and throw a salvage cover over an arrangement of furniture on
command by the instructor. Have students practice until proficiency is evident.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the
instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our
next session.
HOW TO SPREAD A FOLDED SALVAGE COVER USING THE DOUBLE-EDGE SNAP THROW, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A folded salvage cover, two arrangements of furniture, and appropriate personal protective equipment

Behavior: The students will spread a folded salvage cover over an arrangement of furniture using the double-edge snap throw, two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Folded salvage cover
- Two arrangements of furniture
- Appropriate personal protective equipment

REFERENCES:
- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

PREPARATION:
In special situations such as where there are two narrow objects existing on each side of the fire fighter, the double-edge snap throw, two-person method may be used. This throw allows both objects, such as counters, to be covered by one cover. In any operation, the fire fighter must recognize these situations and be able to apply the double-edge snap throw, two-person method.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
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</thead>
<tbody>
<tr>
<td>1. Position Fire Fighter #1</td>
<td>1a. Holding two corners of the cover</td>
</tr>
<tr>
<td></td>
<td>b. Near the objects to be covered</td>
</tr>
<tr>
<td>2. Position Fire Fighter #2</td>
<td>2a. Facing Fire Fighter #1</td>
</tr>
<tr>
<td></td>
<td>b. Holding remaining two corners</td>
</tr>
<tr>
<td>3. Extend cover</td>
<td>3a. Between the objects to be covered</td>
</tr>
<tr>
<td>4. Drop fold and edge</td>
<td>4a. Closest to the objects</td>
</tr>
<tr>
<td>5. Gather several small folds</td>
<td>5a. In each hand</td>
</tr>
<tr>
<td></td>
<td>b. Leaving approximately 4 feet unfolded</td>
</tr>
<tr>
<td>6. Pull cover</td>
<td>6a. Tightly</td>
</tr>
<tr>
<td></td>
<td>b. Between fire fighters</td>
</tr>
<tr>
<td></td>
<td>c. Bringing hands close together</td>
</tr>
<tr>
<td>7. Allow cover to dip</td>
<td>7a. Toward the floor</td>
</tr>
<tr>
<td></td>
<td>b. To start momentum for an upward thrust</td>
</tr>
<tr>
<td>8. Snap cover</td>
<td>8a. Upward</td>
</tr>
<tr>
<td></td>
<td>b. Holding hands together</td>
</tr>
<tr>
<td></td>
<td>c. As high as possible</td>
</tr>
<tr>
<td>9. Snap hands</td>
<td>9a. Outward</td>
</tr>
<tr>
<td></td>
<td>b. When cover is higher than objects</td>
</tr>
<tr>
<td>10. Guide cover</td>
<td>10a. Into position</td>
</tr>
<tr>
<td></td>
<td>b. Over both objects</td>
</tr>
<tr>
<td>11. Straighten sides</td>
<td></td>
</tr>
<tr>
<td>12. Tuck all bottom edges</td>
<td>12a. Under and in</td>
</tr>
<tr>
<td></td>
<td>b. Keeping water out</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The students will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The students will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO SPREAD AN ACCORDION FOLDED SALVAGE COVER USING THE TWO-PERSON COUNTER PAYOFF METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: An accordion folded salvage cover, arrangement of furniture, and appropriate personal protective equipment

Behavior: The students will spread an accordion folded salvage cover using the two-person counter payoff method

Standard: Completing all operations within _________ according to the job breakdown

MATERIALS NEEDED:
• Job breakdown
• Accordion folded salvage cover
• Arrangement of furniture
• Appropriate personal protective equipment

REFERENCES: 
• Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

PREPARATION: When covering the objects in a building, time is a very important factor. When fire fighters are available and space for spreading is limited, or when objects to be covered are of a breakable material, the two-person, counter payoff accordion fold throw is a good method for spreading the cover.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Position fire fighters</td>
<td>1a. To the side and one end of the objects to be covered</td>
</tr>
<tr>
<td>2. Position cover</td>
<td>2a. On forearm of Fire Fighter #1</td>
</tr>
<tr>
<td></td>
<td>b. Visible center line folds towards body</td>
</tr>
<tr>
<td>3. Fire Fighter #1 grasps two bottom pleats</td>
<td>3a. Firmly</td>
</tr>
<tr>
<td>4. Fire Fighter #2 grasps top layer</td>
<td>4a. With both hands</td>
</tr>
<tr>
<td>5. Fire Fighter #1 holds bundle</td>
<td>5a. Firmly</td>
</tr>
<tr>
<td>6. Fire Fighter #2 walks backward</td>
<td>6a. Extending the cover</td>
</tr>
<tr>
<td></td>
<td>b. Maintaining a firm grip</td>
</tr>
<tr>
<td>7. Lift and lay cover</td>
<td>7a. On objects</td>
</tr>
<tr>
<td></td>
<td>b. Both fire fighters</td>
</tr>
<tr>
<td>8. Open the cover</td>
<td>8a. Both fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. Enveloping the objects</td>
</tr>
<tr>
<td>9. Tuck all bottom edges</td>
<td>9a. Under and in</td>
</tr>
<tr>
<td></td>
<td>b. Keeping water out</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO REMOVE A SALVAGE COVER

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, arrangement of furniture, and appropriate personal protective equipment

Behavior: The student will remove a salvage cover without causing damage to the building contents

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Salvage cover
- Arrangement of furniture
- Appropriate personal protective equipment

REFERENCES:
- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 3

PREPARATION:
The preservation of property is one of the fire fighter's major objectives on the fireground. Proper and efficient salvage operations often enable a business to continue after a fire with practically no interruption or a family to continue living in its home a few hours after a fire has occurred. Proper removal of salvage covers is a key aspect of preserving property during salvage operations, and mastery of this skill by fire fighters will enable the department to continue to provide this benefit to the public.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Approach covered objects</td>
<td>1a. From one of the four corners</td>
</tr>
<tr>
<td>2. Grasp corner</td>
<td>2a. Either hand</td>
</tr>
<tr>
<td></td>
<td>b. Between thumb and index finger</td>
</tr>
<tr>
<td>3. Fold corner</td>
<td>3a. Towards middle (center) of the covered objects</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. To prevent snagging sharp projections</td>
</tr>
<tr>
<td></td>
<td>d. To prevent damage to covered objects</td>
</tr>
<tr>
<td>4. Release corner</td>
<td>5a. To the next corner</td>
</tr>
<tr>
<td>5. Move</td>
<td>6a. Either hand</td>
</tr>
<tr>
<td>6. Grasp corner</td>
<td>b. Between thumb and index finger</td>
</tr>
<tr>
<td>7. Fold corner</td>
<td>7a. Towards middle (center) of the covered objects</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td>8. Release corner</td>
<td>9a. Two more times</td>
</tr>
<tr>
<td>9. Repeat Operations 5-8</td>
<td>10a. Toward the middle (center) of the covered building contents</td>
</tr>
<tr>
<td>10. Fold all edges</td>
<td>b. Reducing the size of the cover systematically</td>
</tr>
<tr>
<td>11. Slide one hand</td>
<td>c. Retaining all the water and debris</td>
</tr>
<tr>
<td></td>
<td>d. Until it can be removed gently</td>
</tr>
<tr>
<td></td>
<td>11a. Either hand</td>
</tr>
<tr>
<td></td>
<td>b. Under the cover</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>12. Grasp top</td>
<td>12a. Of salvage cover folds</td>
</tr>
<tr>
<td></td>
<td>b. Other hand</td>
</tr>
<tr>
<td></td>
<td>c. Firmly</td>
</tr>
<tr>
<td>13. Pick up cover</td>
<td>13a. Gently</td>
</tr>
<tr>
<td></td>
<td>b. Carefully, may be heavy</td>
</tr>
<tr>
<td>14. Remove cover</td>
<td>14a. Carrying away from objects</td>
</tr>
<tr>
<td>15. Unfold cover</td>
<td>15a. Reversing Operations 2-9</td>
</tr>
<tr>
<td></td>
<td>b. Carefully</td>
</tr>
<tr>
<td></td>
<td>c. Systematically</td>
</tr>
<tr>
<td>16. Remove water and debris</td>
<td>16a. From cover</td>
</tr>
<tr>
<td></td>
<td>b. Spraying off with water</td>
</tr>
<tr>
<td></td>
<td>c. Shaking on its side</td>
</tr>
<tr>
<td></td>
<td>d. Sweeping off</td>
</tr>
<tr>
<td>17. Prepare cover</td>
<td>17a. For cleaning and/or folding</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO SPLICE SALVAGE COVERS, TWO-PERSON METHOD

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

*Condition:* Salvage covers and appropriate personal protective equipment

*Behavior:* The students will splice two salvage covers, two-person method

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Two salvage covers
- Appropriate personal protective equipment

**REFERENCES:**
- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 4

**PREPARATION:** At times, as when covering large objects or when making long chutes or catchalls, it becomes necessary to have salvage covers that are larger than standard size. Two or more covers must then be spliced together and it is important to make seams watertight. In order to be effective in salvage operations, the fire fighter needs to know how to splice salvage covers properly.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Spread out covers</td>
<td>1a. Adjacent to each other</td>
</tr>
<tr>
<td></td>
<td>b. Side-to-side or end-to-end</td>
</tr>
<tr>
<td>2. Position fire fighters</td>
<td>2a. On opposite sides</td>
</tr>
<tr>
<td></td>
<td>b. Facing each other</td>
</tr>
<tr>
<td>3. Fold Cover #1</td>
<td>3a. Back on itself</td>
</tr>
<tr>
<td></td>
<td>b. Approximately 2 feet</td>
</tr>
<tr>
<td></td>
<td>c. Side adjacent to Cover #2</td>
</tr>
<tr>
<td>4. Lay Cover #2</td>
<td>4a. Over Cover #1</td>
</tr>
<tr>
<td></td>
<td>b. Equal length of fold</td>
</tr>
<tr>
<td>5. Grasp double fold</td>
<td>5a. By both edges</td>
</tr>
<tr>
<td>6. Fold back</td>
<td>6a. On itself</td>
</tr>
<tr>
<td></td>
<td>b. Half the original width (approximately 12 inches)</td>
</tr>
<tr>
<td>7. Continue fold</td>
<td>7a. In the same direction</td>
</tr>
<tr>
<td></td>
<td>b. Laying entire fold over the adjacent cover</td>
</tr>
<tr>
<td>8. Press splice (joint)</td>
<td>8a. Smooth</td>
</tr>
<tr>
<td></td>
<td>b. So water will flow freely and not leak through</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: PRINCIPLES AND PROCEDURES FOR USING AND CONSTRUCTING WATER CHUTES AND DIKES

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles and procedures for using and constructing water chutes and dikes by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Firefighter's Handbook, Delmar, 2000 Edition, Chapter 20

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Fire Service Loss Control, IFSTA, First Edition
• Firefighter's Handbook, Delmar, 2000 Edition

PREPARATION: The ability to remove and channel water effectively requires constant practice and a certain amount of ingenuity. When this work is efficiently done, it reduces fire loss and builds a sense of professionalism within the company.
I. WATER CHUTES

A. Uses

1. One of the most practical methods of removing water that comes through the ceiling from an upper floor
2. Constructed on the floor below fire fighting operations to drain runoff through a window, door, or down a stairway
3. Some departments carry prepared chutes
   a) Approximately 10 feet long
4. More practical to make chutes

B. Construction

1. Effective chutes can be made with a combination of ladders or pike poles and salvage covers
   a) Longer chutes can be made by splicing two salvage covers together and supporting them on a ladder
2. Ladders
   a) Salvage cover is partially unfolded
   b) Roll the edges and place inside the ladder beam
   c) Works like a trough
3. Pike poles
   a) Salvage cover is laid out and pike poles placed on either side

What materials are needed from your fire apparatus to make a chute?
### Salvage Covers

**b) Salvage cover is rolled around the pike poles toward each other**

1) Wrapping the salvage cover around them
2) Stop at desired width of the chute

3) The rolled edges are placed underneath the cover to prevent loosening

**c) The weight of water in the trough tends to tighten the rolls**

### Joining Salvage Covers

1. If the length is longer than a single cover, a leakproof seal must join the two

### Placement

1. Supported in a number of ways
   a) Available furniture
   b) Equipment
   c) Pike poles
   d) Ladders
   e) A-frames

2. Must be placed high near the ceiling opening to prevent splashing

3. Place to channel water outside the structure

### Dikes

**A. Uses**

1. An effective means to control water spread in buildings
2. Dikes are used to direct water flow out to a window or other horizontal opening
   a) Chutes are primarily used to remove water from upper floors of buildings

B. Placement
   1. Forethought is necessary to decide where dikes are to be made
   2. Consideration must be given to where water is traveling, at what speed, and where dikes can be constructed
   3. Usually placed across halls, doors, and other openings to control water spread
   4. Consideration must be given to the availability of salvage covers and other materials and personnel required
   5. Take advantage of all building features, sumps, floor drains, and floor slope when diking floors

What is the difference between the use of water chutes or dikes?

Where would you place a dike to control water spread?

What factors must be taken into consideration when deciding to build a dike to control water?
**SUMMARY:**

Chutes and dikes are an effective means to control water in a building. By use of a chute, water is directed from a drain hole in a ceiling or sprinkler head to outside the building. Dikes prevent the spread of water by providing barriers.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: HOW TO MAKE A WATER CHUTE WITH PIKE POLES, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, pike poles, A-frame ladder, and appropriate personal protective equipment

Behavior: The students will construct a chute using a salvage cover and pike poles, two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Salvage cover
- Two pike poles
- A-frame ladder
- Appropriate personal protective equipment

REFERENCES:
- Fire Service Loss Control, IFSTA, First Edition, Chapter 4

PREPARATION: If you have a fire in a multistory building, it may become necessary to drain off water from upper floors. To do this, a chute to drain water coming from the upper floor to the outside of the building must be constructed. Properly constructed chutes prevent water from collecting on floors, making the salvage effort more effective and reducing the amount of work required of the fire fighters.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open salvage cover</td>
<td>1a. Both fire fighters</td>
</tr>
<tr>
<td>2. Lay cover flat</td>
<td>2a. At desired location</td>
</tr>
<tr>
<td></td>
<td>b. Near A-frame ladder</td>
</tr>
<tr>
<td>3. Place pike poles</td>
<td>3a. Lengthwise on the cover</td>
</tr>
<tr>
<td></td>
<td>b. Fire fighters on opposite edge</td>
</tr>
<tr>
<td></td>
<td>c. Pike extending off the end of the cover</td>
</tr>
<tr>
<td>4. Roll edges</td>
<td>4a. Over the pike poles</td>
</tr>
<tr>
<td></td>
<td>b. Toward the middle</td>
</tr>
<tr>
<td></td>
<td>c. Until there is a 3-foot width between the rolls</td>
</tr>
<tr>
<td>5. Turn the cover over</td>
<td>5a. Keeping the folds in place</td>
</tr>
<tr>
<td>6. Place chute</td>
<td>6a. On A-frame ladder</td>
</tr>
<tr>
<td></td>
<td>b. Hooking the pike poles over a ladder rung</td>
</tr>
<tr>
<td>7. Extend chute</td>
<td></td>
</tr>
</tbody>
</table>
**APPLICATION:**

The students will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The students will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: USING HOSE LINES TO MOVE, CONTAIN, OR DIVERT WATER

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of using hoselines to move, contain, or divert water by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 5

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Booster hoseline (200 feet)
- 2½” hoseline (400 feet)
- Large demonstration area with a flat surface
- Method to charge the hoselines (fire engine/hydrant)
- Drain for water removal

REFERENCES:

- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION:

The ingenuity of the fire fighter may be taxed to the utmost because of different conditions arising in the course of salvage work. This lesson is designed to increase your knowledge in this area. Tuck this information away and sometime when you think that all options have been used, recall this information and it may assist you.
I. HOSELINE AS A SQUEEGEE
   A. An extended length of hoseline may be used as a long continuous squeegee
   B. The hoseline should be laid around the perimeter of the room or area to be drained
   C. By slowly pulling the looped hoseline toward an exit, a large amount of water can be removed in a relatively short time

II. HOSELINES AS A DIKE, CHUTE, OR CATCHALL
   A. The extended length of hoseline may also be used as a temporary dike
      1. When salvage covers are limited or unavailable
   B. Two hoselines can be laid parallel on the floor to form a chute
   C. Hoselines can also be used as improved catchalls
   D. In all the above applications, hoseline should be partially pressurized with water
      1. For weight
      2. For resistance to water being controlled
SUMMARY:

Hoselines can be used for purposes other than just moving water from source to fire. Hoselines can also be put to use in the salvage phase to remove water from the building as a squeegee, dike, chute, or catchall. In all the above applications, the hoseline should be partially charged with water for weight and resistance to water being controlled.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CONSIDERATIONS FOR CONSTRUCTING A STAIRWAY DRAIN

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the considerations for constructing a stairway drain by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Salvage and Overhaul*, IFSTA, Seventh Edition, Chapter 4

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Salvage and Overhaul*, IFSTA, Seventh Edition

**PREPARATION:** Salvage work requires ingenuity. One of the fastest ways to remove water from floors is the stairway drain. The proper use of salvage covers to form stairway drains will reduce the time fire fighters remain on the scene after extinguishment and reduce damage to the involved structure.
### I. CONSTRUCTING A STAIRWAY DRAIN

**A.** There are numerous ways in which stairway drains can be made

1. Method depends on the length, size, type, and style of stairway

**B.** Two common methods of applying salvage covers to stairways

1. Employing the banister to support the sides of the salvage cover
2. Rolling both edges of the salvage cover to form dikes and place salvage cover against walls of stairway
3. A combination of the banister support and wall roll may be used
   a) Note that the rolled edges are placed on the underneath side of the salvage cover to help prevent the salvage cover from unrolling
4. Miscellaneous items such as traffic cones and pike poles may be used to support/raise the salvage covers edges

**C.** Stairway drains should also conform to the shape of each step

1. This will prevent the salvage cover from being damaged and allow the stairway to be used without risking a tripping hazard
2. This also slows the flow of the run-off water allowing it to be directed/channeled

**D.** To conform salvage cover to stair shape

1. Proceed up the steps with feet apart
2. Push the salvage cover into the stair riser with boots

---

**What is one way of conforming salvage covers to stair shape?**

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<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Allow extra salvage cover at the top of stairs to slide down</td>
</tr>
<tr>
<td>E. Splicing salvage covers together may be necessary to make the drain long enough</td>
</tr>
</tbody>
</table>

| APPLICATION |
SUMMARY:

Reduction of fire loss is the key role in salvage operations. The stairway drain is one of the best methods of moving large volumes of water in the shortest possible time. Stairway drains can be constructed using either the banister or against a wall, and can be conformed to the stairs to allow both water run-off and foot traffic.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO MAKE A STAIRWAY DRAIN

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, stairway, and appropriate personal protective equipment

Behavior: The student will make a stairway drain

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Salvage cover
- Stairway
- Appropriate personal protective equipment

REFERENCES:

- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 4

PREPARATION:

In order to provide a continuous route for water removal, it will sometimes be necessary to make a stairway drain using a salvage cover. Stairway drains effectively move large amounts of water and are relatively easy to construct. The fire fighter's ability to remove water from a building quickly will not only make overhaul easier, but will assure that fewer contents are damaged by water.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place salvage cover</td>
<td>1a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Top of stairway</td>
</tr>
<tr>
<td>2. Spread salvage cover</td>
<td>2a. Using accordion throw method</td>
</tr>
<tr>
<td>3. Open salvage cover</td>
<td>3a. Completely</td>
</tr>
<tr>
<td>4. Roll both sides of salvage cover</td>
<td>4a. Inward</td>
</tr>
<tr>
<td></td>
<td>b. To dimension of stairway</td>
</tr>
<tr>
<td>5. Push salvage cover</td>
<td>5a. Into each step</td>
</tr>
<tr>
<td></td>
<td>b. From the top down</td>
</tr>
<tr>
<td></td>
<td>c. Step by step</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** USING BUILDING DRAINS AND SCUPPERS

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the different provisions built into structures to assist with water removal by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Salvage and Overhaul*, IFSTA, Seventh Edition, Chapter 5

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- *Fire Service Loss Control*, IFSTA, First Edition
- *Salvage and Overhaul*, IFSTA, Seventh Edition

**PREPARATION:**

After the protection of building contents, the removal of excess water is normally the next most important salvage function. The accumulation of water can damage machinery, utilities, and stored merchandise, as well as heating, ventilating, and elevator equipment. The use of building drains, scuppers, and other building construction features is an effective way to remove excess water and may make the salvage effort successful when other methods cannot be used.
I. ROUTING WATER

A. The primary objective of salvage crews when removing water from a building should be to remove it quickly and safely without damage to unaffected portions of the building

   Why would this be so important?

   1. Possibility of building collapse
   2. Reduces property loss
   3. Saves salvage crews valuable time
   4. Good public relations

B. Numerous avenues can be used to route water

   1. Floor drains
   2. Soil pipe openings
   3. Scuppers
   4. Stairways
   5. Elevator shafts
   6. Cut holes in floor
   7. Breach walls
   8. Window chutes

C. Floor drains and soil pipe openings offer a built-in means of routing water through pipes

   1. Far away from the area

D. Stairways may also serve as a route to the outside

   1. If conveniently located

   What are examples of avenues used to route water?
Where are scuppers located in a building?

E. Scuppers, where available, can aid in clearing floors in commercial buildings
   1. Drain located in side of wall

F. Walls may have to be breached or holes cut in floors
   1. A last resort
   2. When other methods fail

G. Elevator shafts and other shafts may be used in multistory buildings to take water to ground level

II. PRACTICAL METHODS OF REMOVING WATER

What is the most practical way to remove water in multistory structures?

A. Sewer or soil pipes
   1. The most practical method, especially for multistory buildings such as high-rise offices and hotels
   2. Found on each floor
   3. These pipes service sinks and toilets throughout the buildings
   4. These pipes may be used by
      a) Removing cleanout plugs
      b) Lifting toilets from floor connections
   5. Essential not to damage pipes due to
      a) High cost of repair
      b) Danger of sewage gas leakage
6. Removing cleanout plugs in soil pipes
   
   a) Tapping the edge of the pipe bell may help loosen a tightly lodged plug
   
   b) Once the fitting is removed, a screen or drain guard should be placed over the opening to prevent debris from entering the pipe

7. Removing toilet bowls
   
   a) Preparation
      
      1) Close water valve
      2) Disconnect the pipe or tubing between valve and toilet
      3) Flush toilet to remove water in tank
      4) Remove fastening devices
      
   b) Gently rock the bowl to break the wax or putty seal
   
   c) Lift toilet off the opening
      
      1) Place it to the side of the opening

   2) Remove wax ring
      
      - Unobstructed water flow to the opening
      
   d) Direct flow with salvage covers, 2½" hoseline
   
   e) Use a screen or drain guard
      
      1) Prevent debris from entering the pipe
f) Close or cover the opening immediately upon completion of work to protect building environment from
   1) Contamination by sewage gas
   2) Rat infestation in some areas

B. Horizontal removal of water from floors can be accomplished by using scuppers or by breaching holes through outside walls

C. Cutting holes in upper floors to route water into chutes that extend to the outside is another method of water removal

What should you do with building contents before cutting holes in upper floors?

1. Contents should be moved or covered
2. Chutes constructed in place
   a) Below the hole
3. Cutting ceiling first
   a) Do not damage floor supports
   b) Keeps water from accumulating between floors
   c) Larger than hole in floor
4. Cutting floor
   a) Last procedure
   b) Half the size of the ceiling hole
**SUMMARY:**

After protecting building contents, removing the excess water is usually the next most important salvage function.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Salvage and Overhaul*, IFSTA, Seventh Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF CATCHALLS, CATCH BASINS, SUMPS, AND DIKES

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the characteristics and functions catchalls, catch basins, and sumps by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 4

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Fire Service Loss Control, IFSTA, First Edition
- Salvage and Overhaul, IFSTA, Seventh Edition

**PREPARATION:**

When water collects in a building, most of it will be on floors. Salvage operations should reflect an understanding of the effects of water accumulation on floors and floor coverings. Although damage to the finish of wood floors is always a concern, a greater concern is the way wood floors react to severe or prolonged dampness. These situations require the use of catchalls or catch basins, which can prevent damage to floors. Additionally, sumps may be used to contain large amounts of water from fire suppression efforts, or may be used as a water source when drafting with fire service pumping apparatus.
# I. CATCHALL

## A. Characteristics

1. Constructed from a salvage cover that has been placed on the floor to contain water

   Why do we use catchalls?

2. Control larger amounts of water
   a) Will hold over 379 liters
   b) A chute can be constructed to route the water from the catchall to the outside

3. Can save valuable time during salvage work by catching water and limiting its spread into other areas

4. Since speed is important in controlling water, the cover should be placed in position as soon as possible

   How many fire fighters are required to construct a catchall?

5. Two fire fighters are usually required to prepare a catchall

## B. Function

1. Placed under leaking ceilings or water coming from a leaking light fixture

2. Used to cover the floors when pulling down a ceiling, if time and conditions allow

3. Placed under covered stock to control the water coming from the protected goods
   a) If salvage covers are available
   b) If runoff is high (large amounts)
4. Used in any situation that requires covering a large area of the floor
   a) The entire floor area of a building may be covered, if enough covers are available

II. CATCH BASIN
   A. Characteristics
      1. Usually hold more water than catchalls
      a) Can hold 300 or more gallons
      2. Can be used in smaller areas than catchalls
      3. May be constructed using a salvage cover and tables, bed springs, stock, or chairs placed on the floor to contain water
      4. Two fire fighters are usually required to construct a catch basin in a timely manner

   B. Function
      1. Placed under leaking ceilings, lights fixtures, sprinkler heads, etc.
      2. Arrange for a suitable method of removing the water from the catch basin as soon as possible
         a) Siphon
         b) Pump
         c) Other

III. SUMP
   A. Characteristics
      1. Holds large amounts of water
         a) More than catchalls and catch basins
      2. Serves multiple purposes
a) Traps and holds water during salvage operations  
b) Contains water for drafting operations  

3. Constructed using a salvage cover, pike poles, ladders, and rope or webbing  
4. Requires multiple fire fighters to construct in a timely manner  

B. Function  
1. Near structural openings  
   a) Allows water to empty into sump  
2. Bottoms of stairs  
   a) Allows stair chutes to empty into sump  
3. In accessible location for engine to draft from  
   a) Near fire hydrant  
   b) Near water tender shuttle route  

IV. DIKE  
A. Water on floors can be effectively controlled and channeled with salvage covers  
   1. Dikes or dams can be built across hallways and door openings to limit water spread  

B. Placement  
   1. Availability of salvage covers  
   2. Speed of water flow  
   3. Time necessary to construct dike
**SUMMARY:**

To prevent wood floors from warping, swelling, buckling, and having coverings come loose, the catchall or catch basin should be placed in use as soon as possible. Catchalls and catch basins are good tools to use when you need to cover and/or protect a floor area. Sumps can be used to contain large amounts of water, either from water runoff or for pumping at draft. The control of water on floors is effectively handled by use of the dike or dam. Using a half opened salvage cover placed across the path of the water, stack unfolded covers on bottom half, then fold ends back over to form dike.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Loss Control*, IFSTA, First Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
HOW TO MAKE A CATCHALL, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover and appropriate personal protective equipment

Behavior: The students will make a catchall using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Salvage cover
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 16
- Fire Service Loss Control, IFSTA, First Edition, Chapter 4

PREPARATION:

Many times during overhaul operations, a ceiling must be pulled down and with it the insulation in the ceiling. Cleaning up debris after this operation can be a hard, time-consuming job. The catchall, put in position before opening the ceiling, may be used to save time and extra effort when cleaning the debris from the floor.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lay out cover</td>
<td>1a. In desired location</td>
</tr>
<tr>
<td></td>
<td>b. Flat</td>
</tr>
<tr>
<td>2. Position fire fighters</td>
<td>2a. Both fire fighters on one side</td>
</tr>
<tr>
<td></td>
<td>b. At each end of cover</td>
</tr>
<tr>
<td>3. Roll cover</td>
<td>3a. Inward</td>
</tr>
<tr>
<td></td>
<td>b. Toward center</td>
</tr>
<tr>
<td></td>
<td>c. Approximately 3 feet</td>
</tr>
<tr>
<td>4. Fold both ends</td>
<td>4a. Of side rolls</td>
</tr>
<tr>
<td></td>
<td>b. Over</td>
</tr>
<tr>
<td></td>
<td>c. 90° angle</td>
</tr>
<tr>
<td></td>
<td>d. Forming two corners of the basin</td>
</tr>
<tr>
<td>5. Position fire fighters</td>
<td>5a. Opposite side</td>
</tr>
<tr>
<td></td>
<td>b. At each end of cover</td>
</tr>
<tr>
<td>6. Roll cover</td>
<td>6a. Inward</td>
</tr>
<tr>
<td></td>
<td>b. Toward center</td>
</tr>
<tr>
<td></td>
<td>c. Approximately 3 feet</td>
</tr>
<tr>
<td>7. Fold both ends</td>
<td>7a. Of side rolls</td>
</tr>
<tr>
<td></td>
<td>b. Over</td>
</tr>
<tr>
<td></td>
<td>c. 90° angle</td>
</tr>
<tr>
<td></td>
<td>d. Forming final two corners of the basin</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>8. Roll one end</td>
<td>8a. Both fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. Toward center</td>
</tr>
<tr>
<td></td>
<td>c. Into a tight roll</td>
</tr>
<tr>
<td></td>
<td>d. On top of the side roll</td>
</tr>
<tr>
<td></td>
<td>e. Forming a projected flap</td>
</tr>
<tr>
<td>9. Lift edge roll</td>
<td></td>
</tr>
<tr>
<td>10. Tuck the end roll</td>
<td>10a. To lock corners</td>
</tr>
<tr>
<td></td>
<td>b. Preventing unrolling</td>
</tr>
<tr>
<td></td>
<td>c. Keeping water in</td>
</tr>
<tr>
<td>11. Repeat Operations 8-10</td>
<td>11a. On other end</td>
</tr>
<tr>
<td></td>
<td>b. To complete the catchall</td>
</tr>
</tbody>
</table>
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE A CATCH BASIN

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, benches and/or chairs (enough to make three sides), and appropriate personal protective equipment

Behavior: The student will make a catch basin

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Salvage cover
- Benches and/or chairs (enough to make three sides)
- Appropriate personal protective equipment

REFERENCES:

- None

PREPARATION:

When a great deal of water is needed to extinguish a fire, or a sprinkler system/pipe is leaking water, severe damage to materials on the floors below may occur. Ceiling collapse is also possible if water is not controlled. One method to prevent this type of damage is the construction of a catch basin. This is accomplished by punching a hole in the ceiling with a pike pole and draining water into the catch basin. This will prevent ceiling collapse. The ability to make the catch basin is an important skill.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Position framework material</td>
<td>1a. In desired location</td>
</tr>
<tr>
<td>2. Open cover</td>
<td>2a. Over arranged material</td>
</tr>
<tr>
<td></td>
<td>b. To desired size</td>
</tr>
<tr>
<td>3. Push cover down</td>
<td>3a. Inside arranged material</td>
</tr>
<tr>
<td></td>
<td>b. To floor</td>
</tr>
<tr>
<td>4. Flatten cover</td>
<td>4a. All sides</td>
</tr>
<tr>
<td></td>
<td>b. Bottom</td>
</tr>
<tr>
<td>5. Anchor sides and ends</td>
<td>5a. Tucking under material</td>
</tr>
<tr>
<td></td>
<td>b. Tying as needed</td>
</tr>
<tr>
<td></td>
<td>c. Preventing collapse</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE A SUMP

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A salvage cover, three ladders or one 20-24 foot extension ladder and matching roof ladder, hose belt, rope, tubular webbing, and appropriate personal protective equipment

Behavior: The student will make an improvised sump

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Salvage cover
- Three ladders or one 20-24 foot extension ladder
- Matching roof ladder
- Hose belt, rope, or tubular webbing
- Appropriate personal protective equipment

REFERENCES:
- None

PREPARATION: The improvised sump is designed to be used for a variety of purposes. It may be used to hold water from a hydrant when the pumper cannot hook up to it. It is also used to hold water in salvage operations and for holding water during water tender shuttle operations. The sump is an important operation that the fire fighter should know.
## Operations and Key Points

<table>
<thead>
<tr>
<th>Operation</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lay out ladders</td>
<td>1a. At hydrant outlet or other water source</td>
</tr>
<tr>
<td></td>
<td>b. Forming triangle</td>
</tr>
<tr>
<td></td>
<td>c. Ladders on beam</td>
</tr>
<tr>
<td></td>
<td>d. Desired size</td>
</tr>
<tr>
<td>Secure ladder</td>
<td>2a. Ends together</td>
</tr>
<tr>
<td></td>
<td>b. With hose belt, rope, or webbing</td>
</tr>
<tr>
<td></td>
<td>c. Trapping rung and beam of ladder</td>
</tr>
<tr>
<td>Spread cover</td>
<td>3a. Standard method</td>
</tr>
<tr>
<td></td>
<td>b. On ladders</td>
</tr>
<tr>
<td></td>
<td>c. Covering ladder triangle</td>
</tr>
<tr>
<td></td>
<td>d. Centering cover</td>
</tr>
<tr>
<td>Push cover down</td>
<td>4a. Inside ladder triangle</td>
</tr>
<tr>
<td></td>
<td>b. To ground</td>
</tr>
<tr>
<td>Flatten cover</td>
<td>5a. All sides</td>
</tr>
<tr>
<td></td>
<td>b. Bottom</td>
</tr>
<tr>
<td>Secure cover</td>
<td>6a. Sides and ends</td>
</tr>
<tr>
<td></td>
<td>b. Under outside edges of ladder</td>
</tr>
<tr>
<td></td>
<td>c. Tying if necessary</td>
</tr>
<tr>
<td></td>
<td>d. Preventing collapse</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO MAKE A DIKE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: Five salvage covers and appropriate personal protective equipment

Behavior: The student will make a dike

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Five salvage covers
- Appropriate personal protective equipment

REFERENCES:
- None

PREPARATION:
There may be times when simply covering building contents at a fire scene may not provide adequate protection. Water may also need to be channeled away from the contents. A valuable skill for the fire fighter involved in protecting property is knowing how to construct dikes from salvage covers, whether to divert water from contents or avoid involving unaffected areas.
## Operations

<table>
<thead>
<tr>
<th>Operations</th>
<th>Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open salvage cover</td>
<td>1a. Near desired location</td>
</tr>
<tr>
<td></td>
<td>b. Flat</td>
</tr>
<tr>
<td>2. Fold salvage cover</td>
<td>2a. In half</td>
</tr>
<tr>
<td></td>
<td>b. Lengthwise</td>
</tr>
<tr>
<td>3. Reposition salvage cover</td>
<td>3a. One-third on water side of designated dike line</td>
</tr>
<tr>
<td></td>
<td>b. Two-thirds in dry area</td>
</tr>
<tr>
<td>4. Position four folded salvage covers</td>
<td>4a. Along dike line</td>
</tr>
<tr>
<td></td>
<td>b. End to end</td>
</tr>
<tr>
<td>5. Fold salvage cover</td>
<td>5a. From dry side</td>
</tr>
<tr>
<td></td>
<td>b. Over folded covers to water side</td>
</tr>
<tr>
<td>6. Fold salvage cover</td>
<td>6a. From wet side</td>
</tr>
<tr>
<td></td>
<td>b. Over folded covers to dry side</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF WATER REMOVAL DEVICES

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of characteristics and functions of water removal devices by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition
- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION: Portable pumps, siphons, and ejectors are often overlooked as tools for removing water from basements, elevator shafts, trenches, pits, and other water collecting areas. These devices can assist us in more rapid water removal and are available from many sources outside the fire department.
I. INTRODUCTION
A. Fire fighters often remove a lot of water from a structure after a fire
B. Methods of removing water from shafts or areas below ground level
   1. Draining
   2. Pumping
C. Pumping devices used
   1. Portable pumps
   2. Submersible pumps
   3. Dewatering devices
      a) Siphons
   4. Ejectors
D. Portable and submersible devices should be placed in an area that allows discharged water to flow into soil pipes, storm drains, ditches, or trenches
E. Using a fire department pumper for pumping water is not recommended
   1. Should remain available for fire fighting operations
   2. Debris can damage pump

II. PUMPS
A. Can be used anywhere a hoseline can be placed and an outlet for water can be provided
B. Portable pumps
   1. Susceptible to damage from debris in the water
   2. Maintenance costs are minimal
C. Submersible pumps
   1. Used more frequently in water removal
   2. Lowered into water

III. SIPHONS
   A. Work on the principle of eduction
      1. Similar to foam educators
      2. Water pumped through a narrow opening creates a venturi effect
         a) Draws in surrounding water
   B. Eliminates the likelihood of dirt or debris entering the pump
   C. Supplied with a 1 ½" hoseline, siphons can create a sizeable discharge
      1. A larger hoseline will increase the flow even more

IV. EJECTORS
   A. Least commonly available
   B. Operate and used in the same manner as siphons

V. CONSIDERATIONS
   A. All must be equipped with strainers
   B. Suction should be from the lowest point available
   C. Discharged water should be directed outside the building
   D. Contaminated water and its effect on the environment

Where may some of these devices be found?
SUMMARY:

Pumps, siphons, and ejectors can be used to remove water from low spots. Three types of pumps are commonly used. Pumps, siphons, and ejectors can be used anywhere a hoseline can be placed and a drain provided.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
FL Ferrn 1:

**TOPIC:** HOW TO USE A SQUEEGEE

**TIME FRAME:** 0:15

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A squeegee with handle, water covered floor with drainage, and appropriate personal protective equipment
- **Behavior:** The student will use a squeegee to remove water or liquid from a surface to the drainage area
- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Squeegee with handle
- Water covered floor with drainage
- Appropriate personal protective equipment

**REFERENCES:**

- Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 5

**PREPARATION:**

The preservation of property is one of the fire fighter's major objectives on the fireground. Using a squeegee in the proper manner will assist you in performing salvage operations quickly, thus lessening the damage to both building and contents.
## How To Use A Squeegee

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pick up squeegee</td>
<td>1a. Both hands</td>
</tr>
<tr>
<td></td>
<td>b. Middle of handle</td>
</tr>
<tr>
<td>2. Inspect squeegee head</td>
<td>2a. Rubber in good condition</td>
</tr>
<tr>
<td></td>
<td>b. Not hard or damaged</td>
</tr>
<tr>
<td>3. Position squeegee head</td>
<td>3a. On floor</td>
</tr>
<tr>
<td></td>
<td>b. 45° angle</td>
</tr>
<tr>
<td>4. Move squeegee</td>
<td>4a. Forward</td>
</tr>
<tr>
<td></td>
<td>b. Using short strokes</td>
</tr>
<tr>
<td></td>
<td>c. Keeping rubber edge on floor</td>
</tr>
<tr>
<td></td>
<td>d. Comfortable distance (2-3 feet)</td>
</tr>
<tr>
<td>5. Pick up squeegee</td>
<td>5a. No higher than 6-12 inches</td>
</tr>
<tr>
<td>6. Repeat operations 3-5</td>
<td>6a. As many times as necessary to remove water</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF INDUSTRIAL WATER VACUUMS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of characteristics and functions of industrial water vacuums by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Large industrial water vacuum
- Backpack water vacuum

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

PREPARATION: One of the easiest and fastest ways to remove water is to use the water vacuum. Since fast and efficient work reduces property damage, it is the fire department's duty to provide equipment and personnel to help perform adequate salvage. Salvage is one of our primary jobs and we should use all the tools possible to make us efficient in our task.
## CHARACTERISTICS

### A. Large industrial type
1. Range in size from 3-20 gallons (11.4-75.7 liters)
2. Usually equipped with wheels
3. Particularly well-suited for removing water from carpeting

### B. Backpack type
1. Compact version of industrial type
2. Also known as "water-vac"
3. Capacity of 4-5 gallons (15.1-18.9 liters)
   a) Must be emptied frequently because of limited storage capacity

## FUNCTIONS

### A. Small quantities of water can be removed from floors in any area using an industrial water vacuum
1. Water vacuums have suction, powerful enough to extract water from even deep pile carpeting

### B. Dirt and small debris may also be removed from carpeting as well as from tile and other types of floor coverings
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Operate in a manner similar to an ordinary vacuum cleaner</td>
</tr>
<tr>
<td>1. Except the electric motor is located so that vacuumed water is deposited into an attached metal or plastic container</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the operating difference between an ordinary vacuum cleaner and a water vacuum?</td>
</tr>
</tbody>
</table>
SUMMARY:

Small quantities of water can be removed from floors in any area by using a water vacuum. This type of vacuum ranges in size from 3-20 gallons and comes in either backpack or large industrial with wheels.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Loss Control, IFSTA, First Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** HOW TO USE A CARRYALL TO REMOVE DEBRIS

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

*Condition:* A carryall, appropriate salvage tool, debris, and appropriate personal protective equipment

*Behavior:* The students will use a carryall to remove debris from a building

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Carryall
- Appropriate salvage tool
- Debris
- Appropriate personal protective equipment

**REFERENCES:**
- Salvage and Overhaul, Seventh Edition, Chapter 7

**PREPARATION:**
A carryall can prove a fast and efficient method for removing debris from a building during the overhaul stage.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open carryall</td>
<td>1a. At desired location</td>
</tr>
<tr>
<td></td>
<td>b. Flat</td>
</tr>
<tr>
<td></td>
<td>c. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td>2. Place debris</td>
<td>2a. Onto carryall</td>
</tr>
<tr>
<td></td>
<td>b. Using appropriate tools</td>
</tr>
<tr>
<td></td>
<td>c. Being careful with extremely hot materials</td>
</tr>
<tr>
<td>3. Lift carryall</td>
<td>3a. Two fire fighters</td>
</tr>
<tr>
<td></td>
<td>b. Using handholds</td>
</tr>
<tr>
<td></td>
<td>c. Using legs</td>
</tr>
<tr>
<td></td>
<td>d. Back straight</td>
</tr>
<tr>
<td>4. Remove carryall</td>
<td>4a. From building</td>
</tr>
<tr>
<td></td>
<td>b. In safe area</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: PRINCIPLES AND PROCEDURES FOR RESTORING PREMISES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles and procedures for restoring premises by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 8

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fire Service Loss Control, IFSTA, First Edition
- Salvage and Overhaul, IFSTA, Seventh Edition

PREPARATION: One objective of overhaul is to leave a building and its contents in as safe a condition as possible after a fire has occurred. The building should also be made as habitable as possible. Overhaul work would not be complete if debris and water are left in a building. Such a practice would add to the damage already done by the fire and would impede the restoration of the building to its designated use.
What do you think the first objective of restoring the premises should be?

What are high priority items in making the building safe?

What if the structural integrity of the entire building cannot be confirmed?

---

### I. RESTORING PREMISES

#### A. Making the building safe

1. **Check structural conditions**
   
   a) These areas should be clearly identified and barricaded to prevent access
   
   1) Sagging floors
   2) Sagging ceilings
   3) Sagging roofline
   4) Bulging walls
   5) Cracked walls
   6) Weak roofs
   7) Loose cornices
   8) Holes in floor
   9) Weak stairways

2. **Utilities such as gas and electrical services, and domestic water should be shut-off, if necessary**
   
   a) Utilities representative should check conditions

3. If unsafe, the building should be off limits to all personnel
B. Making the contents safe
   1. Remove all excess water
   2. Remove objects that have absorbed large quantities of water, especially from upper floors
   3. Move undamaged materials and equipment to safer areas in the building or remove entirely
   4. Use on-site equipment and personnel, if necessary (fork lifts, etc.)
   5. Items that should be inspected for hazards
      a) High piled stock
      b) Unsecured storage
      c) Stock from shelves
      d) Wet bundles of bags
      e) Unstable or reactive liquids or solids
      f) Etiologic or radioactive materials
      g) Open or closed tanks of liquids
      h) File cabinets and safes
      i) Heavy machinery
      j) Overhead fixtures
      k) Septic tanks

What should be done with debris that is removed from the building?

C. Making the surrounding area safe
   1. Place debris in isolated areas
      a) Away from combustibles
      b) Away from walkways
   2. Special handling of sharp objects
   3. Stack lumber carefully
   4. Provide secure area
## D. Barricade off partially collapsed buildings

1. Use equipment from other agencies when necessary
   a) Cranes
   b) Bulldozers, etc.
2. Barricade streets, if necessary
3. Post a security guard, if necessary
   a) Fire scene investigation
4. Enforce a collapse zone

## E. Fire protection systems

1. Fire systems should be put back into service immediately after the fire has been controlled
2. System restoration does not have to wait until overhaul activities are complete
3. When systems are shutdown, a fire fighter should be assigned to monitor the control valves
4. Sprinklers offer the best protection in the event of fire flare up or rekindle
   a) It is the fire departments' responsibility to see that a sprinkler system is completely restored before releasing the building back to the owner
   b) Sprinkler discharges in commercial settings (i.e., restaurants) may require the local health department to respond, prior to the system being restored
5. Restoration of utilities (gas and electric) should be delegated to the utility company

---

When should fire protection systems be put back in-service?
F. Openings in roofs, windows, doors, walls, etc.
   1. The fire department is responsible for covering holes caused by fire fighting, no matter how small or large

2. Materials used to cover openings
   a) Salvage covers
   b) Tarps
   c) Plastic sheeting
   d) Roofing felt
   e) Plywood

3. Procedure for covering holes
   a) Place covering material well over edges of hole
   b) Try to prevent water from entering opening
   c) Use old boards and nail over edges of covering material to hold in place
   d) Lay boards across large holes for cover support
   e) Covering doors and windows
      1) Use plywood and nails

Who is responsible for covering holes caused by fire fighting?

What are some examples of materials that can be used to cover openings?
G. Deodorizing the premises
1. This is not the responsibility of the fire department but provides assistance and is good public relations
2. Use a satisfactory deodorizer chemical that is listed by Underwriters Laboratories

H. Releasing the premises
1. Usually the last step in fire fighting activities
2. Simple yet formal procedure
3. Should have a witness present
4. Be tactful but firm when making recommendations
5. Some of the people who may be involved in transfer of control are
   a) Owner and occupants
   b) Utility company
   c) Law enforcement
   d) City officials
SUMMARY:

Salvage and overhaul serve a vital function in fire fighting operations and should be treated as such by all personnel. There are six basic areas of responsibilities in restoring the premises - making the building safe; making the contents safe; making the area safe; restoring fire protection systems; securing the building; and releasing the building to the owner.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Salvage and Overhaul, IFSTA, Seventh Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES AND PROCEDURES FOR COVERING ROOF OPENINGS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.1.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles and procedures for covering roof openings by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Loss Control, IFSTA, First Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Loss Control, IFSTA, First Edition

PREPARATION:
Since efficient salvage work reduces property damage, it is the fire department's duty to perform adequate salvage. "Protect, not wreck" should be the goal. Proper and efficient salvage work often enables businesses to continue after a fire with a minimum of interruption. It also aids families in reoccupation of their homes within a few hours after a fire has occurred. Your ability to cover roof openings safely, effectively, and quickly will assist in keeping businesses open and families in their homes.
I. COVERING ROOF OPENINGS

A. As with any aspect of fire fighting, extreme care must be taken while working on a roof
   1. The roof may have been weakened by fire below
      a) Should be checked for structural stability before covering work begins
   2. Salvage covers or tarps used on roofs should be handled in a manner that minimizes the chance of wind throwing personnel off balance
   3. Extreme caution should also be exercised when working on wet or ice-covered roofs

II. MEASURES TAKEN TO COVER OPENINGS

A. Holes in roofs are typically caused by fire damage or ventilation action by fire fighting crews
B. No matter what size hole exists in a roof, measures must be taken to cover the openings
C. The type of roof and the size of opening determine the method of covering

III. MATERIALS FOR COVERING OPENINGS

A. Roofing felt, Visqueen, roof tarps, or even salvage covers
B. All edges must be tied, weighted, or nailed down for security from the wind
C. Rolls of roofing paper and polyethylene sheeting can be used with staples, tacks, or roofing nails to form watertight coverings
D. Roof tarps or "roofers" are carried by many departments
   1. These are older covers
   2. Should be marked or located in one location for this duty

IV. COVERING PITCHED ROOFS
A. To cover a small hole on a pitched roof, the roofing materials around the top of the hole should be pried away from underlying support material
B. Material used to cover the hole should be positioned over the hole with the edge placed under the uplifted roofing

   1. Prevents water from running underneath
C. The side and bottom edges should overlap the side and bottom edges of the hole

D. All edges should be secured with roofing nails
   1. Lath or boards should be used to hold down the edges
      a) Nails should be driven into boards in a manner that avoids penetration of salvage cover material
      b) Nails should be driven through grommet holes, if boards are not available

Why is the material cover inserted under the roofing upper edge?

What materials can be used to hold down the edges of the covers?
E. Material covering a hole near the peak of the roof should be placed over the hole and on both sides of the ridge.

F. Covering large openings with two or more covers requires that you overlap the covers by at least 12 inches.
   1. Be sure that water will run down the covers and not into the structure.

V. COVERING HOLES IN FLAT ROOFS
   A. The edge around the hole should be raised in a manner similar to that on pitched roofs.
      1. Pry up materials approximately 6 inches around the perimeter.
      2. Block up with available materials:
         a) Wood blocks
         b) Bricks
         c) Other
      3. This creates an angle that aids in shedding water.
   B. A frame constructed of boards may then be secured over the hole.
      1. The frame raises the cover above the roof and provides better drainage.
   C. Place the cover over the frame and secure around the edges.
D. Never walk on a covered area
   1. It may be a concealed hole

VI. BAGGING
A. Sometimes it will be impossible to cover roof openings
B. When this condition exists, the area below the hole should be protected by "bagging"
C. The ceiling joists or floor below the opening should be covered with a salvage cover
D. Forming bags or troughs between the structural members to hold any water

VII. SKYLIGHTS, ROOF HATCHES, AND AIR SHAFTS
A. Easiest of all roof openings to cover and make watertight because their frameworks are elevated
B. Salvage covers or tarps can be placed directly over the existing framework and secured around the edges

Why not walk on a covered area?

Why are these openings easier to cover?
**SUMMARY:**

As with any aspect of fire fighting, extreme care must be taken while working on a roof. Roofs should be checked for structural stability before covering work begins. The size of openings and length of time openings will remain covered affect the type of material chosen for covering work. Sometimes, it will be impossible to cover roof openings. When this condition exists, the area below the hole should be protected by "bagging."

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Service Loss Control*, IFSTA, First Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPAL FEATURES OF WATER SYSTEMS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.17

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principal features of water systems by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: In order to provide efficient and professional emergency service, the fire fighter must have a thorough knowledge of the principal features of a modern water system.

With a thorough knowledge, the fire fighter will be better able to understand the determination of available fire flow, the dependability of the water system, how to cope with system problems, and how to anticipate the need for alternate methods of obtaining an adequate water supply.
# I. WATER SUPPLY SOURCES

<table>
<thead>
<tr>
<th>A. Surface water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lakes, rivers, ponds, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Ground water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wells or water producing stream</td>
</tr>
</tbody>
</table>

## II. PUMPS AND PUMPING STATIONS

<table>
<thead>
<tr>
<th>A. Used when gravity system not available or reliable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. May be used as adjunct to gravity system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Generally highly efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Usually completely automated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Pumping capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Varies from a few hundred gallons per minutes to millions of gallons per day</td>
</tr>
<tr>
<td>2. Diesel pumps permit greater capacity and fuel economy</td>
</tr>
</tbody>
</table>

## III. GRAVITY SYSTEM

<table>
<thead>
<tr>
<th>A. Uses natural elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Most practical method of delivery</td>
</tr>
<tr>
<td>2. Most economical method of delivery</td>
</tr>
<tr>
<td>3. Least installation costs</td>
</tr>
<tr>
<td>4. Least maintenance costs</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Application</th>
</tr>
</thead>
</table>

- How does the water get from the source to the hydrant?
- What is the most efficient type of distribution system?
- What is the most economical type of distribution system?
B. Capacity limited by basin or reservoir
   1. System may operate with or without pumps

IV. COMBINATION SYSTEM
   A. Combines gravity flow and pumps
      1. Used in majority of communities
      2. Gravity system can operate if pumps fail
      3. Tanks used on dead ends
   B. Combined storage
      1. If not in use, water tender filled with pumps

What can be done to provide a better supply of water at a dead end?

V. DISTRIBUTION SYSTEMS
   A. Elements
      1. Pipes
      2. Valves
      3. Hydrants
      4. Meters
      5. Other appliances for conveying water
   B. System design
      1. Grid
         a) Most common
         b) Interlooped and connected at standard intervals
      2. Tier
      3. Circle or belt
   C. Grid system piping
      1. Primary feeder (mains)
         a) Large pipes
b) Wide spacing

c) High capacity

d) 8"-52" or greater

e) Carries water to points for local distribution

2. Secondary feeders

a) Intermediate-sized pipes

b) Forms loops closely spaced

c) High capacity

d) 8"-36" or greater

e) Carries water to distribution lines

3. Distributors

a) Smaller internal grid arrangements that serve consumer blocks and individual fire hydrants

b) Close spacing

c) High capacity

d) Pipe size

1) Residential/multiple housing districts

   • 6" minimum

   • Should be closely gridded by 8" cross-connecting mains at intervals of not more than 600 feet

   • May need larger size main depending on layout and occupancy

2) Shopping/commercial districts

   • 8" minimum

   • With cross-connecting mains every 600 feet
### VI. GENERAL INFORMATION

**A. Main valves**

1. Used to provide flow control in the water system
2. Valves should be tested each year
3. High value area spacing
   a) 500 feet
4. Other areas’ spacing
   a) 800 feet

**B. Water main pipe**

1. Usually good for 30 years service

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<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• May need larger size main depending on layout and occupancy</td>
<td>What is the purpose of main line valves in the distribution system?</td>
</tr>
<tr>
<td>3) 12” mains may be used in principal streets and in long mains not cross-connected at frequent intervals</td>
<td></td>
</tr>
</tbody>
</table>

What is the suggested spacing for valves in high value districts?
**SUMMARY:**

It is important that you determine the main components and features of a modern water system. You should also determine the types of water distribution systems and what types of problems can be anticipated within the modern water system.

There are four basic components to all water supply systems. You should be able to identify the components of sources, means of moving water, treatment facilities, and distribution systems.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: FACTORS AFFECTING FIRE HYDRANT USABILITY

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the factors affecting fire hydrant usability by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials


PREPARATION: In order to provide efficient and professional emergency service, you must have a thorough working knowledge of the reasons why the usability of fire hydrants can be compromised. If hydrants cannot be located and connected to, they are useless to the fire department.
What are some of the obstructions you may find that prevent the use of a fire hydrant?

I. OBSTRUCTIONS
   A. Discharge lower than 15 inches above grade
   B. Barrel plumb to ground
   C. Inadequate clearance on pumper connection to allow for hydrant wrench or long lugs on hose couplings
   D. Vehicles blocking hydrant
   E. Snow, fence, posts, signs, and vegetation, etc.
   F. Distance to hydrant from street or road too far for some pump inlets

II. DIRECTION OF HYDRANT OUTLET
   A. Face direction of pumper
   B. Not toward possible obstruction
      1. Crash protection posts
      2. Land seeping

III. ABOVE GROUND MECHANICAL DAMAGE
   A. Damaged threads
   B. Stern damage
      1. Operating nut missing
      2. Bent or broken stem
         a) Internal or external
      3. Loosened at bury (underground)
      4. Operating nut rounded off by use of pipe wrench
IV. CONDITION

A. Paint in good condition
B. Paint highly visible
C. Rust and corrosion
   1. Caps rusted on
   2. Body rusted through
D. Hydrant caps iced and frozen
E. Barrel frozen
F. Valve stems sized-up

G. Out-of-service indicators
   1. Hydrant covered by bag
   2. Collar around discharge cap

V. ADEQUATE FLOW

A. Internal obstructions
   1. Rust
   2. Tubular corrosion
      a) Corrosion inside hydrant
   3. Small size and high friction loss
B. Street valve closed
C. Inadequate system
   1. Dead end main
   2. Old, inadequate size
   3. Loss of pumping ability
      a) No pressure in system
D. Hydrant must be fully opened
   1. Back ¼-½ turn to prevent locking in open position

How can you visually tell if a hydrant is out of service?
VI. **DRY-BARREL DRAINS**

A. Should close when fully open
   1. No water out drain

B. Must drain when hydrant closed
   1. Hear or feel suction at discharge
   2. Water at base of hydrant
SUMMARY:

You should determine the usability of fire hydrants in your water system. Determine location of fire hydrants and resolve unfavorable conditions created by obstructions, blockages, damage, and lack of proper maintenance.

Fire hydrants are permanent water resources in our community. They must be inspected upon installation to verify proper flow, accessibility, and orientation of outlet positions. Regular routine inspections will check for rated flow, presence of mechanical damage, and obstructions such as overgrown vegetation or new signposts. It is vital that you understand the factors that could affect the operation of their hydrants.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SOURCES OF WATER SUPPLY OTHER THAN HYDRANTS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the sources of water supply other than hydrants for local water systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Water Supplies for Fire Protection, IFSTA, Fourth Edition, Chapter 2

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition

PREPARATION: In order to progress to the learning of the physical features of a modern water system, the student must have a working knowledge of the sources(s) of water for that system.

With a thorough knowledge, you will be better able to understand the determination of available fire flow, the dependability of the water system, how to cope with water problems, and how to anticipate the need for an alternate source of water supply.
I. IDENTIFY VARIOUS WATER SOURCES

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are some natural sources of water we can use for firefighting?</td>
<td></td>
</tr>
</tbody>
</table>

A. Natural

1. Ponds
2. Lakes
3. Streams
   a) Ten feet wide
   b) Average depth 1 foot
   c) Moving 15 feet per minute
      1) 1,000 gpm
         • To use the 1,000 gpm, you need a reservoir to pump from
4. Ocean
5. River

B. Artificial sources

1. Swimming pools
2. Cisterns
3. Irrigation systems
4. Elevated water tanks
5. Reservoirs
6. Rural residential tanks
7. Livestock tanks

What are some artificial sources to use?
### PRESENTATION

<table>
<thead>
<tr>
<th>C. Innovation is the key</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Be creative</td>
</tr>
<tr>
<td>a) Dams, streams</td>
</tr>
<tr>
<td>b) Cut fences and barriers</td>
</tr>
<tr>
<td>2. Avoid hazardous and toxic materials</td>
</tr>
</tbody>
</table>

### APPLICATION

- How would you identify potential hazards?
- What are some of the resources you have in your own community?

### OTHER WATER SOURCES

#### A. Private and commercial resources

1. Railroad tank cars
2. Public works vehicles
3. Cement trucks
4. Milk trucks
5. Other tank vehicles

- When would you need mobile apparatus?

#### B. Fire department mobile apparatus

1. Water tenders specifically designed to transport water
2. Needed when
   a) Inadequate supply
   b) Outside water system

#### C. Portable tanks

1. Carried on apparatus
   a) Commercially built
   b) Locally built
How large should apparatus-carried portable tanks be?

c) At least the capacity of the apparatus tank

2. Construction
   a) Collapsible, canvas lining
   b) Synthetic tank, floating collar
   c) Weight approximately 35-100 pounds

In what situations would a portable tank be of use?

3. Situations used
   a) Tender shuttle
   b) Reservoirs for portable pump supply
   c) Helicopter use

D. Floto-pump
   1. Weighs 50 pounds
   2. Runs 60-90 minutes on one tank
   3. Works in water 6 inches deep

III. WATER TENDERS

A. Private tenders
   1. May have thread incompatibilities
   2. Driver may be familiar with local water sources

B. Fire service tenders
   1. Shuttle tenders
      a) Smaller tanks
         1) <3,500 gallons
      b) Larger pumps
         1) >300 gpm
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Large dump valve with portable tank</td>
<td></td>
</tr>
<tr>
<td>d) More maneuverable</td>
<td></td>
</tr>
</tbody>
</table>

2. Nursing tenders
   a) Larger tanks
      1) >3,500 gallons
   b) Smaller pump
      1) <300 gpm
   c) Smaller or no dump valve
   d) Less maneuverable
      1) Narrow roads
      2) Weight limits

3. ICS classifications
   a) Type I
      1) 2,000 gallons/300 gpm
   b) Type II
      1) 1,000 gallons/120 gpm
   c) Type III
      1) 1,000 gallons/120 gpm
**SUMMARY:**

It is essential that you know all the sources of water supply to meet any emergency. Hydrant systems provide only one alternative. Natural and fabricated sources provide important optional sources of water.

In the fire service, we are not limited to fire hydrants as a source of water. Water supplies in both rural and municipal areas are in natural and fabricated water sources. Other options are only limited to your own innovations.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: CHARACTERISTICS OF PORTABLE WATER TANKS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics of portable water tanks by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Water Supplies for Fire Protection, IFSTA, Fourth Edition, Chapter 7

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Pumping Apparatus Driver/Operator Handbook, IFSTA, First Edition

PREPARATION: Portable water tanks are a valuable resource where no permanent water source is available for fire fighting purposes. Many rural structures are destroyed by fire because fire fighters do not have a source of water. When a portable water tank is rapidly deployed near the pumping engine at the fire scene, a water shuttle can make the difference between a good stop and a total loss.
I. TYPES
   A. Collapsible
      1. Canvas duck or synthetic liner
      2. Rectangular or metal frame

   B. Rigid
      1. Fiberglass
      2. Wood
      3. Steel

   C. Temporary (improvised)
      1. Can be set up using anything available
         a) Ground ladders and salvage covers or visqueen
         b) Stock watering tanks (cattle, sheep, etc.)

II. SIZES
   A. Commercially built
      1. Up to 3,000 gallons

   B. Locally built
      1. Up to 6,000 gallons

III. DEPLOYMENT CONSIDERATIONS
   A. Level ground
      1. No sharp objects on ground
         a) Can puncture tank

   What material could a rigid water tank be made out of?
   What are some items that could be used for a temporary tank?
   What are some of the considerations for deployment?
### Characteristics Of Portable Water Tanks

**PRESENTATION**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B.</td>
<td>Do not block access</td>
</tr>
<tr>
<td>1.</td>
<td>Could restrict apparatus placement</td>
</tr>
<tr>
<td>2.</td>
<td>Close enough to pumping engine</td>
</tr>
<tr>
<td>C.</td>
<td>Tank is <strong>not</strong> portable once deployed</td>
</tr>
</tbody>
</table>

**APPLICATION**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
</table>
**SUMMARY:**

With the increased deployment of out-of-area apparatus to protect structures in rural areas, fire fighters should know how to set up, supply, and pump from portable water tanks. Portable water tanks have many features in their use. Commercial or locally built tanks determine size and construction of the portable water supply. The water tanks can be collapsible, rigid, or improvised with the resources available. The location of the water supply has many determining factors as well. It is important that you understand the needs for portable water supply and what to look for when using this water supply.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: HOW TO USE A PUBLIC WATER SYSTEM'S HYDRANT GATE VALVE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.17

BEHAVIORAL OBJECTIVE:

Condition: A valve box, gate valve, reach rod, and appropriate personal protective equipment

Behavior: The student will open and close a public water system's hydrant gate valve

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Valve box
- Gate valve
- Reach rod (valve key or gate key)
- Appropriate personal protective equipment

REFERENCES:

PREPARATION: It is necessary for fire fighters to have the ability to operate the valves that control water through the distribution system.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Locate valve box</td>
<td>2a. Place away from opening</td>
</tr>
<tr>
<td>2. Remove valve box lid</td>
<td>2b. Of valve</td>
</tr>
<tr>
<td>3. Perform visual inspection</td>
<td>2c. Signs of wear</td>
</tr>
<tr>
<td></td>
<td>3b. Leaks</td>
</tr>
<tr>
<td>4. Turn gate valve</td>
<td>4a. Counterclockwise</td>
</tr>
<tr>
<td>5. Back off</td>
<td>4b. Until fully opened</td>
</tr>
<tr>
<td>6. Turn gate valve</td>
<td>5a. ¼-½ turn</td>
</tr>
<tr>
<td>7. Replace valve box lid</td>
<td>6a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>6b. Slowly</td>
</tr>
<tr>
<td></td>
<td>6c. Until completely closed</td>
</tr>
<tr>
<td></td>
<td>7a. Completely</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPEN AND CLOSE A FIRE HYDRANT VALVE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.17

BEHAVIORAL OBJECTIVE:

**Condition:** A fire hydrant, hydrant wrench, and appropriate personal protective equipment

**Behavior:** The student will open and close a fire hydrant valve

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Fire hydrant
- Hydrant wrench
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 11

PREPARATION:

It is necessary for fire fighters to have the ability to operate the fire hydrant to establish a water supply. Knowledge of the components of hydrants is essential to performing this task.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determine type of hydrant</td>
<td>1a. Dry or wet barrel</td>
</tr>
<tr>
<td></td>
<td>b. Checking location of the stem nut</td>
</tr>
<tr>
<td>2. Turn hydrant cap</td>
<td>2a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until removed</td>
</tr>
<tr>
<td>3. Perform visual inspection</td>
<td>3a. Of discharge outlet</td>
</tr>
<tr>
<td></td>
<td>b. Signs of wear</td>
</tr>
<tr>
<td></td>
<td>c. Leaking valve seat</td>
</tr>
<tr>
<td>4. Turn stem nut</td>
<td>4a. Using hydrant wrench</td>
</tr>
<tr>
<td></td>
<td>b. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>c. Until fully opened</td>
</tr>
<tr>
<td>5. Back off</td>
<td>5a. ¼-½ turn</td>
</tr>
<tr>
<td>6. Turn stem nut</td>
<td>6a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Until completely closed</td>
</tr>
<tr>
<td>7. Replace hydrant cap</td>
<td>7a. Securely</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: NFPA HYDRANT COLOR-CODING SYSTEM

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the NFPA hydrant color-coding system by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8

MATERIALS NEEDED:

• Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials

REFERENCES:

• Essentials of Fire Fighting, IFSTA, Fourth Edition
• NFPA Standard #291, NFPA, 1995 Edition
• Water Supplies for Fire Protection, IFSTA, Fourth Edition

PREPARATION:

The hydrant color-coding system was developed as a method for the fire fighter to premark hydrants for their gallon per minute (gpm) flow. The color-coding means nothing if the fire fighter cannot recall what the color denotes. If noted on pre-incident plans, color-coding may be used to pick the most appropriate hydrant.
I. CLASSIFYING FIRE HYDRANTS
   A. NFPA committee on "Public Water Supplies For Fire Protection" recommends four basic colors to classify a fire hydrant according to flow

   What parts of the hydrant are used to denote flow?

   B. The color is painted on the bonnets and caps
   C. The rating should be based on 20 psi residual pressure
   D. Designed to be consistent and simple
   E. Barrels of fire hydrants may be any color which does not clash or distract from the color in the color code
   F. Local department may use additional colors to denote other flows and/or high pressure hydrants

II. CLASSIFICATION COLORS
   A. Four colors are used to denote the flow produced when classifying hydrants
      1. Red
         a) Denotes a Class C hydrant
         b) Less than 500 gpm
      2. Orange or yellow
         a) Denotes a Class B hydrant
         b) 500-999 gpm
      3. Green
         a) Denotes a Class A hydrant

   A red hydrant flows how many gallons per minute?
A green hydrant flows how many gallons per minute?

b) 1,000-1,499 gpm

4. Light blue
   a) Denotes a Class AA hydrant
   b) 1,500 or greater gpm
**SUMMARY:**

The NFPA color-code system is a rapid system to identify the approximate flow of a hydrant on the fireground by a simple four-color system. You should know the proper location of color-coding on the hydrant. Learn it and use it to your benefit.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS OF WET AND DRY-BARREL HYDRANTS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the differences between wet and dry-barrel hydrants by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 11

MATERIALS NEEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: The basis of providing large fire flow on the fireground is the fire hydrant. There are two main categories of fire hydrants, wet and dry-barrel hydrants. Your comprehension of their advantages and limitations is crucial for effective fireground operations.
I. DRY-BARREL HYDRANT

A. Usually classified as a compression, gate, or knuckle-joint type

B. Easily identified by a single stem nut on top of the barrel which operates all outlets simultaneously

C. Predominantly used in climates where freezing is expected

D. Any water that may remain in the barrels of a closed dry-barrel hydrant will drain through a small valve at the bottom
   1. Drain valve opens as the main valve closes
   2. Drain valve must be kept clean
   3. Water is drained to prevent freezing in the hydrant barrel which may damage the barrel

E. Dry-barrel main parts
   1. Stem nut
   2. Operating stem
   3. Drain hole
   4. Valve
   5. Hose outlet
   6. Outlet cap with chain

F. Larger capacity hydrants may have multiple outlets with a single stem nut

G. Chained outlet caps help prevent losses but chains should be loose for turning

H. If the dry-barrel hydrant is knocked off of the break away flange, the valve usually remains in place and no water is lost

How is the remaining water removed from the barrel?
II. WET-BARREL HYDRANT

A. Usually classified as having a compression-type valve at each outlet
B. Easily identified by a single stem nut which is directly opposite the hose outlet it operates
C. There is a separate stem nut and valve for each hose outlet
D. Predominantly used in climate where freezing is not expected
E. Water always remains in the barrel of the hydrant ready for use
F. Wet barrel main parts
   1. Stem nut
   2. Operating stem
   3. Valve
   4. Valve seat
   5. Hose outlet
   6. Outlet cap with chain
   7. Automatic check valve (optional)
G. Large capacity hydrants may have multiple outlets with a stem nut and valve to operate each hose outlet

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which hydrant has only one valve at the base?</td>
<td>1. Dry-barrel hydrant</td>
</tr>
<tr>
<td>Which hydrant has a stem nut for each hose outlet?</td>
<td>2. Wet-barrel hydrant</td>
</tr>
<tr>
<td>Chained outlet caps help prevent losses but chains should be loose for turning</td>
<td></td>
</tr>
</tbody>
</table>
I. If the wet-barrel hydrant is knocked off the break away flange, the hydrant may lose water if there is no automatic check valve

III. HYDRANT CONSTRUCTION FEATURES

A. Cast iron fire hydrant
   1. Bonnets
   2. Barrels
   3. Foot pieces
   4. Caps

B. Bronze for hydrant
   1. Working parts
   2. Hose outlet threads

C. Facings are made of
   1. Rubber
   2. Leather
   3. Composition material
**SUMMARY:**

There are two basic types of fire hydrants, a wet and dry-barrel hydrant. The single stem nut either across from the discharge or on top of the hydrant is an easy identifying feature to determine if it is a wet or dry-barrel hydrant. The climate dictates the use of dry-barrel hydrants to prevent freeze-up that will render the hydrant useless. The hydrant is an intricate part of fire fighting, it is important that you can identify and understand the working components of both hydrants.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 11 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF FIRE HYDRANTS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the inspection and maintenance procedures for fire hydrants by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Water Supplies for Fire Protection, IFSTA, Fourth Edition, Chapter 3

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

PREPARATION: The water distribution system is the lifeblood of fire suppression. Without adequate hydrant maintenance, the water system you rely on might not be serviceable.
I. INTRODUCTION
A. Most repairs and maintenance of fire hydrants are usually the responsibility of the water department.
B. The water department should be notified when hydrant inspections are made, including the location and route taken.

II. INSPECTION
A. Materials needed
   1. Notebook
   2. Gauge device for checking threads
   3. Lubricating oil
   4. Graphite
   5. Wire brush
   6. Valve key
   7. Hydrant wrench
B. Inspector's observations
   1. Check for obstructions erected around the hydrant
      a) Poles, fences, shrubbery, etc.
   2. Check outlets
      a) Facing proper direction
      b) Maintain 15-inch clearance from bottom of butt to the grade
      c) Foreign materials in outlets
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Check for external damage</td>
<td></td>
</tr>
<tr>
<td>a) Traffic barriers around hydrants help eliminate damage</td>
<td></td>
</tr>
<tr>
<td>4. Condition of paint</td>
<td></td>
</tr>
<tr>
<td>a) Repaint as needed</td>
<td></td>
</tr>
<tr>
<td>C. Flushing the hydrant</td>
<td></td>
</tr>
<tr>
<td>1. Open valve fully and allow water to flow until clear</td>
<td>Why is it important to fully open a dry-barrel?</td>
</tr>
<tr>
<td>a) Flushes hydrant branch and hydrant</td>
<td></td>
</tr>
<tr>
<td>2. After flushing, close hydrant slowly to prevent water hammer</td>
<td>What does the presence of water in a dry-barrel hydrant indicate?</td>
</tr>
</tbody>
</table>

3. The presence of water in a dry-barrel hydrant indicates that either the main valve does not hold tightly or the drain holes are plugged

4. The location of the gate valve in the hydrant branch should be known so it can be closed if complications arise after the hydrant is opened

D. Pressure testing the hydrant

1. Requires a tapped hydrant cap with gauge
   a) Attach gauge cap to one 2½” outlet
   b) Tighten the caps on the other outlets
   c) Open hydrant valve completely
   d) Bleed air from hydrant
      1) Open petcock nozzle on gauge cap
      2) Until steady stream of water appears
3) Close petcock nozzle

e) Record static pressure on gauge

f) Observe tightness of nipples and stuffing box

1) No leaks

g) Close hydrant completely

III. MAINTENANCE

A. Stuffing box

1. Packing in the stuffing box tends to dry over a period of time

2. Check for leakage

a) Considerable leakage

1) Repack main stem and oil

b) Slight leakage

1) Tighten stuffing nut

B. Valve stem

1. Should be oiled

2. Makes it easier to open and close

C. Thread gauge

1. Measuring device should be screwed on each outlet to determine if proper fit can be made

2. Rust and other deposits should be removed from outlet and cap threads with a wire brush

3. Lightly swab cap threads and outlets with a mixture of lubricating oil and graphite

4. Wipe threads clean with a rag

D. Hydrant caps

1. Replace cracked or worn gaskets as needed

2. Place caps on discharge outlet and close firmly

How can we remove rust from threads?
### PRESENTATION

1. Chains should be freed of excessive paint and straightened to ensure free running around the groove in the cap

### APPLICATION
SUMMARY:

In most cities, repair and maintenance of fire hydrants are the responsibility of the water department. However, during hydrant test inspection and maintenance, the fire department should check to make sure fire hydrants are in good operating condition and report to the water department all hydrants that need repair.

When inspecting and maintaining fire hydrants in the field it is important that you bring the proper equipment needed. Your inspection includes the surrounding area, operation of the hydrant, pressure testing the hydrant, and preventative maintenance.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Water Supplies for Fire Protection, IFSTA, Fourth Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO CONNECT A HARD SUCTION HOSELINE FOR DRAFTING

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.14

BEHAVIORAL OBJECTIVE:

Condition: A water tender or engine, strainer, spanner wrench, rubber mallet, and appropriate personal protective equipment

Behavior: The student will connect a hard suction hoseline for drafting

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Water tender or engine (with adequate hard suction hoseline, water, and pump)
- Strainer
- Spanner Wrench
- Rubber Mallet
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 12

PREPARATION: All fire fighters should understand the basic principle involved in the preparation of setting up a drafting operation.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove engine pump suction inlet cap</td>
<td>1a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Using rubber mallet or spanner wrench if stuck</td>
</tr>
<tr>
<td>2. Position hard suction hoseline</td>
<td>2a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Near suction inlet</td>
</tr>
<tr>
<td>3. Connect both sections of hard suction</td>
<td>3a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Using spanner wrench to tighter</td>
</tr>
<tr>
<td>4. Connect strainer</td>
<td>4a. To male end of hard suction</td>
</tr>
<tr>
<td></td>
<td>b. Clockwise</td>
</tr>
<tr>
<td></td>
<td>c. Hand tight</td>
</tr>
<tr>
<td>5. Connect rope</td>
<td>5a. To strainer</td>
</tr>
<tr>
<td>6. Tie knot through eyelet</td>
<td></td>
</tr>
<tr>
<td>7. Connect hard suction hoseline</td>
<td>7a. To apparatus</td>
</tr>
<tr>
<td></td>
<td>b. Clockwise</td>
</tr>
<tr>
<td></td>
<td>c. Using spanner wrench to tighten</td>
</tr>
<tr>
<td>8. Place hard suction hoseline</td>
<td>8a. In water source</td>
</tr>
<tr>
<td></td>
<td>b. Hoseline off bottom</td>
</tr>
<tr>
<td>9. Tie off strainer hoseline rope</td>
<td>9a. To apparatus</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: COMPONENTS OF AN AUTOMATIC SPRINKLER SYSTEM

TIME FRAME: 2:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the components of an automatic sprinkler system by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Upright sprinkler head
- Pendent sprinkler head

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15
- Fire Inspection and Code Enforcement, IFSTA, Sixth Edition, Chapter 7
- NFPA Standard #13, NFPA, 1999 Edition
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: The identification of major automatic sprinkler components and an understanding of their function is an important responsibility. A true appreciation of automatic sprinkler systems cannot be realized until this knowledge has been gained.
I. CONTROL VALVES

A. Used to control supply of water to sprinkler systems
B. Must be indicating valves
C. Types of valves

1. Outside screw and yoke (OS&Y) valve
   a) An aboveground valve
   b) Has a yoke on the outside with a threaded stem
   c) Controls opening and closing of the gate
      1) Water supplied to automatic sprinkler systems
   d) Threaded portion of the stem is out of the yoke when the valve is open
   e) Threaded portion of the stem is inside the yoke when the valve is closed

2. Post indicator valve (PIV)
   a) An underground gate valve
   b) Hollow metal post that is attached to the valve housing
      1) Valve stem is inside this post
   c) A movable target is on the stem
      1) Words "OPEN" and "SHUT" at the opening

3. Wall post indicator valve (WPIV)
   a) Similar to PIV
   b) Extends through the wall with the target and valve operating nut on outside of building
### OPERATING VALVES

#### A. Sprinkler systems employ various valves

1. Alarm test valve
2. Automatic drain valve
3. Check valve
4. Globe valve
5. Inspector's test valve
6. Main drain valve
7. Stop or cock valve

#### B. Alarm test valve

1. Located on a pipe that connects the supply side of the alarm check valve to the retard chamber
   
   a) Catches excess water from momentary water pressure surges

2. Simulates the actuation of the system by allowing water to flow into the retard chamber

3. Operates the water flow alarm devices

#### C. Inspector's test valve

1. Located in a remote part of the sprinkler system

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4. Post indicator valve assembly (PIVA)
   
   a) Similar to PIV

   b) Uses a butterfly valve instead of a gate valve

   c) Does not use target words

   1) Has a sight area that is open when the valve is open and closed when the valve is closed

---

What is the difference?
2. Equipped with the same size orifice as one sprinkler
3. Simulates the activation of one sprinkler
4. Water should drain to the outside of the building

D. Main drain valve
   1. Every sprinkler system riser has this valve
   2. Drains water from the system for maintenance purposes
   3. Can also be used to check the system water supply
      a) Because of the large volume of water that flows when the main drain valve is opened

III. FIRE DEPARTMENT CONNECTION (FDC)
   A. An inlet appliance that has one or more 2½" inlets or one large-diameter inlet

   B. Fire apparatus can boost the pressure or amount of water flowing through a sprinkler or standpipe system

   C. High-rise buildings having two or more zones require a FDC for each zone

   D. Standard requirements
      1. Shall be no shutoff valve between the FDC and the standpipe riser
         a) Gate valves are provided at the bases of individual risers in a multi-riser system

What is a fire department connection?

What is the purpose of the fire department connection?
2. Hose connections to the FDC must be female and equipped with standard caps
3. Hose couplings threads conform to those used by the local fire department
4. Must be designated by a raised-letter sign on a plate or fitting reading "STANDPIPE"
   a) Must indicates which floors are serviced if the FDC does not service the entire building
5. Check valve in line to prevent backflow

E. Not present in single residential automatic sprinkler system

IV. WATER FLOW ALARMS

A. Systems are designed so that water flow actuates an alarm
   1. Accomplished by installing an alarm check valve or a water flow indicator in the main riser

B. Check valve
   1. Water flow lifts a clapper valve
   2. Allows water to flow into piping leading to an alarm device
   3. Retard chamber
      a) A false alarm prevention device
      b) Water chamber must be filled with water before water will flow into the water motor gong
      c) Equipped with a ball check valve leading to a drain
      d) Water surges will partially fill the chamber, but will subsequently drain
         1) Preventing false alarms

C. Normally operated either hydraulically or electrically
   1. Hydraulic
a) Local alarm
b) Used to alert the personnel in a sprinklered building

2. Electric
a) Employed to alert building occupants
b) Can be arranged to notify the fire department

3. Water flow indicator
a) Consists of a vane (paddle) that protrudes through the riser into the waterway
b) Vane is connected to an alarm switch located on the outside of the riser
c) Movement of the vane caused by flowing water operates the switch and initiates an alarm

How does a water flow indicator work?

V. SPRINKLERS

A. Discharge water after the release of a cap or plug that is activated by the heat responsive element
   1. Fixed-spray nozzle
   2. Operated individually by a thermal detector

B. Commonly identified by the temperature at which they are designed to operate

What are the colors that indicate each sprinkler temperature rating?

1. Uncolored or black
   a) Classification: Ordinary
   b) Temperature rating: 135°F - 170°F
   c) Maximum ceiling temperature: 100°F
d) Glass bulb: Orange or red

2. White
   a) Classification: Intermediate
   b) Temperature rating: 175°F - 225°F
   c) Maximum ceiling temperature: 150°F
   d) Glass bulb: Yellow or green

3. Blue
   a) Classification: High
   b) Temperature rating: 250°F - 300°F
   c) Maximum ceiling temperature: 225°F
   d) Glass bulb: Blue

4. Red
   a) Classification: Extra high
   b) Temperature rating: 325°F - 375°F
   c) Maximum ceiling temperature: 300°F
   d) Glass bulb: Purple

5. Green
   a) Classification: Very extra high
   b) Temperature rating: 400°F - 475°F
   c) Maximum ceiling temperature: 375°F
   d) Glass bulb: Black

6. Orange
   a) Classification: Ultra high
   b) Temperature rating: 500°F - 575°F
   c) Maximum ceiling temperature: 475°F
   d) Glass bulb: Black

7. Orange
   a) Classification: Ultra high
   b) Temperature rating: 650°F
c) Maximum ceiling temperature: 625°F

d) Glass bulb: Black

What are some of different ways sprinklers are activated?

C. Release mechanisms

1. Fusible link
   a) Involves a frame that is screwed into the sprinkler piping
   b) Two levers press against the frame
   c) A cap over the orifice in the frame holds back the water
   d) The fusible link holds the levers together until the link is melted during a fire
   e) The water pushes the levers and cap out of the way
      1) Strikes the deflector on the end of the frame
   f) The deflector converts the standard ½-inch stream into a water spray

2. Frangible bulb
   a) Small bulb filled with liquid and an air bubble to hold the orifice shut
      1) Liquid is color-coded to designate the breaking temperature
   b) Heat expands the liquid until the bubble is absorbed into the liquid
   c) Internal pressure increases
   d) Bulb shatters at the proper temperature
      1) Breaking temperature regulated by the amount of liquid and the size of the bubble
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>e) When the bulb shatters, valve cap is released</td>
<td></td>
</tr>
<tr>
<td>3. Chemical pellet</td>
<td></td>
</tr>
<tr>
<td>a) A pellet or solder (under compression) within a small cylinder</td>
<td></td>
</tr>
<tr>
<td>b) Melts at a predetermined temperature</td>
<td></td>
</tr>
<tr>
<td>c) Plunger moves down and releases the valve cap parts</td>
<td></td>
</tr>
</tbody>
</table>

D. Positions

1. Pendant
   a) Most common type in use
   b) Extends down from the underside of the piping
   c) Sprays a stream of water downward into a deflector
      1) Breaks the stream into a hemispherical pattern

2. Upright
   a) Sits on top of the piping
   b) Sprays water into a solid deflector
      1) Breaks the stream into a hemispherical pattern
      2) Redirected to the floor

3. Sidewall
   a) Extends from the side of a pipe
   b) Used in small rooms
   c) Branch lines runs along a wall
   d) Has a special deflector that creates a fan-shaped pattern of water
4. Special-purpose
   a) Used in specific applications
   b) Unique characteristics

E. Recent changes regarding sensitivity of sprinklers
   1. Old commercial sprinklers are relatively insensitive
   2. "Fast response" commercial sprinklers operate more quickly
   3. Residential sprinklers are fast acting and relatively new technology
   4. Some sprinkles now shut off after fire is knocked down
   5. There are also "on" and "off" heads

F. Clearance of sprinklers to obstructions is critical
   1. Standard clearance
      a) 18 inches
   2. Clearance required in some cases
      a) 36 inches

VI. SUPPLEMENTAL SYSTEM COMPONENTS
   A. Exhausters
   B. Accelerators
   C. Hangers
   D. Earthquake bracing is required in California sprinkler systems
What are supplemental water supplies?

E. Supplemental water supplies
   1. Gravity tanks
   2. Pressure tanks
   3. Ground level reservoirs

F. Fire pumps may be required to make up pressure deficiencies

G. Excess pressure valve
**SUMMARY:**

Automatic fire sprinkler systems are supplied through a valve from public mains or private water resources. Fire department connections may be used to supplement these supplies. Major components such as the riser, cross mains and branch lines distribute water to the sprinkler heads. Sprinkler heads are color coded to indicate activation temperatures. Several types are available including upright, pendent, sidewall, residential, and special purpose. Some systems have supplemental components such as exhausters, accelerators, and supply fire pumps.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: CAPABILITIES AND LIMITATIONS OF SPRINKLER SYSTEMS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the capabilities and limitations of sprinkler systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Protection Handbook, NFPA, Eighteenth Edition, Section 6, Chapters 6-9

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Automatic Sprinkler and Standpipe Systems, Bryan

PREPARATION: Although fire sprinklers are the single most effective fire protection devices known, they have their limitations. Knowing these limitations can improve your fire fighting techniques, making you far more efficient. This lesson will describe both the capabilities and the limitations of sprinkler systems.
I. CAPABILITIES

A. Life safety
   1. Loss of life in buildings protected by sprinklers is minimal
   2. Less than 1% of fire fatalities occur in sprinklered buildings
   3. There has never been a multiple life loss fire in a building protected by a properly maintained sprinkler system in the United States

B. Property protection
   1. Fire loss in sprinklered occupancies is a small fraction of that in unprotected properties
   2. Large loss fires (over $500,000) simply do not occur in buildings protected by well-maintained and operational sprinkler systems
   3. Insurance premiums for sprinklered commercial properties are much less than for nonsprinklered properties

C. Other factors
   1. Business interruption is minimized or eliminated with sprinklers
   2. Water damage is minimal compared to that caused by hose streams in nonprotected buildings
   3. Spontaneous sprinkler discharge is extremely rare
      a) About 1 in 3.3 million

What is the major reason for installing sprinkler systems?

What are some other factors favoring sprinkler systems?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Misinformed persons expect all heads to open when the system activates.</td>
<td></td>
</tr>
</tbody>
</table>

II. LIMITATIONS

A. Improper design
   1. Building modifications
   2. Changes in occupancy classifications

B. Physical features of a building may limit effectiveness of system operations
   1. High ceilings
   2. Concealed spaces
   3. Platforms, tables, and interior structures which shield sprinkler discharge

C. Occurrence of a flood or earthquake beyond design limitations may limit effectiveness

D. A system may be "overpowered" by the fire loading of the occupancy it protects
   1. Inherent heat output of contents
   2. High-piled stock
   3. Flammable liquids
   4. Chemicals and explosives

E. Water supply may be compromised

F. Inadequate maintenance may render system inoperative or ineffective
   1. Valves shut off

What are some features that could limit the effectiveness of system operations?

How can a system be "overpowered" by the fire loading of the occupancy it protects?
### OVERCOMING SYSTEM LIMITATIONS

**A.** There is a corrective action to be taken for every "limitation" described previously

- How can you overcome system limitations?

**B.** These corrective actions include

1. Providing adequate system design
2. Providing adequate water supply
3. Matching hazard with correct type of sprinkler system
4. Fire watch person(s) posted by building occupant when system is disabled for repairs
5. Educating fire department personnel and building occupants regarding proper use of sprinkler system

- What role does a building occupant play in a working sprinkler system?
SUMMARY:

Less than 1% of fire fatalities occur in sprinklered buildings. Reduced insurance premiums reflect the reduced property losses experienced. Systems may be rendered ineffective by improper maintenance, building modifications or changes in building use or occupancy. Inspections by qualified personnel must be made on a regular basis to ensure that systems are fully functional and have not been compromised.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Protection Handbook, NFPA, Eighteenth Edition, Section 6, Chapters 6-9 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF WET-PIPE SPRINKLER SYSTEMS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of a wet-pipe sprinkler system by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sprinkler system mock up or diagram
- Sprinkler heads for examination

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Private Fire Protection and Detection, IFSTA, Second Edition
- Pumping Apparatus Driver/Operator Handbook, IFSTA, First Edition

PREPARATION: Wet-pipe automatic sprinkler systems are recognized as the most reliable of all fire protection devices. During this lesson, the fire fighter will be given a basic knowledge of wet-pipe sprinkler systems operation.
## Characteristics And Functions Of Wet-Pipe Sprinkler Systems

### I. PRE-INCIDENT

A. Water throughout system
   1. Antifreeze solution used in some very small systems or in small parts of large systems

2. Clapper valve keeps water in system
3. Connected to domestic (public) water supply

B. Valve positions
   1. Clapper closed
   2. OS&Y open
   3. PIV open
   4. Main drain closed
   5. Alarm check closed
   6. FDC check closed
   7. Sprinkler heads closed

### II. DURING AN INCIDENT

A. Water discharging from opened heads

B. Valve positions
   1. Clapper open
   2. OS&Y open
   3. PIV open
   4. Main drain closed
   5. Alarm check open
   6. FDC check closed
   7. Sprinkler heads
      a) Only those that have fused will be open

What valve keeps water in system?

What valves change position when water begins to flow?
### Characteristics And Functions Of Wet-Pipe Sprinkler Systems

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>C. Alarm is activated by open alarm check valve</td>
<td>How do people outside of the building area know that water is flowing?</td>
</tr>
<tr>
<td>1. Local water gong</td>
<td></td>
</tr>
<tr>
<td>2. Alarm transmitted on monitored systems</td>
<td></td>
</tr>
</tbody>
</table>

### III. FIRE DEPARTMENT ASSISTED OPERATION DURING AN INCIDENT

| A. Same as during the incident except that the fire pumper is pumping into FDC | |
| B. Pump at pressure needed to supply system | |
| 1. May be determined by discharge pressure plate located at FDC | |
| 2. May be determined by preplan information | |
| 3. In the absence of all other indicators, pump at 150 psi | |
| 4. It may be necessary to increase water supply if the fire is still spreading | |
| C. FDC check valve is open | |
| D. Connect hoselines to all inlets of FDC | What is the correct number of hoses to connect to the FDC? |
| 1. One or more siamese connections | |
SUMMARY:

The most common type of sprinkler system is the wet-pipe system. It is fully charged with water at all times. Valves such as the OS&Y, PIV, main drain, and FDC check must be in the proper position for the system to operate. Fire department pumpers may assist systems by connecting supply lines to all the FDC inlets.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF DRY-PIPE AND PRE-ACTION SPRINKLER SYSTEMS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of dry-pipe and pre-action sprinkler systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sprinkler system mock up or diagram
- Sprinkler heads for examination

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: Automatic sprinkler systems are recognized as the most reliable of all fire protection devices. During this lesson, the fire fighter will be given a basic knowledge of dry-pipe and pre-action sprinkler systems operation. Fire fighters need to be able to turn on and off systems for property conservation and protection.
# Characteristics And Functions Of Dry-Pipe And Pre-Action Sprinkler Systems

## I. MODE OF OPERATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Does not contain water in riser, cross mains, branch lines, or head</td>
</tr>
<tr>
<td>B.</td>
<td>System contains air under pressure</td>
</tr>
<tr>
<td>C.</td>
<td>When sprinkler head fuses, the air pressure will escape and the dry-pipe valve automatically opens allowing water to discharge onto fire</td>
</tr>
<tr>
<td>D.</td>
<td>Dry sprinklers are used mainly in cold weather locations</td>
</tr>
<tr>
<td></td>
<td>1. Outside, cold storage, unheated areas, anywhere where freezing may occur</td>
</tr>
</tbody>
</table>

**APPLICATION**

Would you find water or air in the riser of a dry-sprinkler system?

Where would you use a dry-pipe system?

## II. DRY-PIPE SPRINKLER COMPONENTS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Dry-pipe valve</td>
</tr>
<tr>
<td></td>
<td>1. Keeps water out of the sprinkler system piping until a fire fuses a head</td>
</tr>
<tr>
<td></td>
<td>2. Designed to hold water out of the sprinkler system by holding back the water with a small amount of air</td>
</tr>
<tr>
<td>B.</td>
<td>Alarm signaling device</td>
</tr>
<tr>
<td></td>
<td>1. Hydraulic</td>
</tr>
<tr>
<td></td>
<td>2. Electric</td>
</tr>
<tr>
<td>C.</td>
<td>Air supply</td>
</tr>
<tr>
<td></td>
<td>1. Plant or in-house air supply system</td>
</tr>
<tr>
<td></td>
<td>2. Compressor and tank used exclusively for the sprinkler system</td>
</tr>
<tr>
<td></td>
<td>3. Usually 15-50 psi needed</td>
</tr>
<tr>
<td></td>
<td>4. Has a gauge which measures air pressure</td>
</tr>
</tbody>
</table>
D. Accelerator and exhauster
1. Needed in large systems to prevent loss of several minutes while water moves to open sprinkler heads
2. Required in systems over 500 gallons

What is the difference between an accelerator and an exhauster?

3. Accelerator
   a) Unbalances the differential in the dry-pipe valve allowing it to open rapidly

4. Exhauster
   a) Activates when loss of pressure occurs in the dry system and discharges air in system to outside atmosphere

E. Sprinkler heads
1. Same as wet system

Why do dry systems have the heads mounted upright instead of below the pipe?

2. Heads are mounted upright to prevent condensation from freezing the head

III. OPERATION OF SYSTEM
A. When sprinkler opens air rushes out of open heads
B. Dry-pipe valve trips due to loss of air pressure above the valve
   1. Accelerator or exhauster may help remove the air
IV. PRE-ACTION SYSTEMS

A. A dry system which employs a deluge type valve, fire detection devices, and closed sprinkler heads

1. This system will only discharge water into the sprinkler piping in response to the detection system
2. A break in the pipes will not cause water to flow unless the electronic detection system has also actuated

B. Used where it is important that water damage be minimized

V. SYSTEM SHUT DOWN

A. Turn off main water control valve
B. Open main drain
C. Shut off air supply for system
D. Drain any low points of system including alarm lines as needed
E. Notify owner of need to restore system to operation

C. Water pressure in the riser pushes open the clapper assembly and locks it in the open position

D. As water enters the upper chamber of the dry-pipe valve the drip check valve is closed and the water flows into the alarm line, activating the alarm

E. Water then flows to the open head

What opens the clapper assembly when a head opens?

When does water flow to the heads of a pre-action system?
SUMMARY:

Automatic fire sprinklers are one of the most reliable fire protection devices available today. One of the types of automatic sprinklers is the dry pipe system. A valve in the riser holds water back from the system, keeping the branch lines and cross mains dry. When a sprinkler head activates, the system fills with water and the fire is extinguished.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read *Essentials of Fire Fighting*, IFSTA, Fourth Edition, Chapter 15 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF DELUGE SPRINKLER SYSTEMS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of deluge sprinkler systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sprinkler system mock up or diagram
- Sprinkler heads for examination

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: The deluge sprinkler system is a special type of sprinkler system that is used in especially hazardous locations. The firefighter needs to know how and why this system operates.
# Characteristics And Functions Of Deluge Sprinkler Systems

## I. INTRODUCTION

A. All sprinkler heads are open at all times

B. Deluge valve holds water out of system until activation

C. Used in high hazard areas where a rapidly progressing fire could be expected
   1. Aircraft hangers
   2. Chemical plants
   3. Explosive magazines

D. Often includes foam and additive system

E. Requires some type of detector action
   1. Heat
   2. Smoke
   3. Rate of rise
   4. Light IR/UV

## II. ACTIVATION

A. Detector sends signal to deluge valve

B. Valve opens

C. Water flows into piping

D. Manual activation or cross zone activation may also be required

---

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>How is the water kept from coming out of the heads until needed?</td>
</tr>
<tr>
<td>A. All sprinkler heads are open at all times</td>
<td>Where would this type of system be used?</td>
</tr>
<tr>
<td>B. Deluge valve holds water out of system until activation</td>
<td></td>
</tr>
<tr>
<td>C. Used in high hazard areas where a rapidly progressing fire could be expected</td>
<td></td>
</tr>
<tr>
<td>1. Aircraft hangers</td>
<td></td>
</tr>
<tr>
<td>2. Chemical plants</td>
<td></td>
</tr>
<tr>
<td>3. Explosive magazines</td>
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<tr>
<td>D. Often includes foam and additive system</td>
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</tr>
<tr>
<td>E. Requires some type of detector action</td>
<td></td>
</tr>
<tr>
<td>1. Heat</td>
<td></td>
</tr>
<tr>
<td>2. Smoke</td>
<td></td>
</tr>
<tr>
<td>3. Rate of rise</td>
<td></td>
</tr>
<tr>
<td>4. Light IR/UV</td>
<td></td>
</tr>
<tr>
<td>II. ACTIVATION</td>
<td>How is this system activated?</td>
</tr>
<tr>
<td>A. Detector sends signal to deluge valve</td>
<td></td>
</tr>
<tr>
<td>B. Valve opens</td>
<td></td>
</tr>
<tr>
<td>C. Water flows into piping</td>
<td></td>
</tr>
<tr>
<td>D. Manual activation or cross zone activation may also be required</td>
<td></td>
</tr>
</tbody>
</table>
### PRESENTATION

E. Local alarm must alert people to leave area
   1. Large volumes of water (and foam) may be dangerous
   2. Potential for reactions with chemicals in use

### APPLICATION

What special occupant protection is necessary?
SUMMARY:

The deluge sprinkler system is designed to operate in high hazard areas. The system components are similar to dry sprinkler systems but include open sprinkler heads designed to flood large areas and a deluge valve. A detector activates the system that may include foam along with the water. A manual or cross zone activation along with local alarm is also part of the system.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF RESIDENTIAL SPRINKLER SYSTEMS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of residential sprinkler systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the NFPA Standard #13D, NFPA, 1999 Edition

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Sprinkler system mock up or diagram
- Sprinkler heads for examination

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- NFPA Standard #13D, NFPA, 1999 Edition
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: Automatic sprinkler systems are recognized as the most reliable of all fire protection devices. During this lesson, the fire fighter will be given a basic knowledge of residential sprinkler systems and components of their operation.
I. RESIDENTIAL SYSTEM
   A. Integrated system of piping connected to a water supply with approved sprinkler heads that will automatically discharge water over fire areas
      1. Designed for use in residential occupancy only
      2. One or two family maximum
   B. Designed primarily for life safety

   C. Components
      1. Control valve
         a) Single valve controls both domestic water system and sprinkler system
         b) Separate valve for each system
      2. Pressure gauge
      3. Piping
         a) Variety of material allowed by NFPA Standard #13D
         b) Local requirements may be more stringent

   4. Sprinkler heads
      a) Only sprinkler heads rated for residential sprinkler systems are allowed

   5. Check valves
      a) To prevent backflow
b) Separates the protection system from domestic water system

D. Types of systems
   1. Wet-pipe system
      a) Same operation as a standard wet-pipe system
      b) Use only in areas where freezing is not a problem
      c) Systems may contain antifreeze in cold zones
   2. Dry-pipe system
      a) Same operations as a standard dry-pipe system
      b) Used in areas that are subject to freezing

II. DIFFERENCES BETWEEN STANDARD SYSTEMS AND RESIDENTIAL SYSTEMS
   A. Residential sprinkler heads required
   B. No fire department connection
   C. Allows the use of approved plastic pipe

What are the differences between standard sprinkler systems and residential sprinkler systems?
SUMMARY:

A residential sprinkler system is a special system designed for use in single and two family dwellings. While many of the components and operations are the same as all automatic sprinkler systems. There are important differences such as the type of pipe used, and the reaction time of the sprinkler heads. Residential sprinklers are designed to keep a fire from growing, giving occupants time to escape.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read NFPA Standard #13D, NFPA, 1999 Edition in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF STANDPIPE SYSTEMS

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 4-5.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the characteristics and functions of standpipe systems by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Inspection and Code Enforcement*, IFSTA, Sixth Edition, Chapter 7 and *Private Fire Protection and Detection*, IFSTA, Second Edition, Chapter 2

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Examples of each class of system (drawings, overheads, slides, etc.)

**REFERENCES:**

**PREPARATION:**

Standpipe systems are placed in buildings for the purpose of providing water for hose streams close to the seat of the fire and for avoiding a possible delay in laying hoselines from outside sources. Standpipes are provided with outlets on each floor of an occupancy and may or may not be equipped with hose.
I. DESIGN

A. Fire department hoseline outlets installed on different levels of a building

B. To provide a quick and convenient means for operating fire streams on all stories of buildings and in adjacent buildings

C. May be used by fire fighters, occupants, or both

D. Dependent on adequate supply of water to be effective

   1. In both volume and pressure

E. Fire department connection (FDC)

   1. One or more siamese connections through which an engine company can pump water into the standpipe system

   2. Required for Class I and III standpipe systems

II. CLASSIFICATIONS

A. Class I

   1. For fire department use only and those trained in handling heavy hose streams (e.g., fire brigades)

   2. Water supply will be a minimum of 500 gpm for at least 30 minutes

   3. Residual pressure of 65 psi must be maintained at the topmost outlet with 500 gpm flowing

For what purpose is a Class I standpipe system designed?
4. When more than one standpipe is used, the minimum supply shall be 500 gpm for each additional standpipe for 30 minutes.

5. System must be capable of furnishing effective fire streams during more advanced stages of fire fighting.

6. Class I standpipes are supplied with 2½" connections.

B. Class II
1. For use by the building occupants until the arrival of the fire department.
2. Water supply will be a minimum 100 gpm for at least 30 minutes.
3. Residual pressure 65 psi must be maintained at the topmost outlet with 100 gpm flowing.
4. No time limits.
5. This system is supplied with a 1½" hose.

C. Class III
1. For use by fire department personnel and by the building occupants.
2. Minimum water supply and residual pressure will be the same as a Class I system.
3. System is supplied with 1½" hose and 2½" connections.
III. TYPES OF STANDPIPE SYSTEMS

A. Wet
   1. Water supplied at all times
   2. Operates when wall globe valve is opened

What type of standpipe is used in cold weather climates?

B. Dry
   1. Supplied water from FDC only
   2. Manual (switch) activation
   3. Automatic
      a) Air charged
      b) Used in cold climates
   4. Primed systems

Why do high-rise buildings need multiple zones?

C. Zoned
   1. Usually wet systems
   2. Multiple FDCs for different high-rise floors or large building areas
   3. Designed to allow for excessive pressure loss or fire department access when heights exceed 275 feet and excessive friction loss in large warehouse type structures
SUMMARY:
Standpipes are designed to provide a fire department water source close to the seat of the fire. There are three classes of standpipes. FDCs are required for Class I and III standpipes. Systems may be wet or dry and zoned with separate FDCs for each zone.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
FIRE FIGHTER I

**TOPIC:** FIRE SERVICE SUPPORT ACTIVITIES AND SAFETY MEASURES FOR FIRE PROTECTION SYSTEMS

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-5.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the appropriate fire department support activities and safety measures to be observed when working with each type of fire protection system by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Private Fire Protection and Detection, IFSTA, Second Edition, Chapters 1, 2, 5, and 6

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Private Fire Protection and Detection, IFSTA, Second Edition

**PREPARATION:** A large variety of fire protection systems are used in industrial applications. Some of these systems require fire department support, while others do not. Firefighters must understand the proper course of action to take when these systems are encountered on the fireground.
I. SPRINKLER SYSTEMS

A. Fire department support of operating sprinkler systems is one of the highest priorities of initially arriving companies
   1. Connecting an engine to a water source
      a) Hydrant
      b) Static source
      c) Relay operation
   2. Discharging into the fire department connection
   3. Ensuring adequate discharge pressures on all open heads

B. The next concern will be to determine whether continued operation of the open heads is warranted

II. STANDPIPE SYSTEM

A. Fire departments support
   1. Connecting a pumper to the system
   2. Boosting water pressure in a wet system
   3. Energizing a dry system
   4. Producing effective fire streams through hoselines

III. CO₂ SYSTEMS

A. There are no specific fire department support activities to augment CO₂ systems

B. Safety concerns for fire department personnel are
   1. Has system discharged?
   2. Is fire extinguished?
3. Wear SCBA due to oxygen displacement

IV. HALOGENATED SYSTEMS
A. There are no specific fire department support activities to augment halogenated systems
B. Concerns for fire department personnel are

1. If system has not discharged, activate manually only if necessary to accomplish extinguishments
2. Is fire extinguished?
3. Wear SCBA
   a) Halon agents produce toxic gases when contacted by flame
4. Environmental actuation of systems contribute to ozone layer depletion

V. DRY OR WET CHEMICAL SYSTEMS
A. There are no specific fire department support activities to augment dry or wet systems

B. Concerns for fire department personnel are
   1. Has system discharged?
   2. Is fire extinguished?
   3. Disturbance of dry chemical blanket may cause rekindle

Why wear SCBA?

In any area protected by a fixed system involved in fire, what would be the proper course of action if the system has not discharged?

What are fire concerns of department personnel with dry chemical systems?
VI. **FOAM SYSTEMS**

A. There are no specific fire department support activities to augment foam systems

B. Concerns for fire department personnel are
   1. Has system discharged?
   2. Is fire extinguished?
   3. Introduction of fire streams into foam blanket to extinguish remaining fire may disrupt foam
      a) Causing increased intensity of fire
**SUMMARY:**

Private fire protection systems provide an excellent means of controlling fires before the fire department's arrival. One of the first tasks performed upon arrival on scene is to support any operating fire protection systems. Initial attack operations should be compatible with the functions of the automatic systems. Some systems, such as sprinklers and standpipes, require active support while for most other systems the correct action to take is no action at all. Many chemicals, once applied by automatic systems, are rendered ineffective when disturbed by fire department hose streams. It is important for fire fighters to understand the scene actions which are appropriate for each system.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Private Fire Protection and Detection*, IFSTA, Second Edition, Chapters 1, 2, 5 and 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO REPLACE AN AUTOMATIC SPRINKLER SYSTEM HEAD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.13

BEHAVIORAL OBJECTIVE:

Condition: An automatic sprinkler system, properly rated sprinkler head, sprinkler wrench, ladder, and appropriate personal protective equipment

Behavior: The student will replace an automatic sprinkler head

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Automatic sprinkler system
- Properly rated sprinkler head
- Sprinkler wrench
- Ladder
- Appropriate personal protective equipment

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15
- NFPA Standard #13, NFPA, 1999 Edition

PREPARATION: Automatic fire sprinkler systems are a critical tool in the reduction of life and property loss due to fire. Placing a system that has activated back in service is essential in providing protection against fire. The ability to replace sprinkler heads that have activated will expedite restoring the system.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn main control valve</td>
<td>1a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Until fully closed</td>
</tr>
<tr>
<td></td>
<td>d. Checking valve indicator</td>
</tr>
<tr>
<td>2. Turn main drain valve</td>
<td>2a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully opened</td>
</tr>
<tr>
<td></td>
<td>c. To drain all water</td>
</tr>
<tr>
<td>3. Turn sprinkler head</td>
<td>3a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. With sprinkler wrench</td>
</tr>
<tr>
<td>4. Inspect for obstructions</td>
<td>5a. On pipe</td>
</tr>
<tr>
<td>5. Clean threads</td>
<td>6a. With sprinkler wrench</td>
</tr>
<tr>
<td>6. Turn new head</td>
<td>b. Clockwise</td>
</tr>
<tr>
<td></td>
<td>c. Until tight</td>
</tr>
<tr>
<td>7. Turn inspector's test valve</td>
<td>7a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully opened</td>
</tr>
<tr>
<td>8. Turn main drain valve</td>
<td>8a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully closed</td>
</tr>
<tr>
<td>9. Turn main control valve</td>
<td>9a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully opened</td>
</tr>
<tr>
<td>10. Back off</td>
<td>10a. ¼ turn</td>
</tr>
<tr>
<td>11. Leave open</td>
<td>11a. Until all air is bled from the system</td>
</tr>
<tr>
<td>12. Turn inspector's test valve</td>
<td>12a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully closed</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>13. Inspect head</td>
<td>13a. For leaks</td>
</tr>
<tr>
<td></td>
<td>b. Tightening if leaks are found</td>
</tr>
</tbody>
</table>
**APPLICATION:**

The student will practice performing the operations in the job breakdown while under supervision.

**EVALUATION:**

The student will complete a manipulative performance test at a time determined by the instructor.

**ASSIGNMENT:**

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO OPERATE A SPRINKLER SYSTEM'S CONTROL VALVES

**TIME FRAME:** 1:00

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.13

**BEHAVIORAL OBJECTIVE:**

- **Condition:** An automatic sprinkler system and appropriate personal protective equipment
- **Behavior:** The student will open and close an automatic sprinkler system's control valves
- **Standard:** Completing all operations within ___________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Automatic sprinkler system
- Appropriate personal protective equipment

**REFERENCES:**
- Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 1

**PREPARATION:**

The automatic fire sprinkler system is one of the most reliable of all fire protection devices. After a system has operated, it is important that the fire fighter know how to operate the control valves required to place the system back in service and conduct tests to ensure system readiness.

Fire fighters should never personally operate, adjust, alter, or handle any sprinkler devices or equipment other than at emergencies or planned training sessions.

If the equipment is electronically supervised, notify the alarm monitoring company and/or dispatch before operating any control valves.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OUTSIDE SCREW &amp; YOKE (OS&amp;Y)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Remove security chain and lock</td>
<td>1a. From both wheels</td>
</tr>
<tr>
<td>2. Turn OS&amp;Y valve</td>
<td>2a. Clockwise</td>
</tr>
<tr>
<td>b. Until fully closed</td>
<td>c. Stem will be flush with wheel</td>
</tr>
<tr>
<td>3. Turn OS&amp;Y valve</td>
<td>3a. Counterclockwise</td>
</tr>
<tr>
<td>b. Until fully opened</td>
<td></td>
</tr>
<tr>
<td>4. Back off OS&amp;Y valve</td>
<td>4a. Clockwise</td>
</tr>
<tr>
<td>b. ¼ turn</td>
<td></td>
</tr>
<tr>
<td><strong>POST INDICATOR VALVE (PIV)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Unlock PIV wrench</td>
<td>1a. From PIV body</td>
</tr>
<tr>
<td>2. Place wrench</td>
<td>2a. On stem nut</td>
</tr>
<tr>
<td>3. Turn PIV valve</td>
<td>3a. Clockwise</td>
</tr>
<tr>
<td>b. Slowly</td>
<td>c. Until fully closed</td>
</tr>
<tr>
<td>4. Inspect target window</td>
<td>4a. Should indicate closed or shut on post</td>
</tr>
<tr>
<td>5. Turn PIV valve</td>
<td>5a. Counterclockwise</td>
</tr>
<tr>
<td>b. Until fully opened</td>
<td></td>
</tr>
<tr>
<td>b. ¼ turn</td>
<td></td>
</tr>
<tr>
<td>7. Inspect target window</td>
<td>7a. Should indicate open</td>
</tr>
<tr>
<td>8. Replace and lock wrench</td>
<td>8a. On PIV body</td>
</tr>
</tbody>
</table>
## POST INDICATOR VALVE ASSEMBLY (PIVA)

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn butterfly valve</td>
<td>1a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Slowly</td>
</tr>
<tr>
<td></td>
<td>c. Until fully closed</td>
</tr>
<tr>
<td>2. Turn butterfly valve</td>
<td>2a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully opened</td>
</tr>
<tr>
<td>3. Turn main drain valve</td>
<td>3a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully opened</td>
</tr>
<tr>
<td></td>
<td>c. Alarm should sound</td>
</tr>
<tr>
<td></td>
<td>d. Protecting landscape to prevent water damage</td>
</tr>
<tr>
<td>4. Turn main drain valve</td>
<td>4a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully closed</td>
</tr>
<tr>
<td>5. Turn the inspector's test valve</td>
<td>5a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully opened</td>
</tr>
<tr>
<td></td>
<td>c. Alarm should sound</td>
</tr>
<tr>
<td>6. Turn the inspector's test valve</td>
<td>6a. Clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until fully closed</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** HOW TO CONNECT A HOSELINE TO SUPPORT WET AND DRY STANDPIPES

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** SBFS

**BEHAVIORAL OBJECTIVE:**

*Condition:* A hoseline, standpipe with fire department connection, and appropriate personal protective equipment

*Behavior:* The student will connect a hoseline to support wet and dry standpipes

*Standard:* Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Two lengths of 2½" hoseline
- Standpipe with fire department connection
- Appropriate personal protective equipment

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15

**PREPARATION:** Standpipes, whether wet or dry, are a means of supplying water to floors both above and below ground. To take advantage of this labor saving device, it is necessary to know how to connect the hoselines that will supply or support the standpipe system.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stretch hoseline</td>
<td>1a. To standpipe connection</td>
</tr>
<tr>
<td></td>
<td>b. Male thread required</td>
</tr>
<tr>
<td></td>
<td>c. Double males if necessary</td>
</tr>
<tr>
<td></td>
<td>d. Adjustable spanner</td>
</tr>
<tr>
<td>2. Lay hoseline down</td>
<td>2a. Gently</td>
</tr>
<tr>
<td>3. Fold hoseline back</td>
<td>3a. So coupling does not hit pavement</td>
</tr>
<tr>
<td>4. Remove caps</td>
<td>4a. From fire department connection</td>
</tr>
<tr>
<td>5. Inspect fire department connection</td>
<td>5a. For debris</td>
</tr>
<tr>
<td></td>
<td>b. Checking threads and gaskets</td>
</tr>
<tr>
<td>6. Align hoseline</td>
<td>6a. To fire department connection</td>
</tr>
<tr>
<td></td>
<td>b. Center or lowest fitting first</td>
</tr>
<tr>
<td>7. Turn female side of coupling</td>
<td>7a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until tight</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO CONNECT A HOSELINE TO SUPPORT A SPRINKLER SYSTEM

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: Two hoselines, sprinkler system with fire department connection, and appropriate personal protective equipment

Behavior: The student will connect a hoseline to support a sprinkler system

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Two lengths of 2½" hoseline
- Sprinkler system with fire department connection
- Appropriate personal protective equipment

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15

PREPARATION: The most effective way for the fire department to handle what could become a serious fire loss and, more important, the loss of life, is to give proper support to the sprinkler system. Attaching to the fire department siamese connection with 2½" or 3" hoselines and supplying them with adequate water and pressure provides this support. The siamese connection is considered a secondary source of supply. Fire fighters should not use private on-site hydrants to supply a sprinkler system as this could deplete water supply to the system.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stretch hoseline</td>
<td>1a. To sprinkler connection</td>
</tr>
<tr>
<td></td>
<td>b. Male thread required</td>
</tr>
<tr>
<td></td>
<td>c. Double males if necessary</td>
</tr>
<tr>
<td></td>
<td>d. Adjustable spanner</td>
</tr>
<tr>
<td>2. Lay hoseline down</td>
<td>2a. Gently</td>
</tr>
<tr>
<td>3. Fold hoseline back</td>
<td>3a. So coupling does not hit pavement</td>
</tr>
<tr>
<td>4. Remove caps</td>
<td>4a. From fire department connection</td>
</tr>
<tr>
<td>5. Inspect fire department connection</td>
<td>5a. For debris</td>
</tr>
<tr>
<td></td>
<td>b. Checking threads and gaskets</td>
</tr>
<tr>
<td>6. Align hoseline</td>
<td>6a. With fire department connection</td>
</tr>
<tr>
<td></td>
<td>b. Center or lowest fitting first</td>
</tr>
<tr>
<td>7. Turn female side of coupling</td>
<td>7a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Until tight</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: PRINCIPLES OF AUTOMATIC DRY CHEMICAL SYSTEMS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of automatic dry chemical systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: Private fire protection systems provide an excellent means of controlling fires before the fire department's arrival. One of the first tasks performed upon arrival on-scene is to support any operating fire protection system. Initial attack operations should be compatible with the products released by dry chemical fixed systems. Without an understanding of these systems, it is likely that incorrect actions may occur.
I. DRY CHEMICAL SYSTEMS

A. Advantages
   1. Fast knockdown and extinguishment capability
   2. Nontoxic qualities
   3. Chemical is nonconductive

B. Disadvantages
   1. Dry chemical compounds cannot be mixed (BC/ABC)
   2. Chemical residue may cause problems
      a) Clean-up
      b) Electrical contacts
   3. Application of chemical causes a brief flare-up when flame contact is made
   4. Not effective on vegetable oils

C. Common applications
   1. Quenching operations
   2. Dip tanks
   3. Paint spray booths
   4. Kitchen cooking areas
   5. Exhaust duct systems

D. Two main types
   1. Local application
      a) Most common
      b) Frequently seen in food preparation areas
   2. Total Flooding

What are some of the advantages of dry chemical systems?

What are some of the common applications?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. System design</td>
<td></td>
</tr>
<tr>
<td>1. Engineered</td>
<td></td>
</tr>
<tr>
<td>a) For a specific site</td>
<td></td>
</tr>
<tr>
<td>2. Pre-engineered</td>
<td></td>
</tr>
<tr>
<td>a) For general uses</td>
<td></td>
</tr>
<tr>
<td>F. Components</td>
<td></td>
</tr>
<tr>
<td>1. Storage tank(s)</td>
<td></td>
</tr>
<tr>
<td>a) For expellant gas and agents</td>
<td></td>
</tr>
<tr>
<td>b) May be separate</td>
<td></td>
</tr>
<tr>
<td>2. Piping</td>
<td></td>
</tr>
<tr>
<td>a) To carry the gas and agent</td>
<td></td>
</tr>
<tr>
<td>3. Nozzle(s)</td>
<td></td>
</tr>
<tr>
<td>a) To disperse the agent</td>
<td></td>
</tr>
<tr>
<td>4. Actuating mechanism</td>
<td></td>
</tr>
<tr>
<td>5. Chemical extinguishing agent</td>
<td></td>
</tr>
<tr>
<td>G. Activation</td>
<td></td>
</tr>
<tr>
<td>1. Thermal fusible link(s) in ductwork above protected appliance</td>
<td></td>
</tr>
<tr>
<td>2. Manual pull station(s)</td>
<td></td>
</tr>
<tr>
<td>H. Auxiliary control circuits</td>
<td></td>
</tr>
<tr>
<td>1. Gas/electric shut-off to appliance(s)</td>
<td></td>
</tr>
<tr>
<td>2. Fire alarm activation</td>
<td></td>
</tr>
<tr>
<td>3. HVAC controls for fire condition</td>
<td></td>
</tr>
<tr>
<td>I. General field inspection criteria</td>
<td></td>
</tr>
<tr>
<td>1. Presence of mechanical damage</td>
<td></td>
</tr>
<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>2. Aim of nozzles</td>
<td></td>
</tr>
<tr>
<td>3. Change in hazard being protected</td>
<td></td>
</tr>
<tr>
<td>4. Proper pressure on storage container</td>
<td></td>
</tr>
<tr>
<td>a) Not applicable for gas cartridges</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

Dry chemical systems offer quick knockdown without toxicity and are non-conductive. System residues may cause damage to electrical devices. Local application systems are the most common and are frequently seen in food preparation areas. Systems may be activated manually or automatically and may shut down gas or electrical supplies to appliances. Field inspections generally focus on mechanical damage, proper nozzle aim, change in hazards, and pressure gauge check (if applicable).

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF AUTOMATIC WET CHEMICAL SYSTEMS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of automatic wet chemical systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: Private fire protection systems provide an excellent means of controlling fires before the fire department's arrival. One of the first tasks performed upon arrival on-scene is to support any operating fire protection system. Initial attack operations should be compatible with the products released by wet chemical fixed systems. Without an understanding of these systems, it is likely that incorrect actions may occur.
# AUTOMATIC WET CHEMICAL SYSTEMS

## A. Application
1. Commercial cooking hoods
2. Ducts
3. Plenums
4. Cooking appliances

## B. Advantages
1. Effective on both vegetable oils and animal fats
2. Effective on Class A combustibles
3. Easily serviced

## C. Disadvantages
1. Messy
2. Slip and fall hazards after application

## D. Chemical composition
1. Potassium carbonate and water
2. Potassium acetate and water

## E. Suppression action
1. Soap formed which smothers grease/oils
2. Cooling and quenching action on Class A

## F. Components
1. Storage tank(s)
   a) For expellant and chemical

---

**What are some advantages of wet chemical systems?**

**What kinds of chemicals are used in a wet chemical system?**
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Piping</td>
<td></td>
</tr>
<tr>
<td>a) To carry agent</td>
<td></td>
</tr>
<tr>
<td>3. Nozzle(s)</td>
<td></td>
</tr>
<tr>
<td>a) To apply the agent</td>
<td></td>
</tr>
<tr>
<td>4. Actuating mechanism</td>
<td></td>
</tr>
<tr>
<td>5. Chemical agent</td>
<td></td>
</tr>
<tr>
<td>G. Activation</td>
<td></td>
</tr>
<tr>
<td>1. Thermal fusible link in ductwork</td>
<td></td>
</tr>
<tr>
<td>2. Manual pull stations</td>
<td></td>
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<td>H. Auxiliary control circuits</td>
<td></td>
</tr>
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<td>1. Gas/electricity shut-off to appliance(s)</td>
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</tr>
<tr>
<td>2. Fire alarm activation</td>
<td></td>
</tr>
<tr>
<td>3. HVAC controls</td>
<td></td>
</tr>
<tr>
<td>I. General field inspection criteria</td>
<td></td>
</tr>
<tr>
<td>1. Presence of mechanical damage</td>
<td></td>
</tr>
<tr>
<td>2. Aim of discharge nozzles</td>
<td></td>
</tr>
<tr>
<td>3. Change in hazard being protected</td>
<td></td>
</tr>
<tr>
<td>4. Proper pressure on storage container</td>
<td></td>
</tr>
<tr>
<td>5. Rubber nozzle caps in place</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Wet chemical systems have replaced dry chemical systems as the system of choice for food preparation areas due to their effectiveness on vegetable oil fires and common combustibles. Their components and operation are similar to dry chemical systems. Field inspections focus on mechanical damage. Two common chemicals used in these systems are potassium carbonate and potassium acetate. These chemicals are usually released by a thermal fusible link in the ductwork or manual pull stations.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF HALON SYSTEMS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge the principles of Halon systems by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: Private fire protection systems provide an excellent means of controlling fires before the fire department's arrival. One of the first tasks performed upon arrival on-scene is to support any operating fire protection systems. Although uncommon, halogen automatic fixed systems are still in use and a potential for personal injury and exaggerated property damage exits when personnel do not understand how to work safely and effectively with these systems.
### I. PRINCIPLES

#### A. Application
1. Electrical and electronic applications
2. Telecommunications facilities
3. Flammable liquids and gases
4. High value assets
5. Some explosion suppression systems

#### B. Advantages
1. Leaves no chemical residue
2. Not damaging to sensitive electronic equipment
3. Nonconducting

#### C. Disadvantages
1. No longer manufactured
2. Damaging to the earth's protective ozone layer
3. Product (if available) is extremely expensive
4. Toxic byproducts released during combustion
5. Systemic toxic effects above 7% (Halon 1301)

#### D. Chemical composition
1. Halon 104
   a) Carbon tetrachloride
2. Halon 1011
   a) Bromochloromethane

---

<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where would a Halon system work?</td>
</tr>
<tr>
<td>Where are some disadvantages to Halon?</td>
</tr>
<tr>
<td>What chemicals make up Halon gas?</td>
</tr>
</tbody>
</table>
3. Halon 1211
   a) Bromochlorodifluoromethane
4. Halon 1202
   a) Dibromodifluoromethane
5. Halon 1301
   a) Bromotrifluoromethane
   b) Most common
6. Halon 2402
   a) Dibromotetrafluoroethane

E. Montreal protocol
   1. Signed in 1987
   2. 24 countries participated
   3. Prohibits the production of new Halon and Freon
   4. Original stop date advanced to January 1994
   5. More countries now participate

F. Suppression action
   1. Chemically dynamic process
   2. Inhibits the combustion reaction
   3. Byproducts of combustion (above 900°F)
      a) Chlorine gas
      b) Bromine gas
      c) Hydrogen chloride
      d) Hydrogen bromide
      e) Phosgene

How does Halon work?
What are the components of a Halon system?

G. Components
1. Storage tank
   a) 5-600 pounds
2. Nitrogen
   a) Used for super pressurization
3. Distribution piping
   a) Not always present
4. Nozzle(s)
   a) To distribute product
5. Actuating mechanism
6. Connection to detection system (activation)

H. Auxiliary control circuits
1. Early warning occupant exit alarm
2. User abort system (optional)
3. Special HVAC/door controls
4. Room ventilation system (after discharge)

I. General field inspection criteria
1. Presence of mechanical damage
2. Discharge nozzle path clear of obstructions
3. Proper Halon amount in system
   a)Verified by weight of cylinder
   b)Verified by Halon level in cylinder
4. Pressure gauge check
5. Supervision panel error messages
6. Test activation
   a) With solenoids disabled
**SUMMARY:**

Halon fixed systems are widely used to protect sensitive electronic equipment. Halon is nonconductive and leaves no residue. It is toxic in high concentrations and produces many toxic byproducts when contacted by direct flame. Damaging to the earth's ozone level, its production has been banned by 24 countries. Systems are generally serviced by specialized fire protection firms. Fire department inspections are generally limited to checking for obvious damage, current service tag, proper gauge pressure, and presence of error messages on the control status panel.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF CLEAN AGENT AND HALON REPLACEMENT SYSTEMS

**TIME FRAME:** 0:15

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-5.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the characteristics and functions of clean agent and halon replacement systems by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Design of Special Hazard and Fire Alarm Systems, Delmar, 2000 Edition, Chapter 6

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

**PREPARATION:** Private fire protection systems provide an excellent means of controlling fires before the fire department's arrival. Although uncommon, halogen replacement systems and clean agent systems, when present, pose serious health and safety risk to responding fire fighters. A clear understanding of how these systems function will minimize risks to fire fighters.
I. HISTORY
   A. In 1991, the NFPA Technical Committee on Alternative Protection Options for Halon was formed
      1. Researched the options available for Halon 1301 replacement design
      2. Challenge was to find agents possessing extinguishing capabilities of Halon without the environmental concerns
   B. NFPA Standard #2001 was published in 1994
      1. Standard on Clean Agent Fire Extinguishing Systems

II. CHARACTERISTICS
   A. Clean agent defined
      1. Electrically nonconducting, volatile, or gaseous fire extinguishant that does not leave a residue upon evaporation
      2. Must have no known effect on the ozone layer
      3. Must have no known effect on human survival within an enclosure protected by the clean agent
      4. It must be effective when used under the No Observed Adverse Effect Level (NOAEL)

   B. Advantages
      1. Leave no chemical residue
      2. Not damaging to sensitive electronic equipment
      3. Nonconducting
### C. Disadvantages

1. Could be ruled noncompliant with NOAEL by EPA in the future
2. Toxic byproducts released during combustion.
3. Toxic effects above recommended concentrations

### D. Two classifications

1. Halocarbon agents
   - a) Hydrofluorocarbons (HFCs)
   - b) Hydrochlorofluorocarbons (HCFCs)
   - c) Perfluorocarbons (PFCs)
   - d) EPA is investigating certain halocarbons and may rule that some fail to qualify as a NOAEL agent

2. Inert gas agents
   - a) Contain one or more of the following gases mixed with nitrogen or carbon dioxide
      1) Helium
      2) Neon
      3) Argon
   - b) Approximately the same density as air
      1) Mix better
      2) Display less settling to the floor

3. Flammable liquids and gases
4. High value assets

<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLICATION</td>
</tr>
</tbody>
</table>

What are the disadvantages?
III. FUNCTION

A. Use
   1. Electrical and electronic applications
   2. Telecommunications facilities

B. Suppression action
   1. Halocarbon agents
      a) Stored as a liquid
      b) Distributed to the hazard as a gas
      c) Extinguishes the fire by chemical and physical mechanisms
         1) As opposed to oxygen deprivation
   2. Inert gas agents
      a) Contain one or more inert gases mixed with nitrogen or carbon dioxide
      b) Lower the oxygen concentration in a room to a level below 15% (from 21%)
         1) Cannot sustain combustion

IV. SYSTEM DESIGN

A. Components
   1. Storage tanks
   2. Nitrogen pressurization system
      a) Halocarbon only
   3. Distribution piping, if required
   4. Distribution nozzles
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Actuating mechanism</td>
<td></td>
</tr>
<tr>
<td>6. Detection system for activation</td>
<td></td>
</tr>
<tr>
<td>B. Auxiliary control circuits</td>
<td></td>
</tr>
<tr>
<td>1. Early warning occupant exit alarm</td>
<td></td>
</tr>
<tr>
<td>2. User abort system (optional)</td>
<td></td>
</tr>
<tr>
<td>3. Special HVAC/door controls</td>
<td></td>
</tr>
<tr>
<td>4. Room ventilation system</td>
<td></td>
</tr>
<tr>
<td>a) After discharge</td>
<td></td>
</tr>
<tr>
<td>C. General field inspection criteria</td>
<td></td>
</tr>
<tr>
<td>1. Presence of mechanical damage</td>
<td></td>
</tr>
<tr>
<td>2. Discharge nozzle path clear of obstructions</td>
<td></td>
</tr>
<tr>
<td>3. Proper amount of gas/chemical in system</td>
<td></td>
</tr>
<tr>
<td>4. Pressure gauge check</td>
<td></td>
</tr>
<tr>
<td>a) Halocarbon only</td>
<td></td>
</tr>
<tr>
<td>5. Supervision panel display error messages</td>
<td></td>
</tr>
<tr>
<td>6. Test activation with solenoids disabled</td>
<td></td>
</tr>
</tbody>
</table>
**SUMMARY:**

Clean agent and Halon replacement systems are rapidly replacing existing Halon systems. While not currently thought to be environmentally damaging, these chemical compounds are still toxic in high concentration and generate highly toxic products during flame contact. As with Halon, service is provided by specialized firms because fire department inspections are superficial, covering visual checks of installed components and supervision status displays only.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Design of Special Hazard and Fire Alarm Systems*, Delmar, 2000 Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF AUTOMATIC FOAM SYSTEMS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of automatic foam systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION:
Private fire protection systems such as automatic foam systems are effective fire fighting tools. Some require fire department water or foam supply lines to operate. Others operate entirely self-contained and activate automatically. It is important to understand the differences between the systems to effectively support their operation.
What is an automatic foam system?

I. AUTOMATIC FOAM SYSTEMS
A. Preplumbed piping and delivery systems using various types of foam to extinguish fires
B. Used on tank farms, aircraft hangers, fuel loading racks, and similar special hazards

II. TYPES OF FOAM SYSTEMS
A. Self-contained systems
   1. Includes all ingredients and equipment
   2. Premixed solution supply tank under pressure
   3. Often found on airport fire apparatus

B. Fixed foam systems
   1. Permanently mounted self-contained extinguishing systems
   2. Fully automatic activation and operation
   3. Often supplied from a central foam station
   4. No fire department support needed

C. Semi-fixed systems
   1. Type A
      a) Petroleum storage tanks
      b) Distribution piping permanently mounted on storage tanks or hazards
      c) Mobile foam unit (fire truck) moved to scene to supply foam

What is a fixed foam system?

What are the two types of semi-fixed systems?
2. Type B
   a) Foam piped to foam hydrants throughout a facility
   b) Manually applied to burning fuel source by fire department hoselines

What are the high-expansion foam systems types?

D. High-expansion foam systems
   1. May be local application or total flooding
   2. Automatic detection or manual activation
   3. Includes foam generator, piping, and concentrate storage tank

E. Foam/water systems
   1. Deluge sprinkler system
      a) Foam solution injected into system
      b) Will continue to operate with plain water only if foam tank becomes empty
      c) Uses special aerating sprinklers

What are some special foam applications?

F. Special applications
   1. Also known as low-expansion foams
   2. Tank farms
      a) Gentle surface application
         1) Type I outlet
      b) Subsurface application
         1) Type II outlet
      c) Catenary or floating roof systems
         1) Foam walls
d) Dike protection
   1) Overflow containment

3. Aircraft hangers
   a) Group I and II NFPA Standard #409
   b) Foam protection installed at roof standard sprinkler system
      1) Okay for Group II
   c) Underwing foam protection required
   d) Provided by water oscillating monitors

4. Fuel truck loading racks
   a) Roof mounted foam water sprinklers
   b) Foam nozzles at point of connection
   c) Foam nozzles at pump/motor/hazards
   d) Nozzles to sweep beneath the truck
SUMMARY:

There are six basic types of foam systems in operation. Some are self-contained and others require mobile fire apparatus support. Most are found at high hazard locations such as tank farms, large aircraft hangers, and fuel loading docks. Low expansion foams, high expansion foams, or foam/water systems may be used.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF AUTOMATIC CARBON DIOXIDE SYSTEMS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of automatic carbon dioxide systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials


PREPARATION: Private fire protection systems such as carbon dioxide systems provide excellent initial attack capability. However, they provide little protection after the gas dissipates and may asphyxiate persons in the area. It is important that fire department personnel understand these systems and their limitations and inherent safety hazards.
I. OPERATING PRINCIPLES

A. Common applications (NFPA Standard #12)
   1. Open top lube pits
   2. Dip tanks
   3. Marine engine protection
   4. Electrical switchgear rooms
   5. Electric transformer vaults

B. Two main types
   1. Local application
   2. Total flooding

C. Components
   1. Storage tanks
      a) High pressure
         1) 850 psi @ 70°F
      b) Low pressure
         1) 300 psi @ 0°F
   2. Piping
      a) To carry liquid/gas
   3. Nozzles
   4. Actuating mechanism/controls/exit warning alarms
   5. Carbon Dioxide
      a) In gas or liquid form

Where are CO₂ systems used?

What are the two main types of CO₂ systems?

What are the components of a CO₂ system?
### Characteristics And Functions Of Automatic Carbon Dioxide Systems

**D. Activation**
1. Electrically operated
2. Pneumatic rate of temperature rise
3. Fusible link detector
4. Manual activator

**E. Advantages (clean agent)**
1. Inert, odorless, nontoxic, and non-corrosive
2. Effective on open and closed liquid tanks
3. Leaves no residues on equipment
4. Electrical nonconductor

**F. Disadvantages**
1. Asphyxiation of persons can occur
   a) 34% design concentration
2. Tends to dissipate rapidly allowing re-ignition
3. Little effect on smoldering class A fires
4. Little cooling effect
   a) 10% as effective as water
5. Discharge noise and vapor cloud can cause panic
SUMMARY:

Carbon dioxide systems are classed as clean agent systems. Often found in use in electrical vaults, open top lube pits, and engine rooms. They operate at a design concentration of 34% posing a severe asphyxiation hazard to persons in the area. Large refrigerated storage tanks or multiple cylinder storage may be present posing additional hazards. Fire department personnel must understand these hazards to work safely.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Private Fire Protection and Detection, IFSTA, Second Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF ULTRA HIGH-SPEED EXPLOSION SUPPRESSION SYSTEMS

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-5.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the characteristics and functions of ultra high-speed explosion suppression systems by completing the written test

*Standard:* With a minimum 80% accuracy according to the information contained in the *Design of Special Hazard and Fire Alarm Systems*, Delmar, 1998 Edition, Chapter 9

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

**PREPARATION:** An understanding of ultra high-speed explosion suppression systems will raise your awareness and understanding of how and why explosions in buildings and containers occur. This knowledge will increase safety awareness when working near these types of hazards.
I. HISTORY

A. 1940s
   1. Protect British aircraft

B. 1950s
   1. First industrial use

II. DEFINITIONS

A. Explosion
   1. A rapid release of combustion energy (reaction) that can result in the eventual rupture of a vessel, container, or building

B. Detonation
   1. Reaction involving a fuel that contains its own oxidizer such as high explosive
   2. In detonations the flame front expands at a rate greater than the speed of sound
   3. Explosion suppression systems are generally ineffective in fully controlling detonation reactions

C. Deflagration
   1. Reaction involving a mixed fuel and oxidant where the flame front expands at a rate less than the speed of sound

D. Explosion isolation
   1. The automatic closing of a valve to limit the spread of the pressure rise to a predetermined area

E. Lower explosive limit (LEL)
   1. The minimum concentration of airborne combustibles required for ignition
III. COMPONENTS
   A. Cylinder(s) with suppressing agent
   B. Detection system
   C. System of control circuitry

IV. APPLICATION
   A. Aerosol fill rooms
      1. Protecting a hazard such as butane
   B. Grain hazards
      1. Grain dust explosions
   C. Dust hazards
      1. Acrylic
      2. Aluminum
      3. Cellulose
      4. Charcoal
      5. Chocolate
      6. Coal
      7. Corn
      8. Dyes
      9. Epoxies
     10. Fertilizer
     11. Food additives
     12. Herbicides
     13. Ink toner

What are the components of a high-speed suppression system?

Where are high-speed suppression systems used?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Insecticides</td>
<td></td>
</tr>
<tr>
<td>15. Milk powders</td>
<td></td>
</tr>
<tr>
<td>16. Paper</td>
<td></td>
</tr>
<tr>
<td>17. Plastic</td>
<td></td>
</tr>
<tr>
<td>18. Resin</td>
<td></td>
</tr>
<tr>
<td>19. Rubber</td>
<td></td>
</tr>
<tr>
<td>20. Sterate</td>
<td></td>
</tr>
<tr>
<td>21. Sulfur</td>
<td></td>
</tr>
<tr>
<td>22. Talc</td>
<td></td>
</tr>
<tr>
<td>23. Wood</td>
<td></td>
</tr>
<tr>
<td>24. Other airborne solids</td>
<td></td>
</tr>
</tbody>
</table>

D. Vaporous hazards
1. Acetone
2. Ethylene
3. Gasoline
4. Heptane
5. Hexane
6. Isobutene
7. Kerosene
8. Methane
9. Propane
10. Shellac
11. Toluene
12. Xylene
13. Many other flammables

E. Processes
1. Pulverizing
2. Conveying
3. Processing
### Characteristics And Functions Of Ultra High-Speed Explosion Suppression Systems

#### PRESENTATION

4. Storing

F. Other hazards protected

1. Shredders
2. Dust collectors
3. Ignitable metal
4. Wood products
5. Food processing equipment
6. Pharmaceuticals
7. Agricultural products

#### APPLICATION

How does an ultra high-speed explosion suppression system work?

#### V. SUPPRESSION ACTION SEQUENCE

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Combustible mixture ignites</td>
</tr>
<tr>
<td>B.</td>
<td>Pressure in the vessel increases as deflagration spreads</td>
</tr>
<tr>
<td>C.</td>
<td>Detector actuates and notifies control panel</td>
</tr>
<tr>
<td>D.</td>
<td>Control panel initiates agent discharge and isolation valves are closed</td>
</tr>
<tr>
<td>E.</td>
<td>Suppression system halts advancing flame front</td>
</tr>
<tr>
<td>F.</td>
<td>Deflagration is extinguished</td>
</tr>
<tr>
<td>G.</td>
<td>Suppression ceases</td>
</tr>
<tr>
<td>H.</td>
<td>Agent is replaced</td>
</tr>
<tr>
<td>I.</td>
<td>System is placed back in service</td>
</tr>
</tbody>
</table>

How does the suppression agent work?

#### VI. SUPPRESSION AGENT FUNCTION

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Absorbs the energy of the reaction</td>
</tr>
<tr>
<td>B.</td>
<td>Critical chain reactions inhibited</td>
</tr>
</tbody>
</table>
C. Concentration of air and dust modified by suppressant creates a combination that is outside of the combustible range (LEL)

VII. SPECIALLY ENGINEERED SYSTEMS
A. All systems are specifically engineered
B. NFPA Standard #69
   1. Deflagrations where over pressurization is the primary concern (vessels/structures)
   2. Dry chemical, halon, and carbonhalon agents
C. NFPA Standard #15
   1. Ultra high-speed water spray systems where enhanced suppression speed is desired, but overpressurization not a primary concern
SUMMARY:

Ultra high-speed explosion suppression systems were first developed in the 1940s for aircraft protection. Today they have evolved into sophisticated industrial applications preventing and/or limiting explosions in aerosol fill rooms, grain elevators, and processing plants. All systems are specially engineered to NFPA Standards #69 or #15.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF WATER MIST SYSTEMS

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of water mist systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Design of Special Hazard and Fire Alarm Systems, Delmar, 1998 Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

PREPARATION: Private fire protection systems, such as the water mist systems, provide an excellent means of controlling fires before the fire department arrival. Fire department personnel need to understand how these systems function in order to take actions on-scene that do not interfere with the effective operation of the system.
What is a water mist system?

I. WATER MIST SYSTEMS
   A. A water mist system is an automatic water-based fire protection system with nozzles capable of distributing water mist to a variety of hazards (NFPA Standard #750)
   B. Droplets less than 1,000 microns at 3.3 feet
   C. Water mist systems have the potential to serve as a replacement system for Halon
   D. Three classifications
      1. Class I
         a) 90% of drops less than 200 microns
      2. Class II
         a) 90% of drops less than 400 microns
      3. Class III
         a) Neither of the above but meets NFPA Standard #750
   E. System pressurization classification
      1. Low pressure
         a) 175 psi or less
      2. Intermediate pressure
         a) 176-500 psi
      3. High pressure
         a) 501 psi or more

   What are the types of water mist systems?

   F. Types of systems
      1. Deluge
      2. Wet pipe
      3. Pre-action
4. Dry pipe

G. Spray applications
   1. Local application (on a hazard)
   2. Total compartment
   3. Zoned systems

H. Performance objectives
   1. Fire extinguishment
   2. Fire suppression
      a) Heat release reduced
   3. Fire control
      a) Stop rate of spread by prewetting
   4. Temperature control
      a) Allows safe area egress
   5. Exposure protection
      a) Adjacent to fire event

I. Components
   1. Water pressurization system
      a) Pump, etc.
   2. Water distribution system
   3. Discharge nozzles
   4. Detection system

What are the components of a water mist system?
SUMMARY:

Water mist systems are micro-droplet systems with nozzles capable of distributing water mist to a variety of hazards. They can be useful for total extinguishment, for reducing heat release, slowing rate of spread, controlling temperatures for safe egress, or exposure protection. The use of micro droplets increases the water surface area available for heat absorption.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: CHARACTERISTICS AND FUNCTIONS OF AUTOMATIC ALARM INITIATING DEVICES

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-5.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of automatic alarm initiating devices by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Private Fire Protection and Detection, IFSTA, Second Edition

PREPARATION: Early fire detection is a key to keeping fires small and minimizing damage and loss of life. There are various methods of doing this automatically and it is important for the fire fighter to be familiar with these methods.
I. AUTOMATIC ALARM INITIATING DEVICES
   A. Designed to detect
      1. Heat
      2. Smoke
      3. Flame
      4. Fire-gas

II. HEAT DETECTORS
   A. Fixed temperature
      1. Characteristics
         a) Among the oldest types of detection systems
         b) Relatively inexpensive compared to other systems
         c) Least prone to false activations
         d) Slowest to activate

   2. Function
      a) Must be placed in high area of a room
      b) Should have an activation temperature rating slightly above the highest expected ceiling temperature

What are the four groups of combustion products that can activate an automatic fire detector?

What are some of the characteristics of a fixed temperature device?

Where should a fixed temperature device be located to function properly?
3. Detection
   a) Detect heat by one or more of three primary principles of physics
      1) Expansion of heated material
      2) Melting of heated material
      3) Changes in resistance of heated material
   b) Fusible devices/frangible bulbs
      1) Commonly associated with sprinkler systems
      2) Operating systems are identical
   c) Continuous line detector
      1) Can detect heat over a linear area parallel to the detector
   d) Bimetallic detector
      1) Uses two metals that have different thermal expansion characteristics
      2) When heated, one metal expands faster than the other
         - Causing the strip to arch or bend
         - This deflection either makes or breaks contact to the alarm circuit
         - The alarm signal is initiated
### Characteristics And Functions Of Automatic Alarm Initiating Devices

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B. Rate-of-rise</strong></td>
<td><strong>What is another type of heat detector?</strong></td>
</tr>
<tr>
<td>1. Characteristics</td>
<td></td>
</tr>
<tr>
<td>a) Reliable and not subject to false activations</td>
<td></td>
</tr>
<tr>
<td>1) If not properly installed, can be activated under nonfire conditions</td>
<td></td>
</tr>
<tr>
<td>b) Automatically reset if undamaged</td>
<td></td>
</tr>
<tr>
<td>2. Function</td>
<td><strong>How does a rate-of-rise device function?</strong></td>
</tr>
<tr>
<td>a) Designed to initiate a signal when the temperature exceeds 12°-15°F per minute</td>
<td></td>
</tr>
<tr>
<td>b) Can be initiated at a temperature far below that required for a fixed temperature device</td>
<td></td>
</tr>
<tr>
<td>3. Detection</td>
<td><strong>How does a rate-of-rise device detect a fire?</strong></td>
</tr>
<tr>
<td>a) Operates on the principle that the temperature in a room will increase faster from fire than from atmospheric temperature</td>
<td></td>
</tr>
<tr>
<td>b) Pneumatic rate-of-rise spot detector</td>
<td></td>
</tr>
<tr>
<td>1) Most common</td>
<td></td>
</tr>
<tr>
<td>2) Small dome-shaped air chamber with a flexible diaphragm in the base</td>
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</tr>
</tbody>
</table>
3) During a fire, the air within the chamber expands faster than it can escape
   - Pressure within the chamber increases
   - Metal diaphragm contacts the alarm circuit
   - The alarm signal is initiated

c) Pneumatic rate-of-rise line detector
   1) Can monitor larger areas
   2) System of tubing (the air chamber), contains a diaphragm, and is vented
   3) When any portion of the tubing is subjected to a rapid increase in temperature, the alarm sequence begins

d) Rate-compensated detector
   1) Used in areas that are normally subject to temperature change but at a slower rate than under fire conditions
   2) An outer metallic sleeve encases two bowed struts that have a slower expansion rate
   3) During a fire, the outer sleeve expands in length allowing the struts to contact
      - The alarm signal is initiated

e) Thermoelectric detector
   1) Two wires of dissimilar metals are twisted together
   2) Rapid changes in temperature result in larger amounts of current flowing
      - The alarm signal is initiated
III. SMOKE DETECTORS

A. Senses the presence of a fire much more quickly than does a heat detection device

B. Preferred detector in many types of occupancies
   1. Used extensively in residential settings

C. Photoelectric
   1. Sometimes called a visible products-of-combustion detector
   2. Uses a photoelectric cell coupled with a light source
   3. Detects smoke in two ways
      a) Beam application
         1) Uses a beam of light focused across the area being monitored and onto a photoelectric cell
         2) Cell converts the beam into current, which keeps a switch open
         3) When smoke obscures the path of the light beam, current is no longer produced, the switch closes, and an alarm signal is initiated
      b) Refractory application
         1) Uses a beam of light that passes through a small chamber at a point away from the light source
         2) The light does not strike the photocell and no current is produced
            • Switch remains open
3) When smoke enters the chamber, light beam is refracted (scattered) in all directions
   - Portion strikes the photocell, causing current to flow
4) Switch closes and initiates the alarm signal

4. Works satisfactorily on all types of fires
   a) Generally more sensitive to smoldering fires than are ionization detectors

5. Automatically resets when the atmosphere is clear

D. Ionization

1. Invisible products of combustion are detected
2. Uses a tiny amount of radioactive material (usually americium) to ionize air molecules as they enter a chamber within the detector
   a) Ionized particles allow an electrical current to flow between negative and positive plates within the chamber
   b) When smoke enters the chamber, the particles attach themselves to electrically charged molecules of air (ions) making the air within the chamber less conductive
   c) The decrease in current flowing between the plates initiates an alarm signal
3. Responds satisfactorily to most fires
   a) Generally responds faster to flaming fires than to smoldering ones
4. Automatically resets when the atmosphere is clear

What is another type of smoke detector?

D. Ionization
IV. FLAME DETECTORS

A. Also known as light detectors

B. Characteristics
   1. Most sensitive in detecting fires
   2. Easily activated by nonfire conditions
      a) Welding
      b) Sunlight

C. Function
   1. Must be located so they have an unobstructed view of the protected area
   2. If their line of sight is blocked, they will not operate

D. Detection
   1. All types detect the bright intensity light given off by high intensity flames
   2. Because sunlight also contains light from this spectrum, this type can only be used in areas where background light is strictly controlled

What is another name for flame detectors?

What are the three types of flame detectors?

3. Three types
   a) IR detectors
      1) Infrared wave spectrum
      2) Designed to require the flickering motion of a flame to initiate an alarm
   b) UV detectors
      1) Ultraviolet wave spectrum
      2) Virtually insensitive to sunlight
3) Can be used in areas not suitable for IR detectors

c) Combination

V. FLAME-GAS DETECTORS

A. Characteristics
   1. Only practical to monitor the levels of carbon dioxide and carbon monoxide for general fire-detection purposes
   2. Faster than heat detector
   3. Not as fast as a smoke detector

B. Function
   1. Can be more discriminating
   2. Can be designed to be sensitive only to gases produced by specific types of hostile fires
      a) Ignoring gases produced by "friendly" fires

C. Detection
   1. Uses semiconductors or catalytic elements to sense gas and trigger the alarm
SUMMARY:

Products of combustion detectors include group devices generally called fire detectors. They are designed to operate when any one of the four major groups of detectable products of combustion are present. The four major detectable products of combustion are heat, visible products, invisible products, and light. The types of products of combustion detectors are heat-detecting devices, rate of rise, photoelectric, ionization, and flame.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 15 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INSTALLATION PRACTICES FOR RESIDENTIAL SMOKE DETECTORS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the installation practices for residential smoke detectors by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 15 and 16

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: Approximately 85% of all structural deaths occur in dwellings. About three-fourths of all dwelling fires begin as smoldering fires. Over one-half begin in ordinary combustible materials. Well over half of all dwelling units in the United States now have smoke detectors installed. Unfortunately, the performance of these detectors is somewhat disappointing, primarily due to neglect and lack of maintenance on the part of the dwelling occupants.
I. CHARACTERISTICS
   A. The ideal smoke detector would
      1. Provide early warning and maximum coverage
      2. Be resistant to false alarms
      3. Be reliable
      4. Have a long, useful life
      5. Be self-supervising
      6. Require little or no maintenance
      7. Be tested easily
      8. Be easily installed and moved if necessary
      9. Be low in cost

II. LEGAL REQUIREMENTS
   A. New construction
      1. Required to be located in halls and in all bedrooms
      2. Required to be hardwired with a battery backup
      3. Should be wired together to provide for a common alarm
   B. Remodels/improvements greater than $1,000
      1. Smoke detectors in all bedrooms and hallways
      2. Must be at least battery powered
   C. Upon sale of existing homes
      1. Detectors in bedrooms and halls
      2. Battery powered

What are the legal requirements concerning smoke detectors?
III. POWER SUPPLY

A. Household current
   1. More reliable than battery
   2. Must not be controlled by a switch

B. Battery
   1. Normally 9 volt
      a) Must use type recommended by the manufacturer
   2. Advantages
      a) Easy installation
      b) Operate during power failures
   3. Failure (due to lack of battery replacement) is a real problem
      a) Should be placed twice each year
   4. Detectors chirp when battery is low

C. Combination
   1. Preferred method
   2. If a power failure should occur, residents are still protected
   3. Required in new construction

IV. PLACEMENT

A. One smoke detector in every room is the ideal
   1. Provides the fastest detection
   2. May not be economically feasible

B. Recommendation
   1. One on every level of the house
   2. One in every bedroom
3. One in the hallway outside the bedrooms
   a) Alarm must be heard when bedroom door is shut

C. Ceiling mount is preferred
   1. Not near a supply register or kitchen
   2. At least 6 inches from a wall

D. Wall mount is acceptable
   1. Between 6-12 inches down from ceiling
   2. Located away from kitchen or supply register
   3. Not within dead air space

V. MAINTENANCE
   A. In accordance with manufacturer's recommendations and directions
   B. Replace battery semiannually
      1. "Change your clock, change your battery"
   C. Test detector monthly
      1. Actual smoke preferred
      2. Test button acceptable
         a) But may only test the device's horn circuit
   D. Clean and free from dust
      1. Occasional vacuuming
   E. Detectors normally fail
      1. When relatively new
         a) Infant mortality of detector
      2. When old
         a) After 6-10 years of service
SUMMARY:

Residential detectors react to heat, smoke, or a combination of both. They are optional in nonliving areas but required in all new living units and upon the sale of existing dwellings. Units may be powered by household current, battery, or a combination of both. Detectors are generally installed on the ceiling or high on walls outside of sleeping areas. Maintenance is required but frequently not done by building occupants. Expected service life is 6-10 years.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapters 15 and 16 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: BASIC TECHNIQUES FOR PUBLIC EDUCATION

TIME FRAME: 3:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-5.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic instructional techniques for public education by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Firefighter's Handbook, Delmar, 2000 Edition, Chapter 21

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "If You Could See Me Now" video, Coronet MTI

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION:
As a fire fighter, you will be expected to make presentations or instruct various groups in the public sector. There is a big difference in your approach to various groups. You will also need to understand the methods and steps to making a good presentation.
NOTE: Begin the class with the following questions already written on one page of an easel pad. As you ask each question, write their responses below your answers to use for later reference.

<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE: Begin the class with the following questions already written on one page of an easel pad. As you ask each question, write their responses below your answers to use for later reference.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>I. PUBLIC FIRE EDUCATION</th>
</tr>
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<tbody>
<tr>
<td>A. Subjects covered include</td>
</tr>
<tr>
<td>1. Awareness</td>
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<tr>
<td>2. Education</td>
</tr>
<tr>
<td>3. Program</td>
</tr>
<tr>
<td>4. Fire prevention technique</td>
</tr>
<tr>
<td>5. New idea</td>
</tr>
<tr>
<td>6. Threat to suppression forces</td>
</tr>
<tr>
<td>7. Public relations tool</td>
</tr>
<tr>
<td>8. Funding method</td>
</tr>
<tr>
<td>9. Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>What is public fire education?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Everyone</td>
</tr>
<tr>
<td>2. Young</td>
</tr>
<tr>
<td>3. Old</td>
</tr>
<tr>
<td>4. Handicapped</td>
</tr>
<tr>
<td>5. Care givers</td>
</tr>
<tr>
<td>6. Parents</td>
</tr>
<tr>
<td>7. Latchkey children</td>
</tr>
<tr>
<td>8. Babysitters</td>
</tr>
<tr>
<td>9. Employees</td>
</tr>
<tr>
<td>10. Administrators</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>Who needs public fire education?</td>
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</tbody>
</table>
11. Fire fighters
12. Others

Do people need to know about public fire education?
Who is responsible for public education?

C. Who has the responsibility for public fire education?
   1. Fire department personnel
   2. Men, women, and children
   3. Fire prevention bureau
   4. City Manager
   5. Fire Chief
   6. City council

NOTE: Answers should reflect the need to make everyone knowledgeable and accountable.

Show "If You Could See Me Now" video.
How did that make you feel? What can we do?

D. The key
   1. Public fire education is the key to fire prevention

II. FIRE STATION TOURS
   A. One of the most popular tours for all ages
      1. Schools
      2. Clubs/service organizations
      3. Dignitaries
      4. Visitors from other countries
B. Safety considerations

1. Groups need to have a designated safe meeting place to watch fire apparatus leave during an emergency
2. The same safety considerations would be applied to visitors as you would expect from fire department personnel (i.e., no running, jumping or yelling)

C. Donning personal protective equipment

1. Caution should be used when allowing citizens to try on PPE
2. Provide assistance
   a) Donning turnouts
   b) Donning SCBA
3. Helmets
   a) Can be too heavy for a young person’s neck
   b) Diseases can be transferred
      1) Head lice

4. Children can trip and fall while trying to wear heavy or large personal protective equipment
   a) Contaminated turnout gear
      1) Products of combustion
      2) Carcinogens

What happens if you receive an alarm during a station tour?

Is it good practice to allow students to try on your PPE?
III. INFORMATION THE PUBLIC NEEDS TO KNOW

A. 9-1-1

1. Reasons for reporting a fire and smoke conditions immediately, along with other emergencies
   a) Prompt, effective reporting action is necessary to save lives
   b) Prompt response can minimize injury
   c) Prompt response can minimize and protect property
   d) Prompt response can mitigate the emergency in the incipient or early stage into the free burning phase
      1) Engine company's are back in service sooner
      2) Fire fighter energy levels remain high
      3) Good public relations
      4) Safety of the fire fighter

B. Procedure for reporting an emergency

1. After observing smoke or fire conditions and leaving the building
   a) Go to the nearest neighbor
   b) Use an outside telephone
   c) Use a fire alarm box

Why is the immediate report of an emergency necessary?

If you are walking along the street and see smoke coming out of a building, what should you do?
What number do you dial for an emergency?

C. Dial 9-1-1

1. When the dispatcher answers, speak slowly and clearly, "I want to report a . . . at . . ."
   a) Fire
   b) Smoke
   c) Heat
   d) Police call
   e) Medical aid

2. Give the street address and closest intersecting street, and the town

3. Then give your name and telephone number
   a) Stay on the phone until the dispatcher tells you to hang up
   b) If no telephone is available, go to the nearest fire alarm box
      1) Follow the instructions on the box
      2) Wait at the alarm box for fire fighters, so you can direct them to the fire

IV. STOP, DROP, AND ROLL

A. Many young people are burned and injured by the ignition of their clothing

1. Clothed areas cause more severe burns then burns of an unclothed area
2. Injury from clothing fires can be greatly reduced if a person can immediately stop, drop, and roll with their face covered by their hands
   a) Saves a person’s life

   b) Smothers the flames
   c) Decreases the exposure of respiratory passages to flames due to the rise of heat and flame

   d) Running increases the flames due to the increase of oxygen

What effect will the stop, drop, and roll have on flames?

Will the burns be aggravated if the child runs and fans the flame?

What other items may be used to smother the flames if immediately at hand?

B. A person can also smother the flames by rolling up in a
   1. Rug
   2. Blanket
   3. Large towel
   4. Bedspread

What types of clothing may be recommended for safety?

C. The types of clothes to wear for safety
   1. Tight fitting
   2. Denims
### Presentation

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>3.</td>
<td>Corduroys</td>
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<tr>
<td>4.</td>
<td>Jeans</td>
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<tr>
<td>5.</td>
<td>Blouses without frills</td>
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<tr>
<td>6.</td>
<td>Short sleeves</td>
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</table>

### D. Types of clothing not recommended

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<table>
<thead>
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<th></th>
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<tbody>
<tr>
<td>1.</td>
<td>Loosely woven</td>
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<tr>
<td>2.</td>
<td>Lightweight</td>
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<tr>
<td>3.</td>
<td>Fuzzy</td>
</tr>
<tr>
<td>4.</td>
<td>Frilly fabrics</td>
</tr>
<tr>
<td>5.</td>
<td>Fabrics with nap are dangerous because they admit more oxygen</td>
</tr>
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</table>

### E. Procedures

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1. Stop immediately</td>
<td></td>
</tr>
<tr>
<td>a) Wherever you are, indoors or out</td>
<td></td>
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<tr>
<td>2. Drop quickly to the ground</td>
<td></td>
</tr>
<tr>
<td>a) Cover your face with your hands to prevent flames from spreading to that area</td>
<td></td>
</tr>
<tr>
<td>3. Roll over and over to smother the flames</td>
<td></td>
</tr>
<tr>
<td>a) Do not run</td>
<td></td>
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<tr>
<td>b) If immediately at hand, roll up in a</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Rug</td>
<td></td>
</tr>
<tr>
<td>2) Blanket</td>
<td></td>
</tr>
<tr>
<td>3) Large towel</td>
<td></td>
</tr>
<tr>
<td>4) Bedspread</td>
<td></td>
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<tr>
<td>4. Cool burnt area with water</td>
<td></td>
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<tr>
<td>5. Dial 9-1-1 for help</td>
<td></td>
</tr>
</tbody>
</table>
## V. CRAWL LOW IN SMOKE

A. Most casualties in fires are caused by smoke and toxic gases
   1. 80% never see flames

B. Flames and burns are responsible for the fewest number of deaths

C. More individuals are victims of
   1. Asphyxiation
      a) Low oxygen below 15%
   2. Super heated air and gases
      a) A breathing level temperature of 300°F (146.5°C) is usually considered untenable for human occupancy
      b) Breathing of this heated air and gases can create casualties with no external burn evidence
      c) Once the atmosphere is above 1,100°F (593.3°C), collapse of the lungs is instant
   3. Toxic components of smoke
      a) Often responsible for severe deterioration of the ability to reason
      b) Severe deterioration of vision
      c) Reducing the physical mobility
      d) Carbon monoxide
      e) Carbon dioxide
      f) Hydrogen sulfide
      g) Sulfur dioxide
      h) Ammonia

---

**Why do you need to know how to crawl low in smoke?**
When do you use the "crawl low in smoke" procedure?

What is the "crawl low in smoke" procedure?

D. When there is smoke visible in a room

1. Bend your knees
2. Keep your head low
3. Crawl on your hands and knees
   a) Below dense smoke
   b) Move away from the source of smoke and fire
   c) Like a baby not a snake
4. Try to cover your mouth and nose with a cloth
   a) Breathe intermittently through your nose
   b) Stay as low to the ground as possible, the lower the head is to the ground, the cooler and fresher the air
5. Crawl to your destination
   a) Hallways and stairways are the most dangerous routes to travel
   b) Do not use elevators
6. If there is too much smoke to see the door, a person should crawl along the wall until the door or window is reached

VI. SMOKE DETECTORS

A. Significant facts on the value of smoke detectors
   1. Over 90% of the nation's building fire deaths occur in residential buildings

What are some facts about smoke detectors?
### Types of smoke detectors

#### Ionization
- Ionizes air creating energy beam
- Smoke enters and intercepts beam, sounds alarm

#### Photoelectric detectors
- Uses a light source and light sensitive cell in a darkened chamber
- The light source produces a light beam
- When smoke enters the darkened chamber it reflects the light beam into the light sensitive cells
- Setting off the alarm

### NOTE:
Site any recent examples of any events within your department.

What types of smoke detectors are there?
4. Different types of units
   a) Battery units
   b) Electric plug-in units
   c) Electric wired-in units
   d) AC/DC units

C. Reasons for installing smoke detectors
   1. Helps home's occupant by giving early warning so they escape
   2. Earlier discovered fires result in less property damages
   3. Two very important ways smoke detectors can help the fire department
      a) The alarm can warn of fire while it is still small, making extinguishments easier
      b) When the dwelling occupants escape from a burning home because of an early warning, the fire department does not have to make an unnecessary rescue attempt
   4. Ionization detector
      a) Makes the air within the sensing chamber conduct electricity
      b) When smoke enters the chamber, the flow of electrical current is interrupted causing the alarm to sound
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>APPLICATION</td>
</tr>
<tr>
<td>5. Best smoke detector</td>
</tr>
<tr>
<td>a) Ionization detector senses the fires that produce very small or invisible smoke particles best</td>
</tr>
<tr>
<td>b) Photoelectric detectors sense smoky, smoldering fires best</td>
</tr>
<tr>
<td>1) Those fires produce large smoke particles</td>
</tr>
<tr>
<td>c) The National Bureau of Standards has concluded that either detector, properly installed, are adequate in home fire life saving potential</td>
</tr>
</tbody>
</table>

D. Placement of smoke detectors

1. The most important location to install a smoke detector is in a hallway outside of sleeping areas
   a) Homes with more than one group of sleeping areas should install them in each area
   b) Homes with more than one floor level should have a detector on every level
   c) Providing smoke detectors for each bedroom increases protection particularly when there are smokers in the home

2. Interconnecting units
   a) Detector remote from the bedrooms may be difficult to hear

   When should interconnecting units be used?

   Which is the best smoke detector?

   Where should the smoke detectors be placed?
b) Number of interconnected detectors will depend on the resident

3. Placement
   a) Ceiling placement
      1) Near the center of the hallway or room
   b) Wall placement
      1) 6-12 inches from the ceiling in the hallway or room
   c) Areas to avoid
      1) Exterior walls and ceilings having poor insulation, extreme exterior temperatures can cause thermal barriers on the inside, preventing smoke from reaching the detector
      2) Avoid placing detectors within three feet of register
      3) Smoke could be pushed or pulled away from the detector
   d) Near air supply registers
      1) Avoid placing detectors within three feet of register
      2) Smoke could be pushed or pulled away from the detector
   e) False alarm
      1) To minimize false alarms avoid exposure to
         • Cooking or furnace fumes
         • Fireplace smoke
         • Dust

E. Maintenance of smoke detectors
   1. Most smoke detectors require very little maintenance
## Testing smoke detectors/co-detectors

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>2. Replace batteries yearly</td>
<td>How often should your detector be tested?</td>
</tr>
<tr>
<td>a) In accordance with manufacturer’s recommendations and directions</td>
<td></td>
</tr>
<tr>
<td>3. Or whenever weak battery signal sounds</td>
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<tr>
<td>4. Use vacuum to clean dust</td>
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### VII. EXIT DRILLS IN THE HOME (EDITH)

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>A. Provides a means for ensuring that all family members know what to do in</td>
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<tr>
<td>the event of a fire in a single family dwelling</td>
<td></td>
</tr>
<tr>
<td>B. Emphasizes other fire safety skills</td>
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<tr>
<td>1. Crawl low in smoke</td>
<td></td>
</tr>
<tr>
<td>2. Home smoke detectors/co-detectors</td>
<td></td>
</tr>
<tr>
<td>3. Make sure door is cool before opening</td>
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<tr>
<td>C. Provides meeting place for all members so that a quick count can be taken</td>
<td></td>
</tr>
</tbody>
</table>
### D. Floor Plan Design

1. Draw a floor plan of each person's bedroom or show the whole house
2. Show two exits
3. Write down your outside meeting place

### E. Procedures

1. Install a smoke detector approved by a testing agency outside each sleeping area
   - a) The detector will awaken the family if it "senses" smoke
2. The bedroom door should always be closed while you are asleep
   - a) A closed door holds back smoke, heat and flame from a fire outside the room and provides additional time to use an alternate escape route from the bedroom, such as a window
3. Feel the bedroom door before opening it to see if it is warm
   - a) If the door is not warm, hold your body against it and open it cautiously just enough to find out whether smoke, heat or flame is on the other side
   - b) Crawl low in smoke
4. Every plan should contain at least two evacuation routes
   - a) Your primary evacuation route should lead directly outside
   - b) If the way is clear, proceed directly outside
   - c) If not, use alternate route

What are the EDITH procedures?
Why is there a need to know hazards found in the home?

VIII. HAZARDS IN THE HOME

A. Most home fires can be prevented by inspecting for hazards and correcting them
   1. Members of every household should conduct a home fire check periodically, such as spring and fall

B. Correct the hazards and reduce the chance of fire

C. Fire is one of our nation's major problems
   1. It is the second most frequent cause of accidental death
   2. Each year more than two thirds of the annual fire deaths occur in residences, generally in the victim's own home
   3. Residential property losses are billions of dollars annually

D. Locations of hazards
   1. Living room
   2. Bedroom
   3. Kitchen
   4. Basement
   5. Storage
   6. Outside

E. Types of hazards
   1. Careless smoking
   2. Matches
   3. Electrical
   4. Heating/cooling
   5. Flammable/combustible materials
6. Improper storage
7. Dispensing practices
8. Housekeeping
9. Rubbish
10. Other

F. Careless smoking
   1. Do not smoke in bed
   2. Smokers endanger the lives of others
   3. Check your house after smokers visit
      a) Smoking materials disposed of properly
      b) Large ashtrays used

G. Matches
   1. Store matches and lighters where young children cannot get them
   2. Tools not toys
      a) Light candles, fireplace, barbeques

H. Electrical
   1. Extension cords should not be overloaded
      a) Out in the open
      b) Not over hooks
      c) Under rugs
      d) Through doorways
         1) Become worn
            • Creates short circuits
   2. Should not serve more than one appliance
   3. Roll up appliance cords so children cannot pull on them
   4. Repair or replace cords that are frayed or worn
   5. Small appliances not working right should be repaired or discarded
6. Fuse box or circuit breaker  
   a) Checked to make sure that proper size fuses or breakers have been installed  
   b) If fuse or breaker blows/shuts-off  
      1) Cause should be located  
      2) Problem fixed  
  
I. Heating/cooling  
   1. Portable space heaters should be kept away from people and things that burn  
   2. Portable oil heaters, if applicable  
   3. Solid fuel heating equipment must be listed by a testing laboratory and requires proper installation, maintenance, and use  
   4. Furnace and heating/cooling systems should be checked at least once a year  
      a) Cleaned if necessary  
   5. Chimneys and chimney connection should be checked regularly for cracks and defects and cleaned whenever needed or once a year  
      a) Ashes should be kept in covered metal containers and removed to a safe location  

J. Flammable/combustible materials  
   1. Old newspapers, rubbish, and other combustibles in attic, cellar, closets, and garage should be thrown out  
   2. Should not be stored near the stairs or near sources of heat  
   3. Keep work area clear  
   4. Paint, varnish, turpentine, and vegetable based oils should be kept in tightly closed metal cans  
      a) Not in glass containers  
      b) Kept away from heat/flame sources
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>c) Storage in metal cabinets is recommended</td>
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<tr>
<td>5. Rags and oily mops saturated with polish, paint, linseed, or other vegetable oils should be kept in tightly closed metal containers or discarded into same</td>
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<tr>
<td>6. Liquefied petroleum gas (LPG) containers/tanks should be installed and maintained only by competent repair people</td>
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<tr>
<td>7. Combustibles such as weeds or brush should be cleared a distance of 10 feet, to mineral soil, around liquefied petroleum gas tanks</td>
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<td>8. Outside burning should be done only in accordance with local regulations and under adult supervision</td>
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<tr>
<td>9. Gasoline should never be stored in a garage, attic, or basement</td>
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<tr>
<td>a) Store in approved container</td>
<td></td>
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<tr>
<td>b) In outbuilding or outside</td>
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<tr>
<td>c) Away from house</td>
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<tr>
<td>10. Combustible vegetation should be cleared to a distance of 30 feet, or nearest property line, in wildland urban interface areas</td>
<td></td>
</tr>
</tbody>
</table>

K. Improper storage
1. Goes hand-in-hand with flammable/combustible materials

L. Dispensing practices
1. Flammable liquid such as gasoline should be stored only in listed safety cans
   a) Glass jars, plastic jugs, and open pails/buckets should not be used
2. Handling and dispensing of flammable liquids should only be done in well ventilated areas
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>3. Excessive quantities of flammable liquids are a hazard</td>
<td></td>
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<tr>
<td>4. Use of flammable liquids for removing grease, oil, or paint is extremely</td>
<td></td>
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<tr>
<td>dangerous</td>
<td></td>
</tr>
<tr>
<td>a) Highly discouraged</td>
<td></td>
</tr>
<tr>
<td>b) If used, do so in a well-ventilated area away from ignition sources</td>
<td></td>
</tr>
<tr>
<td>1) A light switch could be an ignition source</td>
<td></td>
</tr>
<tr>
<td>M. Housekeeping</td>
<td></td>
</tr>
<tr>
<td>1. Most people are reluctant to throw anything away</td>
<td></td>
</tr>
<tr>
<td>2. Results in quantities of</td>
<td></td>
</tr>
<tr>
<td>a) Old clothes</td>
<td></td>
</tr>
<tr>
<td>b) Magazines</td>
<td></td>
</tr>
<tr>
<td>c) Newspapers</td>
<td></td>
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<tr>
<td>d) Rags</td>
<td></td>
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<tr>
<td>e) Junk</td>
<td></td>
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<tr>
<td>3. Unsightly storage</td>
<td></td>
</tr>
<tr>
<td>a) Results in storage in the attic, basement, closets, or garage</td>
<td></td>
</tr>
<tr>
<td>1) Often around an ignition source</td>
<td></td>
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<tr>
<td>N. Rubbish</td>
<td></td>
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<tr>
<td>1. Trash and leaves in large quantities around the house</td>
<td></td>
</tr>
<tr>
<td>a) May spread a fire to the house</td>
<td></td>
</tr>
<tr>
<td>2. Trash should be stored in metal containers if not burned</td>
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<tr>
<td>3. If trash is burned</td>
<td></td>
</tr>
<tr>
<td>a) Check location of burn</td>
<td></td>
</tr>
</tbody>
</table>
b) Incinerator
   1) Type
   2) Condition
   3) Use

c) Burning regulations

O. Other

1. Use and storage of portable barbecue grills restricted to outside
   a) Charcoal stored inside and dry
      1) Sensitive to spontaneous heating once dried, after being wet or damp

2. Occupancy with a swimming pool
   a) Type and method of storage of chemicals
   b) Accessibility and capacity for possible fire fighting use

3. To prevent scald burns or other accidents, put small children in the playpen when older children or adults are preparing meals

4. If water in hot water heater is above 130°F, turn it down to prevent scald burns

IX. FIRE EXTINGUISHERS

A. Can help if properly used to keep a fire small fire, keeping loss of properly and maybe life to a minimum

B. Extinguisher identification
   1. Class A
      a) Letter A

Why do you need to be familiar with fire extinguishers?

How are extinguishers identified?
### PRESENTATION

<p>| | |</p>
<table>
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<tr>
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</table>
| b) | The word "ash"
    | 1) Combustible materials such as wood, paper, etc. |
|   |   |
| c) | Green triangle |
|   |   |
| 2. | Class B |
|   | a) Letter B |
|   | b) The word "boiling"
    | 1) Flammable liquids such as gas, oil, solvents, etc. |
|   |   |
| c) | Red square |
|   |   |
| 3. | Class C |
|   | a) Letter C |
|   | b) The word "current"
    | 1) Electrical current |
|   |   |
| c) | Blue circle |
|   |   |
| 4. | Class D |
|   | a) Letter D |
|   | b) Yellow star |

Can you use a Class "A" fire extinguisher on a Class "C" fire?

What about a Class D fire?

### C. Uses

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Class A</td>
</tr>
<tr>
<td></td>
<td>a) Ordinary combustibles</td>
</tr>
<tr>
<td></td>
<td>1) Paper</td>
</tr>
<tr>
<td></td>
<td>2) Plastic</td>
</tr>
</tbody>
</table>
2. Class B
   a) Flammable liquids
      1) Petroleum products
      2) Grease

3. Class C
   a) Energized electrical
      1) Electrical

4. Class D
   a) Flammable metals
      1) Magnesium
      2) Titanium
      3) Aluminum

D. Selection
   1. Use
   2. Size

E. Placement
   1. Accessible

F. How to use
   1. P-A-S-S
      a) Pull pin
      b) Aim nozzle at base of fire
      c) Squeeze handle
      d) Sweep
         1) Side to side
         2) At base of fire
         3) Until completely out
4) Save excess
   • In case of rekindle

G. When to or not to use
   1. If in doubt, stay out
   2. Clear others out first
   3. Know how to use
   4. Know what it can be used on
   5. Only small fire
   6. Maintain an exit
   7. Always call the fire department

H. Servicing
   1. After use
   2. Annually
      a) Power will pack in vehicles on a hanger

X. BURNS
   A. Every year thousands of people are burned with many requiring hospitalization
   B. Burns are one of the major causes of accidental death and injury to children
   C. Eighty percent (80%) of burns to children under 8 years old are caused by hot liquids
   D. Scalds constitute the most frequent kind of burn injury and can result in disfigurement, hospitalization, and sometimes death

   What are three major causes of burns?

   E. Three major causes of burns
      1. Thermal
         a) Flame
         b) Radiation
c) Excessive heat from fire, steam, hot liquids, and hot objects

2. Chemicals
   a) Acids
   b) Bases
   c) Caustics

3. Electricity
   a) AC/DC current
   b) Lightening

Where are the three classes of burns?

4. Burns are classified as
   a) Superficial (first degree)
   b) Partial thickness (second degree)
   c) Full thickness (third degree)

5. Principal symptoms and signs

   a) Superficial
      1) Pain
      2) Reddening of skin

   b) Partial thickness
      1) First layer of skin is burned through and the second layer is damaged
      2) Deep intense pain
      3) Intense reddening

What are the symptoms or signs of a superficial burn?

What are the symptoms or signs of a partial thickness burn?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Blisters</td>
<td></td>
</tr>
<tr>
<td>c) Full thickness</td>
<td>What are the symptoms or signs of a full thickness burn?</td>
</tr>
<tr>
<td>1) All layers of the skin are damaged</td>
<td></td>
</tr>
<tr>
<td>2) Decreased pain due to nerve damage</td>
<td></td>
</tr>
<tr>
<td>3) Skin areas are charred black or areas that are dry and white</td>
<td></td>
</tr>
<tr>
<td>4) Patient may complain of severe pain or may feel no pain</td>
<td></td>
</tr>
<tr>
<td>6. Treatment of burns</td>
<td></td>
</tr>
<tr>
<td>a) Remove from heat source</td>
<td></td>
</tr>
<tr>
<td>b) Treat airway, breathing, and circulation</td>
<td></td>
</tr>
<tr>
<td>c) Immediately flood or immerse in cool water continuously</td>
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<tr>
<td>1) Until medical aid arrives</td>
<td></td>
</tr>
<tr>
<td>2) Until you get the patient to the hospital</td>
<td></td>
</tr>
<tr>
<td>3) Until you run out of water</td>
<td></td>
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<tr>
<td>4) EMTs should treat per local protocols</td>
<td></td>
</tr>
<tr>
<td>d) Large or deep burns</td>
<td></td>
</tr>
<tr>
<td>1) Cover with sheet or cloth and keep wet</td>
<td></td>
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<tr>
<td>2) Call for medical aid (9-1-1)</td>
<td></td>
</tr>
</tbody>
</table>
What can be done to reduce the number of burns from hot water or liquids?

7. Burn prevention
   a) Reduce the water temperature of the hot water heater to a safe level
      1) Comfortable bath water 100°F
      2) The Consumer Product Safety Commission recommends that hot tap water be maintained at 120°F (49°C)
   b) Watch young children in the bathtub
      1) Remove or lock the hot water faucet handle to make it unworkable for small children
   c) Cook on rear burners of the range
      1) Turn pot handles to the rear but not over burners
      2) Don’t wear loose fitting long sleeves
   d) Keep small children confined or out of the kitchen
      1) When cooking
      2) When serving hot liquids
      3) Keep electrical appliances to the rear of counters

What if a parent brings their child into the fire station stating that the child has been playing with matches?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>8. Juvenile firesetters</td>
<td></td>
</tr>
<tr>
<td>a) Working through chain of command</td>
<td></td>
</tr>
<tr>
<td>b) Juvenile firesetter programs in the fire service</td>
<td></td>
</tr>
</tbody>
</table>

What are your actions?
SUMMARY:
Teaching citizens to recognize and react to public safety hazards is a function of the fire department. Interacting with citizens of all ages in organized station tours, group meetings, children at school, and special occasions allows the fire fighter to present public education information. The public needs to know how to notify public safety agencies in the event of an emergency. Stop, drop, and roll is an injury prevention technique to be taught to all age groups, especially children. The dangers of smoke and how to avoid its deadly effects are covered in crawling low to escape. Issues relating to smoke detectors are covered as a reminder for citizens to check their own or to get new ones. Issues of placement and maintenance of smoke detectors are also presented. The importance of exit drills (EDITH) is covered in presenting life safety issues of escaping hazardous situations. There are many hazards in the home and the fire fighter needs to be able to explain how to deal with them effectively. With proper training fire extinguishers can be used effectively on small fires. Awareness of the types of burns and treatments is also presented.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
FIRE FIGHTER I

**TOPIC:** ROLE OF THE FIRST RESPONDER IN FIRE INVESTIGATIONS

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-3.4 and SBFS

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written test

*Behavior:* The student will confirm a knowledge of the role of the first responder in fire investigations by completing the written test


**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- *Essentials of Fire Fighting*, IFSTA, Fourth Edition

**PREPARATION:** The actions of public safety personnel providing emergency services at a fire scene are critical to not only lifesaving and fire suppression efforts but to any subsequent investigation of the incident.
## What would you consider before arrival to a fire scene as it relates to the cause of the fire?

### I. OBSERVE THE FIRE SCENE CONDITIONS

A. Public safety personnel responding to a fire should observe conditions and activities at or near the scene

1. They can give investigators arriving later an accurate and complete description

B. Can gain information valuable to the fire investigation during their approach to and arrival at the scene

### II. THE PRESENCE, LOCATION, AND CONDITION OF VICTIMS AND WITNESSES

A. Vehicles leaving the scene, bystanders, or unusual activities near the scene

1. Most witnesses stay and watch the fire and fire fighting efforts
2. If the fire is in a dwelling at three in the morning you would expect to find occupants in night dress
3. If the fire is in an office building after working hours and the owner/occupant is on-scene, consider why?
4. Familiar faces
   a) Any familiar faces around the scene?
      1) Identify and have the person explain presence at scene

What should you notice when looking at the bystanders at the fire scene?
### Scene conditions

1. Flame and smoke conditions
   - a) Volume of flames and smoke
   - b) Color, height, and location of the flames
   - c) Direction in which the flames and smoke are moving

2. Separate fires?

3. Trailer material evident?

4. Occupancy and use of the structure
   - a) A residential occupancy being used as a business

   **Are doors open when building is expected to be empty of occupants?**

5. Conditions of the structure
   - a) Lights turned on
   - b) Fire through the roof
   - c) Walls standing
   - d) Opened, closed, or broken windows and doors

   **What are the issues relating to forcible entry?**

   - e) Indications of forcible entry prior to fire department arrival
   - f) Possibility fire was set to hide another crime
   - g) Covered windows
     1) Unusual attempts to block view into structure
6. Any discarded ignitable liquid containers or trailer materials visible inside or outside the scene

7. Conditions surrounding the scene
   a) Blocked driveway
   b) Debris
   c) Damage to other structures

8. Weather conditions
   a) Wind direction
   b) Wind velocity

9. Unusual characteristics of the scene
   a) Presence of containers
   b) Exterior burning or charring on the building
   c) Absence of normal contents
   d) Unusual odors
   e) Fire trailers

10. Fire suppression techniques used
    a) Ventilation
    b) Forcible entry
    c) Utility shut-off measures

11. Status of utilities
    a) Electrical
    b) Natural or propane gas
c) Fire alarms
d) Security alarms
e) Sprinklers

III. EXERCISE SCENE SAFETY
   A. Evaluate the scene for safety hazards
      1. Structural collapse of the building
      2. Smoke
      3. Electrical, chemical, or biological hazards
      4. Other health risks
   B. Establish safety/hazard zones
   C. Communicate hazards to other personnel arriving at the scene
   D. Use tools and personal protective equipment appropriate to the task during all operations
   E. Danger
      1. Beware of incendiary or explosive devices!
      2. Multiple devices are often present
SUMMARY:

While approaching a fire scene, first responders should observe and mentally note unusual conditions and activities. As conditions permit, initiate permanent documentation of the information (e.g., written notes, voice recordings, videotapes). The actions of public safety personnel providing emergency services at a fire scene are critical to not only lifesaving and fire suppression efforts, but to any subsequent investigation of the incident. First responders’ initial observations provide investigators with information pertinent to the investigation. As the investigation unfolds, these observations may provide the starting point for evidence collection and preservation efforts. Safety overrides all other concerns. Ensuring the safety of victims, bystanders, and public safety personnel is the first responders’ foremost concern at the fire scene. First responders must take steps to identify and remove or mitigate safety hazards that may further threaten victims, bystanders, and public safety personnel. They must exercise due caution to avoid injuries to themselves and others. The scene may contain devices specifically designed to kill or maim public safety personnel. Do not touch any suspected incendiary or explosive device. Evacuate the area and request the services of personnel trained in the removal of such items.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: FIRE DEPARTMENT EMERGENCY COMMUNICATION SYSTEMS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-2.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the fire department emergency communication systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Protection Handbook, NFPA, Eighteenth Edition, Section 10, Chapter 1

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

PREPARATION: Well-trained personnel are of no value if there is no reliable means to direct them to the right place at the right time. It is the responsibility of the fire department's communication divisions to provide this direction.

The communications center is where all requests for emergency assistance are received and appropriate responses are sent. It should also provide logistical support to the responding units until the situation is under control.
I. COMMUNICATIONS CENTERS

A. Site selection and configuration considerations

1. Alternate dispatch location
   a) Totally removed from primary location
   b) All necessary requirements for long term use

2. Security
   a) Fire detection and prevention equipment
   b) Emergency lighting
   c) Dead bolt locks
   d) Computerized entry systems
   e) Tape and disk storage
   f) Off-premises storage of backup software

3. Emergency power
   a) Independent circuits
   b) Standby generators
   c) Large battery banks

4. Uninterrupted power source (UPS)
   a) Eliminates voltage surges, spikes, and interruptions that cause damage to computer-aided dispatch (CAD) systems
   b) Supplies temporary battery backup power to allow for computer programs to be closed or standby generators to start during power failures
### c) Components

1) Set of batteries
2) Battery charger
3) DC to AC converter
4) Power conditioning components

### d) Phased to the commercial power frequency and produces the same power

1) Therefore, any fluctuations or interruptions in commercial power will not affect the computer

### 5. Other considerations

a) Location
b) Lighting
c) Console layout
d) Acoustics
e) Restrooms, sleep areas, etc
f) Emergency rations

### II. RADIO COMMUNICATION SYSTEMS

#### A. Radio system selection

1. Fire radio service frequencies available
   a) 33-46 MHz (VHF low)
   b) 150-172 MHz (VHF high)
### What are some considerations when selecting a frequency?

2. Considerations when selecting a frequency
   a) Terrain
   b) Number of radio units required
   c) Frequencies used by bordering fire districts
   d) Mutual aid agreements
   e) Type of operation
   f) Use of EMS or local government radios
   g) FCC frequency coordination process

### What are some types of systems?

B. Type of radio system operation
   1. Simplex
      a) Uses a single frequency for both transmit and receive in all radios for each channel
      b) Only one radio can transmit at any time and all others must receive
   2. Two-frequency half-duplex
      a) Uses separate frequencies to transmit and receive
      b) As in the simplex system, only one radio can transmit at any one time

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<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>c) 450-512 MHz (UHF)</td>
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<tr>
<td>d) 806-930 MHz</td>
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</tr>
<tr>
<td>1) Conventional</td>
<td></td>
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<tr>
<td>2) Trunked</td>
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</tbody>
</table>
3. Two-frequency full-duplex  
   a) Uses separate transmit and receive frequencies  
   b) Permits simultaneous "talk-listen" conversations  

4. Coded Squelch  
   a) Continuous Tone Coded Subaudible Squelch (CTCSS)  
      1) Each radio continually transmits a low frequency tone (67-200 Hz) as a background to the voice signal  
      2) 38 industry standard tones available (e.g., 131.8 Hz)  
      3) Only the selected tone will activate the radio receiver  

   Why are Coded Squelch Systems used?  
   4) Limits interference from other users on the same radio frequency  
   5) Trade names  
      • Private Line or "PL" (Motorola)  
      • Channel Guard (GE)  
   b) Digital Coded Squelch (DCS)  
      1) 23 bit binary word used to activate radio receiver  
      2) Many more codes available than CTCSS  
      3) Each code can be a positive or negative number  
      4) Only transmissions with correct digital code are received
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>5. Two-frequency repeater</td>
<td></td>
</tr>
<tr>
<td>a) Centrally located, high-powered base station &quot;repeater&quot;</td>
<td>Can anyone explain the &quot;repeater system?&quot;</td>
</tr>
<tr>
<td>b) Repeater receives a transmission from any radio in the system with correct frequency (and CTCSS or digital code) and instantly retransmits or &quot;repeats&quot; the message on a second frequency that is received by all other radios in the system</td>
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<tr>
<td>6. Radio paging</td>
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<tr>
<td>a) Consists of a paging &quot;encoder&quot; located in the communications center and individual personal pagers</td>
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<tr>
<td>b) Pagers are available that will respond to tone-only, tone-and-voice operation, and alphanumeric digital display paging</td>
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<tr>
<td>1) Pagers may also be activated by groups</td>
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<tr>
<td>C. Mobile and portable radios</td>
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<tr>
<td>1. Mobile radios are ideal for use in apparatus</td>
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</tr>
<tr>
<td>a) They have a high RF power output (30-100 watts) and considerable range</td>
<td></td>
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<tr>
<td>b) However, their use is restricted to vehicles</td>
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</tr>
<tr>
<td>2. Portable radios operate on a much lower RF power output (0.1-7 watts) and have considerably less range</td>
<td></td>
</tr>
<tr>
<td>a) They can be hand-carried and allow communication outside the vehicle</td>
<td></td>
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</tbody>
</table>
### Emergency Medical Services communications (EMS)

1. Each state has an EMS communications plan on file with the FCC
   - a) Identifies how EMS will be implemented in that state
   - b) FCC has set aside ten UHF frequency pairs for communication between field EMS personnel and base hospital personnel
   - c) Ten channels are shared and used in all 50 states
   - d) EMS providers may also be licensed to use certain frequencies in the Special Emergency Radio Service (low-high-UHF)

### Hazardous materials team communication

1. Two major areas of communication
   - a) Hazardous materials information from base
   - b) Hazardous material intra-team communication

---

b) The reduced RF power can affect communication reliability inside vehicles and structures

c) Some portables can rebroadcast through a vehicle radio repeater for greater range

What does EMS stand for?

Does anyone know what frequency pair is used in this area?
2. Types of communication equipment in use
   a) Mobile radio telephone patch
      1) Ties up radio channel
   b) Mobile cellular telephones
      1) Allows a fax to be installed with the telephone
      2) Allows direct access to hazardous material information services
      3) Less potential for error
   c) UHF MED radio
      1) For medical control or to obtain toxicological information from base hospitals
   d) Hands free wireless radio systems
      1) VOX mics (voice operated microphone) keep hands free
      2) Bone, ear, or throat microphones for voice pickup in noisy environments

III. CONSOLIDATION OF COMMUNICATIONS CENTERS
   A. Two popular methods of consolidation
      1. Contracting with another public safety agency to provide this service

      2. Joint Powers Authority (JPA)
         a) Independent government entity serving two or more agencies
         b) Established to provide specific services (e.g., dispatch)
         c) Major benefit is shared administration costs
### PRESENTATION

<table>
<thead>
<tr>
<th>d) Operated by a Board of Directors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) No single agency is in control</td>
</tr>
<tr>
<td>e) Each participant has equal representation and equal responsibility to make the operation a success</td>
</tr>
</tbody>
</table>

### IV. PROCESSING COMMUNICATIONS WITHIN THE DEPARTMENT

#### A. Data collection systems

1. Incident related data
   a) Time of dispatch
   b) Address
   c) Identity of responding units
   d) Departure times from scene
   e) Radio traffic tape logs or digital media
   f) Telephone tape logs or digital media
   g) Times of significant events at the scene

2. Operational related data
   a) Geographic
   b) Equipment
   c) Response order
   d) Additional resource

3. Administrative/management data
   a) Personnel records
   b) Personnel scheduling

What types of data are related to an incident?

What are some examples of operational related data?
4. The following reports can be used to project future needs of the department such as location of new fire stations, hiring of additional personnel, and relocation of existing equipment:

a) Response time
b) Emergency activity
c) Occupancy activity
d) Specific incident
e) Personnel staffing
f) Fire loss/injury
g) Equipment related
h) Reports for outside agencies

What are some uses for these reports?

5. Run card files

a) Contains a dispatch plan for every area of the jurisdiction served
b) Indexing method
   1) Assign numeric designations to all intersections
   2) Specific running card to each intersection
   3) Alarm boxes are normally assigned an identify code corresponding to the intersection closest to their physical location

What is a run card file?

6. Status keeping systems

a) Minimizing response times
### Status Keeping

**What information is involved in status keeping?**

**d)** Status keeping may involve the tracking of various information such as:
1. Availability of the unit for emergency response
2. Service capabilities of the unit:
   - Paramedic
   - Heavy rescue, etc.
3. Location of the unit
4. Means of contacting the unit:
   - Radio
   - Phone, etc.
5. Miscellaneous items based on department operating policy

### Computer-aided Dispatch (CAD)

**What does CAD stand for?**

**7. Computer-aided dispatch (CAD)**

**a)** One or more computers are used in dispatching calls

**b)** Data is programmed into the computer and the pertinent information is instantly retrieved when needed

**c)** Automatically transmitted to operating units by the dispatcher
**SUMMARY:**

When developing a communications center, site selection and configuration considerations include having an alternate dispatch location, providing security and emergency power, and ensuring an uninterrupted power source.

There are various radio frequencies available to fire departments today that operate different types of systems, such as simplex, duplex, radio paging, mobile and portable radios, and Emergency Medical Services (EMS) communications.

Fire Department Emergency Communication Systems include all the methods by which the public can notify the fire department communication center of an emergency and all the methods by which the center can notify the proper fire fighting units and then relay the information between all personnel involved at the scene.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fire Protection Handbook*, NFPA, Eighteenth Edition, Section 10, Chapter 1 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF A FIRE DEPARTMENT RADIO

**TIME FRAME:** 1:00

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-2.3

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the characteristics and functions of a fire department radio by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition

**PREPARATION:** The radio is the primary communication tool used in the fire service. We use it to confirm response, give report on conditions, give and receive assignments, and organize resources.
I. RADIO USE

A. All radio communications in the United States is under authorization and license from the Federal Communications Commission (FCC)

B. It is a federal offense to send personal messages over a fire department radio

C. Prior to using the radio, you must become familiar with
   1. Operation of the equipment
      a) PTT switch
      b) On-Off-Volume control knob
      c) Squelch control knob
         1) Frequency selection
         2) Hand-held battery care
   2. Departmental policies and procedures pertaining to radio use
   3. Selecting the proper channel
   4. Selecting the proper repeater

D. Other important considerations include
   1. Avoid unnecessary transmissions
      a) Example
         1) San Bernardino, Squad 271, for your information, be advised, at this time, we are released, available, and returning

Who licenses the use of radios?

What must you do prior to use of radio equipment?
2. Be brief, accurate, and to the point
   a) Example
      1) San Bernardino, Squad 271, available

3. New emergencies and units working at fires have priority over routine radio traffic

4. Do not use profane language

5. Hold the microphone 1-2 inches from the mouth
   a) Do not SHOUT
   b) Avoid low voice tones

6. Know what you are going to say before you key the radio

E. Arrival and condition reports
   1. Report arrival and address if different than the one reported
   2. Give building and occupancy description
      a) Single-story commercial strip mall
      b) Single-story duplex
      c) 30,000 square foot single-story concrete tilt-up
      d) Two-story eight-unit apartment complex
   3. Indicate nature and extent of fire
      a) Light smoke showing
      b) Heavy smoke showing
      c) Fire showing
      d) Well involved/fully involved

What should you include in your report on conditions?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What do you say to indicate you see nothing?</td>
</tr>
</tbody>
</table>

4. Report rescue and exposure problems
   a) Exposures threatened to the south
   b) Victims standing at the fire escapes

5. Name the incident and identify the incident command post
   a) Typically named after the street or name of the building
   b) ICP located in Division A

6. Indicate attack mode/function
   a) Investigating
   b) Fire attack
   c) Command

F. Updated report on condition
   1. Indicate change of Incident Commander
   2. Progress (or lack of it) being made
   3. Direction of spread
   4. Indicate problems
   5. Describe needs for resources or equipment
   6. Indicate anticipated actions
### How do you call for additional resources?

**G. Calls for additional resources**
1. Normally, only the IC may request additional equipment
   a) This may vary by local conditions
2. However, all firefighters need to know the local procedure for requesting additional resources
3. If you request "additional alarms" know what resources you will get
4. Be specific when requesting additional resources
   a) Use ICS protocol
5. Keep record of additional incoming resources and assign them
   a) Staging is an assignment
   b) Be prepared to transfer command with written resource status

### FREQUENCY USE

**A.** There are several types of radio frequencies used for different purposes

<table>
<thead>
<tr>
<th>1. Primary</th>
<th>2. Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Used for initial dispatch of resources, routine traffic</td>
<td>a) Used for tracking resource and situation status for routine incidents</td>
</tr>
<tr>
<td></td>
<td>1) Medical aids</td>
</tr>
</tbody>
</table>

**What should the primary frequency be used for?**

**What is the support frequency used for?**
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Traffic collisions</td>
<td></td>
</tr>
<tr>
<td>3) Structure fires</td>
<td></td>
</tr>
<tr>
<td>3. Command</td>
<td></td>
</tr>
<tr>
<td>a) Used for major incidents where a large amount of radio traffic is anticipated and the primary frequency would be inappropriate</td>
<td></td>
</tr>
<tr>
<td>b) Enables the command and general staff to communicate</td>
<td></td>
</tr>
<tr>
<td>4. Tactical</td>
<td></td>
</tr>
<tr>
<td>a) Used for tactical operations at an incident</td>
<td></td>
</tr>
<tr>
<td>5. Air-to-ground</td>
<td></td>
</tr>
<tr>
<td>a) Used by ground units in emergencies to communicate with aircraft</td>
<td></td>
</tr>
<tr>
<td>6. Air-to-air</td>
<td></td>
</tr>
<tr>
<td>a) Used by aircraft to coordinate with each other</td>
<td></td>
</tr>
<tr>
<td>7. Statewide frequencies</td>
<td></td>
</tr>
<tr>
<td>a) All firefighting resources can communicate with each other</td>
<td></td>
</tr>
<tr>
<td>b) OES 1</td>
<td></td>
</tr>
<tr>
<td>c) OES 2</td>
<td></td>
</tr>
<tr>
<td>d) White Fire &quot;Net&quot;</td>
<td></td>
</tr>
<tr>
<td>1) White 1</td>
<td></td>
</tr>
<tr>
<td>• Used for traffic between dispatch centers to field units</td>
<td></td>
</tr>
</tbody>
</table>

What is the tactical frequency used for?

What is the "white net" used for?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) White 2</td>
<td>• Used for interagency unit to unit</td>
</tr>
<tr>
<td>3) White 3</td>
<td>• Used for interagency unit to unit</td>
</tr>
<tr>
<td>4) White 2 and 3 are not to be used for air-to-ground</td>
<td></td>
</tr>
<tr>
<td>e) ITAC</td>
<td>1) 800 MHz statewide frequencies</td>
</tr>
<tr>
<td>f) CALCORD</td>
<td>1) Used for communication between private and public agencies</td>
</tr>
<tr>
<td></td>
<td>• Private air-ambulances to fire department field units</td>
</tr>
<tr>
<td>g) Travel Net</td>
<td>1) Used for communication with regional dispatch centers by strike team leaders and other resources en route to major incidents statewide</td>
</tr>
</tbody>
</table>

What is the CALCORD used for?
SUMMARY:

Radios play a very important role during the emergency incidents. As with any tool, the radio is only as good as the user. Fire fighters should be able to select the proper frequency and know what they are going to say before keying the radio. An effective fire fighter can use the radio to communicate report on conditions, request additional resources, and advise supervisors of progress and needs. Communications should be brief and to the point.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18 in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO OPERATE A FIRE DEPARTMENT RADIO

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-2.1

BEHAVIORAL OBJECTIVE:

 Condition: A fire department hand-held radio with TAC channel and a fire department vehicle with mobile radio, using TAC channel

 Behavior: The student will correctly set the on-off-volume control knob, squelch, frequency selector, and PTT switches to receive and transmit a brief message

 Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Fire department hand-held radio with TAC channel
- Fire department vehicle with mobile radio, using TAC channel

REFERENCES:

- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18

PREPARATION:

Portable and mobile radios are the primary communication tools used by the fire service. The ability to use them correctly is essential for all fire fighters.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turn radio on</td>
<td>1a. With on/off control knob</td>
</tr>
<tr>
<td></td>
<td>b. On top or face of radio or control head</td>
</tr>
<tr>
<td>2. Adjust volume</td>
<td>2a. To midrange</td>
</tr>
<tr>
<td></td>
<td>b. Using volume control knob/wheel or volume step up/down display buttons</td>
</tr>
<tr>
<td>3. Set squelch (if not preset)</td>
<td>3a. Until hissing sound ceases</td>
</tr>
<tr>
<td></td>
<td>b. Using squelch control knob/wheel</td>
</tr>
<tr>
<td>4. Select desired frequency/tone</td>
<td>4a. Using channel selector or keypad</td>
</tr>
<tr>
<td>5. Monitor frequency</td>
<td>5a. For clear channel condition</td>
</tr>
<tr>
<td></td>
<td>b. Listen and observe channel busy indicator light, if present</td>
</tr>
<tr>
<td>6. Activate PTT (push-to-talk) switch</td>
<td>6a. Speak clearly across face of mic or hand-held radio</td>
</tr>
<tr>
<td></td>
<td>b. On side of radio microphone or hand-held radio</td>
</tr>
<tr>
<td>7. Release PTT switch and listen for response</td>
<td>7a. Using radio speaker</td>
</tr>
</tbody>
</table>

**NOTE**: Hand-held radios should be held slightly sideways and away from the face with the antenna in a vertical position.
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CLEAR RADIO TEXT AND COMMON TERMINOLOGY

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-2.3

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of clear radio text and common terminology by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Incident Command System, IFSTA, First Edition

PREPARATION: Proper use of the radio requires the use of clear text and common terminology instead of various codes. The intent of the use of "clear text" and "common terminology" is to paint a clear picture and reduce confusion, particularly where different agencies are working together. Confusion could result in inefficient operations causing greater loss of life or property.
## I. ADVANTAGES TO THE FIRE SERVICE

A. Clear text
   1. Concise
   2. Plain English
   3. Easily understood
   4. No agency specific codes

B. Common terminology
   1. Same system as used in FIRESCOPE's Incident Command System
   2. Allows different fire department jurisdictions to understand one another
      a) Example
         1) Type I Engine Strike Team is the same throughout the state

C. Allows easy integration of agencies, private companies, and organizations other than the fire service into emergency operations

   1. Provides multiagency coordination

## II. CLEAR TEXT RADIO TERMINOLOGY DEFINITIONS

A. What is your location?
   1. Announce your present location

B. Disregard
   1. Don't pay attention to the radio traffic

C. Standby
   1. Wait for additional instruction
   2. Wait for other radio users to continue with higher priority traffic

D. Is ______ available for a phone call?

Does the fire service need to integrate with other agencies?
E. Contact the communications center
   1. Call your dispatch center by phone

F. On-scene
   1. Used when units arrive at the scene of an incident
   2. The person speaking on the radio identifies who is being called first, then who is speaking
      a) Example
         1) "Perris, Engine 3183, on-scene"

G. Can handle
   1. Used when the amount of equipment needed to handle the incident is sufficient
      a) Example
         1) "Grass Valley, Engine 2381, can handle"

H. Fire contained
   1. There is a line built around the fire but still potential for the fire to jump control lines

I. Fire under control
   1. To complete a control line around a fire and cool all hot spots
   2. The line can be expected to hold under foreseeable conditions

J. Emergency traffic only
   1. Radio users will limit all radio traffic to emergency in progress or a new incident
2. Radio traffic includes status information
   a) Responding
   b) Reports on conditions
   c) On-scene and available may be authorized during this period

K. Emergency traffic
   1. Used to clear designated channels used at an incident for life/safety radio traffic
   2. All other radio users unless directly related to the emergency will refrain from using the radio until cleared by the communications center or IC
      a) Examples
         1) "Fire fighter down"
         2) "Immediate change in tactical operations"
   3. The term "mayday" shall not be used
      a) This could cause confusion with the term used for aeronautical and nautical emergencies

Why can't the term "mayday" be used?

L. Priority traffic
   1. This term is used to gain control of a radio frequency to report very important traffic

What would be an example of "priority traffic?"

2. You are assigned a task and you are unable to complete your objective
   a) Example
      1) "Grass Valley, Engine 2376, priority traffic"
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>
| M. Resume normal traffic  
  1. The emergency traffic is completed and radio users may resume routine traffic | What is "routine traffic"? |
| N. Routine traffic  
  1. Radio use that involves resources changing locations, incident numbers, call times, and other nonemergency traffic | |
| O. Unreadable  
  1. Used when signal received is not clear  
  2. In most cases, try to address the specific trouble  
     a) Under modulating (low modulation)  
     b) Background noise | What does "copy" mean? |
| P. Copy, copies  
  1. Used to acknowledge message is received  
  2. Unit identifier must also be used  
     a) Example  
     1) "Grass Valley, Prevention 2321, copies" | |
| Q. Affirmative  
  1. Yes | |
| R. Negative  
  1. No | |
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Respond, responding</td>
<td></td>
</tr>
<tr>
<td>1. Used during dispatch to mean &quot;proceed to&quot; or &quot;proceeding to&quot; the incident</td>
<td>What is the difference between responding and en route?</td>
</tr>
<tr>
<td>a) Example</td>
<td></td>
</tr>
<tr>
<td>1) &quot;San Bernardino, Engine 3592, responding&quot;</td>
<td></td>
</tr>
<tr>
<td>T. En route</td>
<td></td>
</tr>
<tr>
<td>1. Normally used by administrative or staff positions</td>
<td></td>
</tr>
<tr>
<td>2. Can be used by resources proceeding to nonemergency incidents</td>
<td>What type of incidents would you say &quot;en route?&quot;</td>
</tr>
<tr>
<td>3. &quot;Responding&quot; is used for proceeding to an emergency incident</td>
<td></td>
</tr>
<tr>
<td>4. &quot;En route&quot; is used for proceeding to nonemergency incidents</td>
<td></td>
</tr>
<tr>
<td>5. Public service, move-up/cover assignments</td>
<td></td>
</tr>
<tr>
<td>6. &quot;En route&quot; is not a substitute for &quot;responding&quot;</td>
<td></td>
</tr>
<tr>
<td>U. In quarters</td>
<td>When would you use your station name or number?</td>
</tr>
<tr>
<td>1. Used to indicate that a unit is in a station</td>
<td></td>
</tr>
<tr>
<td>2. When the unit is in quarters not normally assigned</td>
<td></td>
</tr>
<tr>
<td>a) Example</td>
<td></td>
</tr>
<tr>
<td>1) &quot;Perris, Engine 3362, in quarters West Riverside&quot;</td>
<td></td>
</tr>
</tbody>
</table>
## Out-of-service

1. Indicate why the unit is out-of-service
   - a) Mechanical
   - b) Uncovered
   - c) Training

## In-service

1. This term means that a unit is operating, not in response to a dispatch

## Resource request

1. Specify resource type
   - a) Crews
   - b) Equipment
   - c) Aircraft
   - d) Overhead
   - e) Supplies
   - f) Frequencies

2. Example
   - "Perris, Battalion 9B, resource request, crews, aircraft"
SUMMARY:

The fire service's main tool of communication is the radio. The use of clear text and common terminology is a crucial part of effective communications during routine and emergency incidents. Your fire department must be able to communicate within its own organization as well as other jurisdictions. In addition, all fire departments must be able to effectively communicate with other agencies and private companies. Clear text includes painting a picture without the use of 10 Codes or other department specific codes. When all agencies are speaking the same language, confusion is reduced and effective communications is accomplished.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: METHODS OF RECEIVING FIRE ALARMS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-2.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the methods of receiving fire alarms by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition

PREPARATION: We have all heard the story about the caller who calls the fire department and says, "Come quick, my house is on fire!" - and hangs up without giving an address.

Fire department communications include all methods by which the public can notify the fire department of an emergency and by which the communications center notifies the proper units and personnel that are to respond. There is nothing more embarrassing than responding to the wrong address.
I. REPORTING A FIRE

A. Fire department public education programs should include information on how to report an emergency correctly

1. Telephone
   a) Dial number
      1) Fire department direct
      2) 9-1-1 most common
      3) "0" for Operator

   b) Report type of incident
      1) Fire, medical aid, etc.
   c) Give address
   d) Give cross street
   e) Give your name and location
      1) Sometimes hard to get caller to give
   f) Give call-back number
   g) Stay on the line if requested to do so by the dispatcher

2. Fire alarm telegraph box
   a) Send signal
   b) Stay at location

3. Fire alarm station
   a) Send signal
   b) Notify fire department

When using 9-1-1, what information should be given?
II. METHODS OF RECEIVING ALARMS

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Coded systems</strong></td>
<td>What are the two types of coded systems?</td>
</tr>
<tr>
<td>1. Wired telegraphic</td>
<td>What three specific messages must a radio system be equipped to send?</td>
</tr>
<tr>
<td>a) Activated by depressing a lever</td>
<td></td>
</tr>
<tr>
<td>b) A coded wheel transmits a coded number signal when activated</td>
<td></td>
</tr>
<tr>
<td>c) System is limited, no other information except the location is transmitted</td>
<td></td>
</tr>
<tr>
<td>d) Malicious false alarms are a problem</td>
<td></td>
</tr>
<tr>
<td>2. Radio (wireless)</td>
<td></td>
</tr>
<tr>
<td>a) Similar to the telegraph system</td>
<td></td>
</tr>
<tr>
<td>1) Transmits geographic location</td>
<td></td>
</tr>
<tr>
<td>b) In addition, it also must be equipped to send at least three specific messages</td>
<td></td>
</tr>
<tr>
<td>1) Test</td>
<td></td>
</tr>
<tr>
<td>2) Tamper</td>
<td></td>
</tr>
<tr>
<td>3) Fire</td>
<td></td>
</tr>
<tr>
<td>c) Some printing systems when activated by the incoming radio signal print the date, time, the message sent by the box, box number, etc.</td>
<td></td>
</tr>
<tr>
<td>d) Certain weather conditions may cause false alarms, (e.g., fog, rain)</td>
<td></td>
</tr>
</tbody>
</table>
What are the two types of voice systems?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Voice systems</td>
<td>What are the various types of private fire alarm systems?</td>
</tr>
<tr>
<td>1. Telephone fire alarm box</td>
<td></td>
</tr>
<tr>
<td>a) Telephone</td>
<td></td>
</tr>
<tr>
<td>1) Telegraph mechanism</td>
<td></td>
</tr>
<tr>
<td>2) Lifting the handset indicates the box location</td>
<td></td>
</tr>
<tr>
<td>b) Direct voice transmission to the communications center</td>
<td></td>
</tr>
<tr>
<td>c) Allows for exchange of more information</td>
<td></td>
</tr>
<tr>
<td>d) System is generally leased from the local telephone company</td>
<td></td>
</tr>
<tr>
<td>2. Public telephone</td>
<td></td>
</tr>
<tr>
<td>a) The most common form of turning in fire alarms</td>
<td></td>
</tr>
<tr>
<td>b) 9-1-1 is a simple number, easy to remember</td>
<td></td>
</tr>
<tr>
<td>c) Stickers placed on telephone can assist callers when under stress</td>
<td></td>
</tr>
<tr>
<td>d) Commonly goes to police and delays in relaying calls are still reported</td>
<td></td>
</tr>
<tr>
<td>3. Private fire alarm signaling</td>
<td></td>
</tr>
<tr>
<td>a) Used to detect and transmit alarms to the fire department communications center</td>
<td></td>
</tr>
<tr>
<td>b) Types of private systems</td>
<td></td>
</tr>
<tr>
<td>1) Central station protective signaling</td>
<td></td>
</tr>
<tr>
<td>2) Local protective signaling</td>
<td></td>
</tr>
</tbody>
</table>
### METHODS OF RECEIVING FIRE ALARMS

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3) Auxiliary protective signaling</td>
<td>What are some common household warning systems?</td>
</tr>
<tr>
<td>4) Remote station protective signaling</td>
<td></td>
</tr>
<tr>
<td>5) Proprietary protective signaling</td>
<td></td>
</tr>
<tr>
<td>6) Household fire warning systems (e.g., smoke detectors, heat detectors)</td>
<td></td>
</tr>
</tbody>
</table>

#### 4. Radio and walk-in alarms

- **a)** A fire/emergency may be reported directly to the fire station either over the radio or people may walk into the station to report a fire

- **b)** Record all the data necessary to respond the first due companies, include
  
  1) Record information
  
  2) Notify dispatch
  
  3) Alert the company personnel
  
  4) Respond

### III. METHODS OF ALERTING FIRE DEPARTMENT PERSONNEL

#### A. Staffed stations

- 1. Computerized line printer
- 2. Vocal alarm
- 3. Teletype
- 4. House light
### Methods Of Receiving Fire Alarms

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Telephone from dispatcher</td>
<td></td>
</tr>
<tr>
<td>6. Telegraphic register</td>
<td></td>
</tr>
<tr>
<td>7. Radio</td>
<td></td>
</tr>
<tr>
<td>8. Walk-in</td>
<td></td>
</tr>
<tr>
<td>9. House bell</td>
<td></td>
</tr>
<tr>
<td>10. Private alarm system</td>
<td>How might we alert an unstaffed station?</td>
</tr>
</tbody>
</table>

#### B. Unstaffed stations

1. Radio pagers
2. Telephones
3. Sirens
4. Whistles or air horns
5. Alphanumeric pagers
SUMMARY:

As fire fighters, we need to ensure that the public is educated in how to report emergencies. Telephones, fire alarm boxes, and fire alarm stations are examples of how the public can report an emergency. Alarms are received at the communications center through coded or voice systems. There are many different ways to alert fire department personnel at either staffed or unstaffed stations, and it is important that fire fighters have an understanding of the alarm resources available within their communities to receive and transmit emergency calls.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: TELEPHONE AND COMMUNICATION PROCEDURES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-2.2

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of telephone and communication procedures by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Specific operating manuals provided by the manufacturer of the specific telephone and/or communication items

PREPARATION: The smooth operation of the department can start with you as fire fighters. Something as simple as answering a telephone can actually slow down the operation and cause confusion if not done correctly in a prompt and courteous fashion. Since technology is here to stay, we need to embrace it with open arms and use it to better serve ourselves, the department, and the citizens we serve.
I. TELEPHONE PROCEDURES

A. Answering the phone
   1. Answer promptly
   2. Identify
      a) Department name
      b) Company or station number
      c) Yourself
   3. Be prepared to take a message

B. Emergency calls
   1. Note time
   2. Name of caller
   3. Caller's phone number
   4. Location of caller
   5. Nature of emergency
   6. Location of emergency
   7. Relay information to communications center upon responding

C. Taking a message
   1. Date of message
   2. Time
   3. Name of caller
   4. Caller's phone number

APPLICATION

How should a phone be answered?

What do you do if you receive an emergency call on the business line?

What information is needed for a message?
5. Message to be forwarded
6. Your name

What phone etiquette should be followed?

D. Phone etiquette
   1. Answer promptly
   2. Be courteous
   3. Never leave the line open or someone on hold for an excessive amount of time
   4. Post the message or deliver it to the person promptly
   5. Terminate the call courteously

II. OTHER FIRE DEPARTMENT COMMUNICATION ITEMS

NOTE: Besides telephones, various different fire department communication items are available for our use. Listed below are some of those examples. Due to the changing and varying technology available today, the following items are agency specific and need to be addressed on an as used and needed basis.

What are some other examples of items that can be used in the fire service for communicating?

A. Fax machines
B. Computers
   1. E-mail
   2. Internet access
C. Intercom systems
D. Cellular phones
SUMMARY:

When answering the telephone, you should identify the department name, company or station number, and yourself. If the telephone is answered promptly and courteously, you can help with creating and maintaining a positive public image while making a smoother running department. When taking a message for someone, you should include the name of the caller, the time and date the person called, and the appropriate message. Besides telephones, other fire department communication items that are available for fire departments to use are cellular telephones, computers, and fax machines. All of these items allow us to do our job more efficiently and effectively.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 18 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: TRAFFIC PRE-EMPTION DEVICES

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-2.1

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of traffic pre-emption devices by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Firefighter's Handbook, Delmar, 2000 Edition Chapter 3

MATERIALS NEEDED: • Writing board with markers/erasers
• Appropriate audiovisual equipment
• Appropriate audiovisual materials


PREPARATION: When responding to an incident, time is of the essence. Traffic control devices can help reduce emergency apparatus response time and provide a means of safety for the responding units and other vehicles on the road.
I. DEFINITION
   A. Systems that control traffic signals and provide a safe transition to a priority right-of-way for emergency vehicles

   Who would be using a traffic control device?

II. USE
   A. Emergency response vehicles
      1. Recognizes the emergency response vehicle
         a) Allows it to change traffic control signals on its route
         b) Clears the way for emergency responders

   What is the purpose of traffic control devices?

III. PURPOSE
   A. To reduce response times
   B. To increase the safety of the general public
   C. To increase the safety of emergency responders

IV. OPERATION
   A. Manually activated devices
      1. Operated by a switch
      2. Switch is held until apparatus clears areas
      3. May be set-up on a timer
   B. Siren activated devices
      1. Sound pickup unit
         a) Located at each protected intersection
         b) Filters out all other noise, except siren
         c) Sends signal to traffic light selector in control box

   What are the four most common devices?
2. Traffic light selector/control box
   a) Holds amber light for a few seconds
   b) Then switches to red which flashes at double the normal rate

C. Light activated devices
   1. Strobe
      a) Attached to apparatus
      b) Pulsating, high intensity light
      c) Sends signal to detector
         1) Located at protected intersections
         2) Activates traffic light selector in control box

D. Traffic light selector/control box
   1. Holds light green or speeds up normal cycle to green in desired location of travel
   2. Light detector indicator
      a) Located next to light detector
      b) Assures driver that traffic signal is under control of the system
**SUMMARY:**

Traffic control devices allow us to get to the emergency scene quickly and efficiently, while also increasing the level of safety to emergency responders and the public. They are activated manually or automatically by radio frequencies, strobe lights, or remote signal detection devices such as microwave or laser technology.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

TOPIC: INTRODUCTION TO THE PRINCIPLES OF VEHICLE EXTRICATION

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-1.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the basic principles of vehicle extrication by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Rescue Practices, IFSTA, Fifth Edition
- Principles of Extrication, IFSTA, First Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition
- Vehicle Rescue and Extrication, Mosby, 1991 Edition
- Vehicle Rescue, Brady, Second Edition

PREPARATION: The fire service is viewed as the public agency trained, equipped, and responsible for rescue of all types. Vehicle rescue is the most common call requiring rescue/extrication. With the advances in hydraulic-powered rescue tools, fire fighters tend to ignore the more basic tools and techniques of extrication and may never receive detailed instruction in the use of standard, light rescue tools and techniques.
I. SIZE-UP, ASSESSMENT OF THE INCIDENT

A. Forms the basis for decisions as the extrication process continues

B. Size-up begins en route with information from the dispatcher

C. Elements of size-up
   1. Safety
      a) Self, crew, victims, and public
   2. General scene
      a) Identify possible hazards
   3. Victims
      a) How many, where are they?
   4. Vehicles
      a) Are they stable?
   5. Resources
      a) What is available, what is needed, is there enough personnel?

D. It is important to remember that an incident is a dynamic event (always changing)
   1. Size-up must be a continuous process throughout the incident
   2. Plans and responses may need to be modified as changes in the incident or resources occur

E. Call for additional help if needed

II. CONTROL OF HAZARDS

A. Safety must come first for self, crew, victim, and public
   1. Establish danger zone area
      a) 25-foot circle around vehicle

When does size-up begin?
2. Full personal protective equipment
3. Check for undeployed airbag
4. Check for spilled fuel or other fluids
   a) Cat litter can make surface less slippery
5. Deploy attack line

What are some hazards to consider?

B. Hazards to consider
   1. Traffic
   2. Fire
   3. Electrical
   4. Hazardous materials
   5. Unstable vehicles
   6. Others

C. Most hazards identified during size-up must be controlled before gaining access to victims

What are the considerations for the hazard of traffic?

D. Hazard considerations
   1. Traffic
      a) Warning devices
      b) Speed limits
      c) Stopping distance for oncoming traffic
      d) Volume of traffic
      e) Road conditions
      f) Weather conditions
      g) Location (curved or straight road)
      h) Notify local authority to assist in traffic control
### PRESENTATION

<table>
<thead>
<tr>
<th>i)</th>
<th>Awareness of intoxicated drivers driving through/past the scene</th>
</tr>
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<tbody>
<tr>
<td>j)</td>
<td>Never, ever turn your back to oncoming traffic at the scene</td>
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</table>

<table>
<thead>
<tr>
<th>2. Downed electrical wires</th>
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<tbody>
<tr>
<td>a) Do not enter an accident zone where there are downed wires</td>
</tr>
<tr>
<td>b) Always assume downed wires are &quot;hot&quot;</td>
</tr>
<tr>
<td>c) Notify utility service company immediately</td>
</tr>
<tr>
<td>d) No attempt should be made to move downed power lines except by properly trained and equipped utility personnel</td>
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<tr>
<th>3. Unstable vehicles</th>
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<tbody>
<tr>
<td>a) Stabilize all vehicles before attempting to gain access</td>
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<tr>
<td>b) Inclines</td>
</tr>
<tr>
<td>1) Chock the wheels, cribbing</td>
</tr>
<tr>
<td>2) Emergency brake on if working</td>
</tr>
<tr>
<td>3) Deflate vehicle tires as a last resort</td>
</tr>
<tr>
<td>c) Slippery surface (oil, ice, etc.)</td>
</tr>
<tr>
<td>1) Chock the wheels, cribbing, and engine chock blocks</td>
</tr>
<tr>
<td>2) Emergency brake on</td>
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<tr>
<td>3) Cat litter, absorbent</td>
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<tr>
<td>PRESENTATION</td>
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<td>--------------</td>
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<tr>
<td>d) Tilted</td>
</tr>
<tr>
<td>1) Chock the wheels, cribbing, engine chock blocks</td>
</tr>
<tr>
<td>2) Secure with lines</td>
</tr>
<tr>
<td>3) Do not work on downhill side</td>
</tr>
<tr>
<td>e) Stacked vehicles</td>
</tr>
<tr>
<td>1) Chock the wheels of all vehicles</td>
</tr>
<tr>
<td>2) Insert any suitable material between surface and unbalanced part of vehicle</td>
</tr>
<tr>
<td>• Blocks, tires, cribbing, lumber, airbags, step chocks, etc.</td>
</tr>
<tr>
<td>3) Secure with lines as necessary</td>
</tr>
<tr>
<td>f) Vehicle on side</td>
</tr>
<tr>
<td>1) Increase contact points with ground</td>
</tr>
<tr>
<td>2) Spread contact points as wide as possible</td>
</tr>
<tr>
<td>3) Use cribbing, wedges, and step chocks</td>
</tr>
<tr>
<td>4) Secure with lines</td>
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<tr>
<td>g) Overturned vehicles</td>
</tr>
<tr>
<td>1) Place a solid object between roof and the roadway</td>
</tr>
<tr>
<td>2) Use jacks to angle as necessary</td>
</tr>
<tr>
<td>3) Secure with lines</td>
</tr>
<tr>
<td>h) Vehicle totally or partially submerged in the water</td>
</tr>
<tr>
<td>1) Consider direction and effects of the current</td>
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### Fire Fighter I

#### Presentation

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>2) Safety of fire fighter comes first</td>
</tr>
<tr>
<td>- Consider throw bags and fire fighters down stream to save anyone who gets swept away</td>
</tr>
<tr>
<td>i) Fuel leaks</td>
</tr>
<tr>
<td>1) Find source and plug if possible</td>
</tr>
<tr>
<td>- Appropriate material (e.g., plug-in dike, petro putty, etc.)</td>
</tr>
<tr>
<td>- You may only have to crimp the fuel line</td>
</tr>
<tr>
<td>2) It is <strong>always</strong> a good idea to have a attack line ready</td>
</tr>
<tr>
<td>3) Ascertain the direction of flow</td>
</tr>
<tr>
<td>- Dike as necessary</td>
</tr>
<tr>
<td>4) Consider extending exclusion zone to 100 feet</td>
</tr>
</tbody>
</table>

#### Application

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<th>APPLICATION</th>
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<tr>
<td>4. There is a general rule that no victim should be moved until all necessary emergency medical has been completed</td>
</tr>
</tbody>
</table>

Under what conditions can this general rule be (safely) disregarded?

a) When the victim and the first responder are endangered by the circumstances of the entrapment, such as

1) Fires
2) Hazardous materials spills
3) Submersed in water
III. SUPPORT OPERATIONS

A. Special circumstances that may be necessary for the rescue operations to continue safely

B. Initiate any needed support based on size-up
   1. Supplemental lighting
   2. Protecting victim from rescue or scene dangers
   3. Fire prevention
   4. Special firefighter protection

IV. GAINING ACCESS

A. An opening is made for the first responder to get to the victim in order to begin emergency care

B. Always stabilize vehicles before attempting to gain access

C. "Try before you pry!"

D. Determine the easiest/safest access

NOTE: Specific tools and techniques for gaining access will be discussed during tool demonstration.

E. Generally consider gaining access in the following order
   1. Doors
   2. Side/rear windows
   3. Windshield
   4. Vehicle body
      a) Last resort
      b) Too time consuming

F. Gaining access can be as simple as opening a door or as difficult as cutting through the roof of a vehicle that has gone off a cliff

What should be done just before gaining access?
G. Exercise every precaution and care for the victim
   1. Make sure not to add further injuries

V. ASSESSING VICTIMS AND BEGINNING EMERGENCY CARE

A. Every victim must be evaluated
   1. Golden hour

   2. The fire fighter's goal is a fifteen (15) minute extrication

B. Triage
   1. Make an orderly survey of victims, if possible
   2. Usually not possible if multiple victims in one vehicle
   3. Use the Simple Triage And Rapid Transport (START) procedure
      a) Accepted method of prioritizing victims' injuries

C. Provide care for life threatening situations
   1. Airway
   2. Artificial ventilation
   3. Control bleeding
   4. CPR
   5. C-spine precautions

D. Other assistance can be performed later at the scene, but before transporting
   1. Immobilization of fractures
   2. Minor bleeding

Who needs to consider the victim's "golden hour"?

What other assistance should be performed?
VI. EXTRICATING/DISENTANGLING

A. Emergency care occurs before, during, and after disentanglement

B. Protect the patient from additional injury
   1. Shield from debris
   2. Ensure adequate ventilation under protective coverings

NOTE: Actual practice with tools and techniques will occur in succeeding lessons.
   3. Use rigid protection from cutting and prying operations (spinal board) as necessary
   4. Remove patient from life threatening hazards

C. Remove the wreckage from the patient
   1. Efforts required range from the simple to the complex
      a) Move seat back
      b) Widen door openings
      c) Cut seat belts
      d) Remove steering wheel
      e) Displace steering column
      f) Displace pedals
      g) Displace a crushed dash
D. Always try the easiest solution first
   1. Is the victim really stuck?
      a) Ask victim if they can move themselves
      b) Consider removal of victims' shoes, etc.
   2. Do hands-on assessment
      a) Do not look and assume
   3. Consider the mechanism of injury
   4. Get information from victim, if possible

VII. REMOVE AND TRANSFER
A. Package victim to minimize further injury
   1. Remember your ABCs
      a) Airway
      b) Breathing
      c) Circulation
   2. Control bleeding
   3. Immobilize all fractures
   4. Dress wounds
   5. Splint possible neck injuries
   6. Maintain control of life threatening problems

B. Equipment for packaging
   1. Short spine board/KED type wrap around short board
   2. Long spine board (AKA backboard)
   3. Splints
   4. Bandages
   5. Scoop stretcher
   6. "Spider" straps
7. "D"-Ring straps
8. Others

C. Transfer victim to transport personnel
   1. Select carrying device
   2. Ensure no further victim injury
   3. Move victim to ambulance and assist in loading
      a) Use legs, not your back, when loading victims

VIII. PUTTING ALL PHASES TOGETHER

A. Although we have reviewed phases in a linear fashion, the phases actually occur simultaneously in many instances
   1. Size-up continues throughout the entire operation
   2. Support operations occur at the same time as hazard control and gaining access
   3. Victim evaluation and emergency care begin with gaining access and continue throughout the operation
   4. Disentanglement may begin and/or end by gaining access
      a) When opening a door and moving a seat back is all that is necessary to gain access, render care and remove victim, disentanglement and gaining access were accomplished with the same effort

B. Use common sense

   1. Always ensure the safety of everyone at the scene
      a) You come first
   2. Take special care not to add to victim's injury

Remember Murphy's Law?
3. Evaluation of priorities
   a) A fire fighter must make a visual evaluation of the damaged vehicle
   b) It can give him or her clues relating to unseen injuries
   c) Rule of thumb
      1) All head injuries must be assumed to have C-spine injuries and must be immobilized
   d) When victims are seriously injured in several systems, trying to do everything just right in C-spine management and taking so long to accomplish it that the victim expires, is probably not the most helpful action for the victim
      1) A victim with possible C-spine injuries and the vehicle catches on fire
      2) A victim stuffed under the dashboard with head injuries and respiration difficulty
      3) Multiple victims with multiple injuries with limited access
   e) Make decisions using common sense based on individual circumstances
      1) Follow rules, if possible
      2) Do not kill your victim doing it!

IX. TOOLS FOR SIMPLE EXTRICATION
   A. Cutting tools
      1. Air chisel
      2. Hacksaw

What tools are used for simple extrication situations?
### Pulling, prying, and spreading tools

<table>
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<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>3. Straight blade screwdriver</td>
<td></td>
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<tr>
<td>4. Bolt cutter</td>
<td></td>
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<tr>
<td>5. Linoleum knife</td>
<td></td>
</tr>
</tbody>
</table>

B. Pulling, prying, and spreading tools

| 1. Chains and chain sets | |
| 2. Cable come-along | |
| 3. Jacks | |
| 4. Pry axe | |
| 5. Porto-power | |
**SUMMARY:**

Review the phases of vehicle extrication: size-up, hazard control, new vehicle technology, hazards airbags, support operations, gaining access, emergency care, disentanglement, and removal. Emphasize safety requirements of all phases. Stress that common sense must prevail, such as rule of thumb guidelines; each accident is different and constantly changing; do the job the easiest way possible; and safety of the fire fighter is paramount. Review the different tools for simple extrication.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4 in order to prepare yourself for the upcoming quiz. Study for our next session.
TOPIC: VEHICLE ANATOMY

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of vehicle anatomy by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Principles of Vehicle Extrication, IFSTA, Second Edition
- Vehicle Rescue, Brady, Second Edition

PREPARATION: Modern day vehicles come in various types or design. It is important for emergency personnel to be familiar with all types of vehicles. Although many new technical features within these vehicles are designed to reduce injuries to the passengers, the same features pose an extreme safety threat to the rescuer.
# I. PASSENGER VEHICLE

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<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td><strong>A.</strong> Automobile, sport utility vehicle, minivan and pickup truck</td>
<td>What types of vehicles have airbags?</td>
</tr>
<tr>
<td>1. Safety features</td>
<td></td>
</tr>
<tr>
<td>a) Airbags, location, curtains</td>
<td></td>
</tr>
<tr>
<td>1) Most 1998 and newer vehicles contain airbags</td>
<td></td>
</tr>
<tr>
<td>b) Absorbing bumpers, loaded bumpers</td>
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<tr>
<td>c) Side impact rails</td>
<td></td>
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<tr>
<td>d) Batteries</td>
<td></td>
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<tr>
<td>1) How many?</td>
<td></td>
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<tr>
<td>2) In what locations?</td>
<td></td>
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<tr>
<td>2. Kinematics of injury</td>
<td></td>
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<tr>
<td>3. Vehicle stabilization</td>
<td></td>
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<tr>
<td>4. Gaining access</td>
<td></td>
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<tr>
<td>5. Extrication progress</td>
<td></td>
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<tr>
<td>6. Surrounding hazards</td>
<td></td>
</tr>
<tr>
<td>a) Overhead power lines</td>
<td></td>
</tr>
<tr>
<td>b) Fuel leaks</td>
<td></td>
</tr>
<tr>
<td>c) Other vehicles</td>
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<th>APPLICATION</th>
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</table>

<p>| B. Passenger bus | |
|------------------|
| 1. School, transit, and commercial | |
| a) Size-up | |
| b) Victim assessment | |
| 1) Triage | |</p>
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>
| c) Stabilization  
   1) Cribbing, airbags, etc. | How should you gain access to a school bus? |
| d) Gaining access  
   1) Emergency doors can be accessed from outside  
   2) Emergency door opening button  
   3) Window, roof hatch | |
| e) Extrication progress | |

C. Medium/heavy trucks  
1. Straight trucks, truck/semi-trailer combinations, and specialty trucks  
   a) Truck anatomy | What types of trailers are there? |
   b) Trailer anatomy  
      1) Box/livestock | |
   c) Stabilization | |
   d) Gaining access  
      1) Windows  
      2) Doors | |
   e) Third-door conversion | |

D. Railcar  
1. Passenger/freight  
   a) Types  
      1) Locomotives  
      2) Passenger cars | How many types of railcars are there? |
3) Food service cars
4) Baggage
5) Tank/box

2. Anatomy
   a) Electrical hazards
      1) Jumper cables connect cars
      2) Fuel hazards

3. Size-up
   a) Scene
      1) Types involved
      2) Request additional resources
   b) Vehicle
      1) Hazardous materials on board
      2) Shutdown fuel system
   c) Victim
      1) Triage

4. Stabilization
   a) Railroad ties make good cribbing
   b) Heavy shoring may be needed

5. Gaining access
   a) Elevated platform
   b) Locomotive entry
   c) Passenger car door entry
   d) End door entry

What can be used for cribbing when working with railcars?

How can a person work alongside a railcar?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>e) Window entry</td>
<td></td>
</tr>
<tr>
<td>f) Roof/wall entry</td>
<td></td>
</tr>
<tr>
<td>E. Industrial/Agricultural</td>
<td></td>
</tr>
<tr>
<td>1. Tractors/forklifts/cranes</td>
<td></td>
</tr>
<tr>
<td>a) Top heavy</td>
<td></td>
</tr>
<tr>
<td>b) Anatomy</td>
<td></td>
</tr>
<tr>
<td>1) Operational controls</td>
<td></td>
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<tr>
<td>2) Fuels</td>
<td></td>
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<tr>
<td>• LPG</td>
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<tr>
<td>• Diesel</td>
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<tr>
<td>c) Size-up</td>
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</tr>
<tr>
<td>d) Stabilization</td>
<td></td>
</tr>
<tr>
<td>e) Gaining access</td>
<td></td>
</tr>
</tbody>
</table>

What potential problem is faced when using a tractor or forklift?
SUMMARY:

Fire fighters need to be aware of vehicle anatomy. Emergency workers are subject to responding to various types of vehicle extrication assignments. Take every opportunity to become familiar with various vehicle types and anatomy.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: NEW VEHICLE SAFETY SYSTEMS

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of new vehicle safety systems by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 5

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Principles of Vehicle Extrication, IFSTA, Second Edition
- Vehicle Rescue, Brady, Second Edition

PREPARATION: Vehicle airbags and energy absorbing bumpers can reduce injuries to passengers, but also cause injuries to emergency personnel if not properly respected. New high strength metals can make extrication more difficult and can damage tools. The ability to recognize these systems and their characteristics will allow the fire fighter to perform safer and more efficient extrications.
I. VEHICLE AIRBAG

A. Deployed airbag is usually safe
   1. Dust residue from deployed airbags can be hazardous if it contacts the skin or is inhaled
      a) Use appropriate personal protective equipment

B. Types of airbag systems
   1. Supplemental Restraint Systems (SRS)
   2. Side Impact Protection Systems (SIPS)
   3. Head Protection Systems (HPS)
   4. Knee bolsters
   5. Seat belt pretensioners

C. Undeployed airbags
   1. Steering wheel
   2. Inflatable tube/side airbags
   3. Window curtain
   4. 1998 and newer vehicles can have 1-11 airbags

D. Disabling the airbag
   1. Disconnect battery

   2. Some models stay active for up to 30 minutes after power is disconnected

What hazard does a deployed airbag present?

How long can some airbag systems stay active after the power is disconnected?
II. ENERGY ABSORBING BUMBERS  
A. 1974 and newer  
B. Avoid direct contact in front or back of vehicle if on fire  

III. ROLL BARS/CAGES  
A. Can add to the challenge of extrication, due to new tensile strength  
B. Take precautions to avoid damaging rescue tools  
   1. Cutter blade  
   2. Spreader tips
SUMMARY:

Fire fighters need to be aware of vehicle safety systems in newer vehicles. Be familiar with the manufacturer's information and specification materials provided to emergency personnel. Take every opportunity to become familiar with various vehicle safety systems.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.


**TOPIC:** VEHICLE ACCIDENT SIZE-UP

**TIME FRAME:** 1:00

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-4.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the components of vehicle accident size-up by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fire Service Rescue Practices*, IFSTA, Fifth Edition, Chapter 9

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**
- "Collision Rescue II" video, Media Distributors
- *Essentials of Fire Fighting*, IFSTA, Fourth Edition
- *Principles of Extrication*, IFSTA, First Edition

**PREPARATION:** Proper size-up of a vehicle accident scene sets the tone for the incident operation. Thorough size-up will provide firefighters with the knowledge to make good decisions. This will limit further injury to victims and prevent injury to emergency personnel.
When does the size-up process begin?

I. SIZE-UP

A. During dispatch

1. Information received during alarm is important to the success of operation and will aid in the overall size-up
   a) Location of accident
      1) Interstate freeway
      2) Rural road
      3) Street
      4) Highway
   b) Types of vehicles
      1) Car
      2) Truck
      3) Bus
   c) Number of vehicles
   d) Condition of vehicles
      1) Rear end collision
      2) Rollover
      3) Side impact
      4) Over the side
      5) Head on
      6) High speed
   e) Number of people injured, types of injuries
   f) Any special hazards
      1) Power lines down
      2) Fire
      3) Fuel leaks
B. While en route
   1. Day of the week
   2. Time of the day
   3. The weather
   4. Detours
   5. Railroads
   6. Bridges and tunnels
   7. Schools

C. Upon arrival
   1. First assure the safety of your own equipment
      a) Seek safe place for your apparatus
         1) Use your apparatus as your "safety shield"
            • Place it between you and oncoming traffic
         b) Consider traffic, roadway known hazards, wind condition
            1) Rain
            2) Fog
            3) Smoke
            4) Fire

2. Traffic
   a) Consider number of lanes blocked, limitations of access for other responding units
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Virtually unlimited effects</td>
<td></td>
</tr>
<tr>
<td>c) Consider traffic control</td>
<td></td>
</tr>
<tr>
<td>1) Immediate request for traffic control early can pay off later</td>
<td></td>
</tr>
<tr>
<td>d) Personnel safety</td>
<td></td>
</tr>
<tr>
<td>1) Never, ever turn your back on oncoming traffic</td>
<td></td>
</tr>
<tr>
<td>e) Exiting the apparatus on the &quot;traffic side&quot; can be very hazardous</td>
<td></td>
</tr>
<tr>
<td>1) Be aware at all times</td>
<td></td>
</tr>
<tr>
<td>3. Roadway</td>
<td></td>
</tr>
<tr>
<td>a) Consider parking vehicles on shoulder, driveway, or service road</td>
<td></td>
</tr>
<tr>
<td>1) Weather and shoulder conditions have to be considered</td>
<td></td>
</tr>
<tr>
<td>4. Hazards</td>
<td></td>
</tr>
<tr>
<td>a) Power pole with wires down</td>
<td>What overhead hazard may be encountered at a vehicle accident?</td>
</tr>
<tr>
<td>1) Always treat as live (hot) wires</td>
<td></td>
</tr>
<tr>
<td>b) Establish danger zone</td>
<td></td>
</tr>
<tr>
<td>c) Burning vehicles</td>
<td></td>
</tr>
<tr>
<td>1) Maintain 100 feet distance when parking rescue unit</td>
<td></td>
</tr>
<tr>
<td>2) Beware of traffic traveling through the smoke, they can't see emergency personnel</td>
<td></td>
</tr>
<tr>
<td>d) Chemical leaks</td>
<td></td>
</tr>
<tr>
<td>1) Position unit upwind</td>
<td></td>
</tr>
<tr>
<td>2) Position unit upgrade</td>
<td></td>
</tr>
</tbody>
</table>
3) Deny entry until chemical/Haz Mat personnel mitigate the leak

  e) Explosives
     1) Request haz mat, law enforcement, etc.
     2) Position unit up to 2,000 feet from involved vehicles
     3) Follow DOT/FRO protocol in identifying a safe distance for emergency personnel

5. Verify the information

   a) Location
   b) Types and number of vehicles involved
   c) Number of people injured and extent of injuries
   d) Special hazards
   e) It is imperative that the above information be transmitted to the communications center to expedite the response of additional emergency units

What additional resources may be required at a vehicle accident?

1) Police
   - Traffic control
   - Evaluation

2) Ambulance, helicopter
   - Basic life support or advanced life support

3) Utilities
   - Gas
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Power company</td>
<td></td>
</tr>
<tr>
<td>• Telephone</td>
<td></td>
</tr>
<tr>
<td>4) Hazardous Materials Unit</td>
<td></td>
</tr>
<tr>
<td>• Local Haz Mat team</td>
<td></td>
</tr>
<tr>
<td>• Authority/agency</td>
<td></td>
</tr>
<tr>
<td>5) Hospital notification</td>
<td></td>
</tr>
<tr>
<td>• To prepare for multicasualty incident</td>
<td></td>
</tr>
<tr>
<td>• They may receive multiple patients</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:
A complete size-up of an emergency scene will ensure the systematic, thorough, and safe mitigation of the situation. It is unsafe and very dangerous at times to wait until the first units arrive to order resources. Based on a good report and information upon dispatch, be proactive and prepare by ordering resources early. You can always cancel them en route.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Fire Service Rescue Practices, IFSTA, Fifth Edition, Chapter 9 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: PRINCIPLES OF VICTIM DISENTANGLEMENT

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the principles of victim disentanglement by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fire Service Rescue Practices, IFSTA, Fifth Edition, Chapter 9

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Essentials of Fire Fighting, IFSTA, Second Edition
- Fire Service Rescue Practices, IFSTA, Fifth Edition
- Principles of Extrication, IFSTA, First Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition

PREPARATION: Removing a victim from a vehicle accident can be challenging. Is the victim stabilized? Are support operations in place? Can we gain access to the victim or victims? The fire fighter must recognize the need to determine a systematic approach to victim disentanglement that provides safety for the rescuers as well as those being rescued.
# I. VEHICLE STABILIZATION

A. Safety for fire fighters

B. Safety for victims

C. Safety for bystanders/support personnel

# II. DISENTANGLEMENT PROCESS

A. Unnecessary if
   1. Vehicle has minor damage
   2. Doors can be opened
   3. Seats can be moved in usual manner

B. Necessary if
   1. Victims have minor or major injuries
   2. Vehicle has major damage
   3. No access to victim or victims

C. The proper action for the fire fighters is not to disentangle the victim from the vehicle, but to remove the vehicle from the victim

# III. METHODS OF DISENTANGLEMENT

A. Disassembly
   1. Removal of nuts, bolts, and fasteners that hold parts together

   a) Least desirable
      1) Vehicle components too oxidized
      2) Vehicle sheet metal too distorted
      3) Necessary tools unavailable
      4) Labor intensive
### B. Distortion
1. Forcible twisting of vehicle components
   a) Forcing door open
   b) Raising roof

### C. Displacement
1. Movement or removal of a vehicle component from one point to another
   a) Seat removal
   b) Windshield removal

### D. Severance
1. Process of cutting vehicle components so that they can be removed
   a) Door post to remove roof

---

What tools can we use to accomplish these operations?

1) Screwdrivers
2) Pliers
3) Pry bars
4) Hand winches
   • Come-along
5) Hydraulic rescue tools
   • High and low pressure
6) Mechanical jacks
7) Airbags
   • Low pressure
   • High pressure
8) Hacksaw
9) By-pass pruning shears
   • To cut windshield
10) Reciprocating saw

IV. GAINING ACCESS

A. Victim protection
   1. Protective covering
      a) Blankets
      b) Salvage covers
      c) Spine boards

B. Enlarge working area
   1. Open area so fire fighters can enter with rescue tools
   2. Ample working space
   3. Permit removal of victim(s)

4. Common openings include
   a) Windows
   b) Doors
   c) Roof

What are some openings that are easily available to the fire fighter?
SUMMARY:

These methods of disentanglement will provide the fire fighter with a safe and efficient process to gain access to and remove the victim from an automobile accident.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fire Service Rescue Practices, IFSTA, Fifth Edition, Chapter 9 in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO STABILIZE A VEHICLE ON ITS WHEELS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Various types/sizes of cribbing, adjunct tools and equipment as needed, vehicle prop, and appropriate personal protective equipment

Behavior: The student will stabilize a vehicle on its wheels

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Various types/sizes of cribbing
- Adjunct tools and equipment as needed
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4
- Vehicle Rescue, Brady, Second Edition, Chapter 5

PREPARATION: Before any type of vehicle rescue operation can take place, the fire fighter must stabilize the vehicle to provide safety for themselves and the victim(s).
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place stabilization equipment</td>
<td>1a. Under vehicle to immobilize suspension</td>
</tr>
<tr>
<td></td>
<td>b. Frame strong point</td>
</tr>
<tr>
<td></td>
<td>c. Door strong point</td>
</tr>
<tr>
<td></td>
<td>d. Over as wide an area as possible</td>
</tr>
<tr>
<td>2. Deflate all four tires</td>
<td>2a. Last resort</td>
</tr>
<tr>
<td></td>
<td>b. After cribbing is in place</td>
</tr>
<tr>
<td></td>
<td>c. Without cutting sidewall</td>
</tr>
<tr>
<td>3. Snip off valve stems</td>
<td>3a. With wire cutters</td>
</tr>
<tr>
<td>4. Pull stems out</td>
<td>4a. With pliers</td>
</tr>
<tr>
<td>5. Remove valve core</td>
<td>5a. With commercial tool</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO STABILIZE A VEHICLE ON ITS SIDE

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Various types/sizes of cribbing, adjunct tools and equipment as needed, vehicle prop, and appropriate personal protective equipment

Behavior: The student will stabilize a vehicle on its side

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Various types/sizes of cribbing
- Adjunct tools and equipment as needed
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

PREPARATION: Before any type of vehicle rescue operation can take place, fire fighters must stabilize the vehicle to provide safety for both themselves and the victim(s).
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Determine amount of stabilization required | 1a. Contact points from vehicle to ground or other hard surface  
  b. Contact points spread over as wide an area as possible |
| 2. Place stabilization equipment | 2a. At roof side  
  b. Between front door post and ground  
  c. Between rear door post and ground  
  d. At roof line |
| 3. Place stabilization equipment | 3a. At undercarriage side  
  b. Between frame and ground  
  c. At firewall  
  d. At rear deck edge |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

TOPIC: HOW TO STABILIZE A VEHICLE ON ITS ROOF

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Various types/sizes of cribbing, adjunct tools and equipment as needed, vehicle prop, and appropriate personal protective equipment

Behavior: The student will stabilize a vehicle on its roof

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Various types/sizes of cribbing
- Adjunct tools and equipment as needed
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4
- Vehicle Rescue, Brady, Second Edition, Chapter 5

PREPARATION:

Before any type of vehicle rescue operation can take place, fire fighters must stabilize the vehicle to provide safety for both themselves and the victim(s).
## OPERATIONS

1. Determine amount of stabilization required
2. Place stabilization equipment

## KEY POINTS

1a. Contact points from vehicle to ground or other hard surface
   b. Contact points spread over as wide an area as possible

2a. Where needed
   b. At roof supports to relieve ground to vehicle contact
   c. At least three points of ground to vehicle contact
   d. Hood deck edge
   e. Firewall strong point
   f. Rear roof deck line
   g. Rear deck edge
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO REMOVE AN ADHESIVE MOUNTED VEHICLE WINDSHIELD, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Various adjunct rescue tools, vehicle prop, and appropriate personal protective equipment

Behavior: The students will remove an adhesive mounted vehicle windshield using the two-person method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED: • Job breakdown
• Various adjunct rescue tools
• Vehicle prop
• Appropriate personal protective equipment

REFERENCES: • "Car Busters" video series, Film Communicators
• "Collision Rescue II" video, Media Distributors
• Essentials of Fire Fighting, IFSTA, Fourth Edition
• Extrication Principles and Vehicle Design, Mosby, 1999 Edition
• Fire Service Rescue Practices, IFSTA, Fifth Edition, Chapter 9
• Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

PREPARATION: Entry and rescue through vehicle windshields may, in some situations, be impractical, but in most cases, it can be the easiest and quickest way to get to the victim(s). Fire fighters must recognize the fact that windshield removal will facilitate most extrication and disengagement challenges.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Create an access hole</td>
<td>1a. In the center top of windshield</td>
</tr>
<tr>
<td></td>
<td>b. Using appropriate tool</td>
</tr>
<tr>
<td>2. Cut windshield</td>
<td>2a. Back to &quot;A&quot; post</td>
</tr>
<tr>
<td>3. Continue to cut windshield</td>
<td>3a. Down &quot;A&quot; post, to the hood</td>
</tr>
<tr>
<td></td>
<td>b. Fire Fighter #2 supporting windshield</td>
</tr>
<tr>
<td>4. Repeat Operations 2 and 3</td>
<td>4a. On opposite side</td>
</tr>
<tr>
<td>5. Pull top of windshield</td>
<td>5a. Out and down</td>
</tr>
<tr>
<td></td>
<td>b. Laying the windshield onto hood</td>
</tr>
<tr>
<td>6. Remove windshield</td>
<td>6a. Windshields removed in this method will normally release upon folding down</td>
</tr>
<tr>
<td></td>
<td>b. To safe area</td>
</tr>
<tr>
<td></td>
<td>c. Away from vehicle</td>
</tr>
</tbody>
</table>
APPLICATION:
The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO REMOVE A CHANNEL MOUNTED VEHICLE WINDSHIELD, TWO-PERSON METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Various adjunct rescue tools, vehicle prop, and appropriate personal protective equipment

Behavior: The students will remove a channel mounted vehicle windshield

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Various adjunct rescue tools
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:
- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4
- Vehicle Rescue, Brady, Second Edition

PREPARATION:
Entry and rescue through vehicle windshields may, in some situations, be impractical. However, in most cases it can be the easiest and quickest way to get to the victim(s). Fire fighters must recognize the fact that windshield removal will facilitate most extrication and disengagement challenges.
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</tr>
</thead>
<tbody>
<tr>
<td>1. Remove wiper</td>
<td>1a. Peeling back</td>
</tr>
<tr>
<td></td>
<td>b. Away from windshield</td>
</tr>
<tr>
<td>2. Remove chrome stripping</td>
<td>2a. Using appropriate tool</td>
</tr>
<tr>
<td>3. Insert cutting tool</td>
<td>3a. Through rubber channel</td>
</tr>
<tr>
<td>4. Cut rubber</td>
<td>4a. Starting at midpoint and working towards slide</td>
</tr>
<tr>
<td></td>
<td>b. Fire Fighter #2 supporting windshield</td>
</tr>
<tr>
<td>5. Repeat Operations 1-4</td>
<td>5a. On opposite side</td>
</tr>
<tr>
<td>6. Push windshield</td>
<td>6a. Out from inside of vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Gently</td>
</tr>
<tr>
<td>7. Remove windshield</td>
<td>7a. To safe area</td>
</tr>
<tr>
<td></td>
<td>b. Away from vehicle</td>
</tr>
</tbody>
</table>
APPLICATION:

The students will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The students will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPEN A VEHICLE ROOF USING AN AIR CHISEL

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: An air chisel and accessories, compressed air cylinders, adjunct tools and equipment as needed, vehicle prop, and appropriate personal protective equipment

Behavior: The student will open the roof of a vehicle using an air chisel

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Air chisel and accessories
- Compressed air cylinders
- Adjunct tools and equipment as needed
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Firefighter's Handbook, Delmar, 2000, Chapter 16
- Principles of Extrication, IFSTA, First Edition, Chapter 5
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

PREPARATION: When the fire fighter comes upon a vehicle on its side and ordinary measures such as opening doors are not available, going in through the roof after first stabilizing the vehicle may be the best option. This approach will save time and provide a wide, safe access to the victim, thus making the fire fighter's job an easier one.
### OPERATIONS | KEY POINTS
---|---
**CAUTION:** Be sure vehicle is stabilized on its side before beginning operation. &
1. Place air chisel, air cylinder, tools, and equipment &
   1a. Near work area &
   b. Avoiding debris, mud, foot traffic &
   c. Safely &
2. Assemble components for use &
   2a. When installing or replacing chisels in air hammer, disconnect from air source first &
3. Make two vertical cuts &
   3a. Using appropriate tool &
4. Make one horizontal cut &
   4a. Using appropriate tool &
   b. 1½-2 inches from rain gutter &
   c. Parallel to vertical cuts angled in at bottom &
5. Fold roof down &
   5a. Using appropriate tool &
   b. Toward the ground &
   c. Aware of sharp edges &
6. Cut and remove roof struts &
   6a. Using air chisel &
   b. Safely &
7. Remove roof &
   7a. To safe area &
   b. Away from vehicle
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF LIGHT RESCUE HAND TOOLS

**TIME FRAME:** 2:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-4.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of the characteristics and functions of light rescue hand tools by completing the written test

**Standard:** With a minimum 80% accuracy according to the information contained in the *Principle of Vehicle Extrication*, IFSTA, Second Edition, Chapter 3

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Chains
- Come-along
- Ratchet jack

**REFERENCES:**

**PREPARATION:** Many accident victims can be extricated quickly and safely using simple hand tools. If your powered rescue tool fails to start or a seal fails, you may have to rely on hand tools. You can accomplish the same objective, freeing a trapped victim, with different equipment. The utilization of simple tools in extrication can be both rapid and effective, but as always, your safety is paramount in any rescue operation.
I. INTRODUCTION

A. Mechanical advantage
   1. The ability to gain access to or disentangle victims is often greatly aided by the use of leverage or other forms of mechanical advantage
   2. Results of all actions should be considered first
      a) "For every action... there is a reaction"

   1) Stabilization
   2) Access
   3) Disentanglement

   b) Push, pull, spread or whatever, take a second and take a look
      1) What is going to happen if you push here or pull there?
      2) Something else may be moving where you do not want it
      3) Try to look at the total effect your actions might have before you take them

B. Equipment
   1. Chains
   2. Come-along
   3. Jacks

II. CHAINS

A. A frequently used tool in mechanical advantage systems, but seldom understood

B. Grades
   1. Expressed as numbers
      a) Series 70 or Series 80
### Characteristics And Functions Of Light Rescue Hand Tools

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>

2. Manufacturers have many different names and numbers

3. Working strength of the chain is very important
   a) Do not exceed it!
   b) The assumption that a chain is a chain, and the bigger the better, is **not true**

4. Know what you want to use it for and the load requirements before selecting it
   a) What is it designed for?
   b) What is its working strength?
   c) What condition is it in?
   d) Size of chain is determined by diameter of rod forming the links

C. Hardware

1. Design
   a) For heaviest grade of chain
   b) For specific chain size
      1) 5/16-inch hardware is for 5/16-inch chain, not ¼-inch or ⅜-inch

2. Safety
   a) Use hardware the way it was designed
      1) Especially hooks
      2) Do not place hooks so that load is placed on tip
         • Load should be in bottom of throat
      3) The load should not pull at too great an angle from the long axis of the hook if it is connected directly to the anchor and bind

If a bigger chain also stronger and better?
4) This would load the hook along the shaft rather than in the bottom of the throat

3. Types
   a) Grab hook
      1) Designed to do just that, grab the chain
      2) Has a narrow throat to fit chain and not slip
   b) Slip hook
      1) Designed to slide along chain to allow chain to tighten around object
      2) Has a wide, rounded throat
   c) Master link
      1) A ring that can be in various shapes (pear, round, oval) and various sizes
      2) Used as a pulling point in chain sets

D. Inspection

   1. Check the links
      a) Distortion (out of shape)
      b) Worn spots (ground down or cut)
      c) Cracks
   2. Check the overall length for damage due to overloading
      a) Compare the original measurement (when the chain was new) with its current measurement
         1) Original measurement should be recorded on metal tag on chain or in a log

What do you look for when inspecting chain?
b) May seem unimportant, but is the only way to detect this type of compound damage due to excessive loading
   1) A difference of as little as \( \frac{1}{8} \) inch indicates that overloading has occurred
   2) Will even indicate otherwise undetectable damage to a number of links

 c) How to measure
   1) Lay chain on flat surface
   2) Stretch out straight
   3) Pull tight
   4) Measure from end link to end link
      - As accurate as possible
      - Do not measure the hooks
   5) Record measurements and date taken in a log

d) When to measure
   1) Any time it is felt the chain may have been overloaded
      - Any deviation in length should be carefully evaluated as to possible damage to its serviceability and safety
      - If there is any doubt, it should be replaced
   2) At a regular inspection interval
E. Tow chains
   1. Found on most emergency apparatus
   2. Hardware
      a) 5/16-inch or 3/8-inch chain
      b) 15-25 feet long
      c) Has some combination of grab and/or slip hooks on its ends
   3. Use
      a) By wrapping chains around objects or hooking directly to objects with hooks
      b) Can be made adjustable

F. Chain sets
   1. Found in pairs
      a) One long chain
         1) Usually 10-12 feet in length
      b) One short chain
         1) Usually 5 feet in length
   2. Hardware
      a) Same on both
      b) Slip hook on one end
      c) Master link on other end
         1) Grab hook attached to it
   3. Identification of different lengths
      a) Hooks and master link on long and short chains painted different colors
      b) Master links on long and short chains are generally a different shape
         1) Round on short chain
         2) Oval on long
4. **Use**
   a) With slip hook end of chain
      1) Take one or two wraps around object
      2) Hook slip hook on chain
   b) With grab hook/master link end of chain
      1) Adjust master link to obtain correct length
      2) Hook grab hook on chain

### III. COME-ALONG

A. Portable cable winch operated by a manual ratchet

   1. Also known as a hand winch

B. Excellent tool for gaining mechanical advantage in a variety of pulling operations

C. **Features**

   1. Light and heavy duty stamped steel or cast housings
   2. Pulling capabilities depending on model
      a) Usually from 2,000-6,000 pounds
   3. Cable lengths vary depending on model
      a) 10-50 feet
      b) Chain up to 20 feet

D. **Basic construction**

   1. Mainframe
      a) Holds mechanism together
      b) Cast aluminum or stamped steel construction
      c) Cheaper cable come-alongs usually have frames that are not as strong as the cable
2. **Drum**
   a) Holds cable
   b) Has teeth on one side for spooling cable in and out
   c) Most hold an average of 20-25 feet of cable

3. **U-frame**
   a) Moves back and forth to spool cable in and out

4. **Cable shield**
   a) Helps cable spool evenly
   b) Keeps cable tight on drum

5. **Mainframe pawl**
   a) Keeps cable from spooling out
   b) Used to free spool cable out under load

6. **Reverse lever**
   a) Located on U-frame
   b) Controls direction of cable movement when the U-frame is actuated

7. **Safety handle**
   a) Used to give leverage in actuating the U-frame
      1) Spooling cable in and out
   b) Designed to fail (bend) before the come-along's capacity is exceeded
      1) Do not substitute pipe or other materials
      2) Will not provide safety factor
      3) Could exceed the capacity of the come-along
8. Cable
   a) Carries the load
   b) Safety
      1) Must wear gloves
         • Injury from broken strands
      2) Use a hand-over-hand method
         • Do not slide through hands
         • Can catch on broken strands
   c) Check for defects
      1) Flat spots
         • At its strongest if round and strands can interact with each other when a load is applied
      2) Worn spots
      3) Broken strands

9. Cable guide
   a) Keeps cable in alignment with the drum

10. Mainframe hook
    a) Hook at end of mainframe used to attach to an object
    b) Usually a slip hook

11. Hook (cable end)
    a) Attaches cable end to
       1) A load
       2) An anchor
       3) The mainframe
    b) Usually a slip hook

12. Snatch block
    a) Pull with a slip hook attached
    b) Used to
### PRESENTATION

1) Increase mechanical advantage
2) Change direction of cable

### APPLICATION

What does "load" refer to?

**a)** Load
   1) The object to be moved

What does "anchor" refer to?

**b)** Anchor
   1) The object to attach the come-along to that will not move when the load is pulled

### E. Pulling operation set-up

1. Terminology

#### What does "load" refer to?

**a)** Load
   1) The object to be moved

#### What does "anchor" refer to?

**b)** Anchor
   1) The object to attach the come-along to that will not move when the load is pulled

2. Procedure

#### a) Collect all needed equipment

1) Come-along
2) Handle
3) Chains
4) Cribbing, if needed

#### b) Wrap chain around anchor and secure

#### c) Wrap chain around load and secure

1) Adjust to length

#### d) Hook cable to load, single line versus double line pull

1) Single line pull
   - Hook at end of cable attached to load come-along
   - Will only function at half its rated capacity, usually 2,000 pounds (1 ton)
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>• Will have twice the reach of double line</td>
<td></td>
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<tr>
<td>• Moves the load at 1:1 ratio; for every 1 foot of cable spooled in, the load will move 1 foot</td>
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<tr>
<td>2) Double line pull</td>
<td></td>
</tr>
<tr>
<td>• Hook at end of cable is attached to end of mainframe or other anchor</td>
<td></td>
</tr>
<tr>
<td>• Load is attached to hook on snatch block come-along</td>
<td></td>
</tr>
<tr>
<td>• Will function at total rated capacity, usually 4,000 pounds (2 tons)</td>
<td></td>
</tr>
<tr>
<td>• Has only half the reach of single line</td>
<td></td>
</tr>
<tr>
<td>• Moves the load at a 2:1 ratio</td>
<td></td>
</tr>
<tr>
<td>e) Free spool cable out</td>
<td></td>
</tr>
<tr>
<td>1) Reverse lever in lowering/backing off position</td>
<td></td>
</tr>
<tr>
<td>2) Hold mainframe by sides</td>
<td></td>
</tr>
<tr>
<td>3) Release mainframe pawl with thumb</td>
<td></td>
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</tbody>
</table>

What do we mean by a 2:1 ratio?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Pull come-along towards anchor paying out cable</td>
</tr>
<tr>
<td>• Avoid pulling cable off drum without load</td>
</tr>
<tr>
<td>• Doing this will loosen the cable on the drum</td>
</tr>
<tr>
<td>• Cable could cross and cause wedging on drum or damage when a load is applied to the cable</td>
</tr>
<tr>
<td>5) Put out enough cable</td>
</tr>
<tr>
<td>• You can only bring in as much cable as you put out</td>
</tr>
<tr>
<td>• Keep the chains to the load and anchor adjusted short</td>
</tr>
<tr>
<td>• Provides the maximum cable length and potential for load movement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>f) Hook mainframe hook to anchor</td>
</tr>
<tr>
<td>g) Adjust chain to length and hook</td>
</tr>
<tr>
<td>h) Protect cable, snatch block, and mainframe</td>
</tr>
<tr>
<td>1) Things to avoid</td>
</tr>
<tr>
<td>• Sharp bends in cable can flatten or otherwise damage the cable (cable has its greatest strength when it is round)</td>
</tr>
<tr>
<td>• Lengthen chains to load or anchor to avoid damage to the cable or place cribbing to remove bend</td>
</tr>
<tr>
<td>2) Keep hooks facing up</td>
</tr>
</tbody>
</table>
Why should hooks face up?

- They will not catch on anything

3) Do not place the mainframe in a bind
   - Load should be transmitted straight through the long axis of the mainframe; placing it in a bind could damage it
   - Place cribbing under or lengthen the anchor chain to correct

4) In general, the pull should be as straight as possible from the mainframe hook to the load end of the cable
   - Install handle
   - Place reverse lever in pulling/lifting position
   - Start pulling operation

F. Lowering/backing off requires load of about 15 pounds or more than the load on the drum
   1. Move reverse lever to lowering/backing off position
   2. Move handle towards load until it disengages mainframe pawl
      - You should hear it click
   3. Move handle towards mainframe hook
      - You should hear another click as the U-frame pawl disengages
      - Repeat process
## PRESENTATION

<p>| | |</p>
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>4.</td>
<td>Considerations for slacking cable</td>
</tr>
<tr>
<td></td>
<td>a) Move handle smoothly</td>
</tr>
<tr>
<td></td>
<td>1) Do not slam it back and forth</td>
</tr>
<tr>
<td></td>
<td>b) Most come-alongs will only lower/back off one tooth at a time</td>
</tr>
<tr>
<td></td>
<td>c) Do not try to release mainframe pawl while come-along is under load</td>
</tr>
</tbody>
</table>

### Why should you not try to release the mainframe pawl while come-along is under load?

1) This could result in uncontrolled release of cable

### G. Maintenance considerations

1. Keep the come-along clean
2. Lubricate as recommended by manufacturer

### Why should the cable be kept tight on the drum?

3. Keep the cable on the drum neat and tight
   a) This will avoid potential wedging or damage to cable
   b) Apply about 10-pound load at cable end while rewinding cable
4. Check mainframe and other parts for damage
5. If the handle is removable, carry a spare
IV. RATCHET JACK

A. Also known as high-lift jack

B. Uses
   1. Clamp
      a) Develops approximately 750-pound force
   2. Winch (come-along)
      a) Develops approximately 7,000-pound force
   3. Jack
      a) Develops approximately 7,000-pound force in the first two-thirds of the jack stand

C. Available in a number of models
   1. Usually from 42-62 inches in height

D. A very valuable and cost-effective tool
   1. Must be used with care
   2. Can be dangerous if used improperly

E. Basic construction
   1. Base plate
      a) Provides stability
   2. Head (lifting mechanism)
      a) Device that moves along standard to provide pulling, pushing, or lifting effect
   3. Standard (beam)
      a) Shaft along which the head moves
         1) Cast or forged construction
   4. Top handle
      a) Bolted to top of standard
      b) Placed perpendicular to standard for clamping operations
5. Handle for actuating lifting mechanism (head)

6. Shear pin bolt
   a) Protects the jack from overloading
   b) The load will not fall when it shears
   c) Replacement is necessary to move the load, usually a 5/16" x 2⅜" SAE Grade 2 bolt

7. Nose
   a) Part of head used for lifting
   b) Hole in underside for clevis for pulling operations

8. Climbing pins
   a) Common problem area
   b) Dirt, sand, etc., or lack of lubrication will cause the climbing pins to stick and fail to engage the standard

9. Reversing latch
   a) Found on side of head
   b) Controls direction the head travels when working under load

10. Extension tube
    a) Piece of rectangular steel tube with saddle welded on top for supporting loads
    b) Standard slips inside of tube and tube rests on top of head, as head moves up standard tube moves up
    c) Excellent stabilization tool
    d) Increases in length, decreases in capacity

F. Actuating lifting mechanism

1. To move up standard
   a) Move reverse lever to up position
b) Move handle down until you hear a click
   1) This is the climbing pin engaging

   c) Move the handle up until you hear another click
      1) This is the second climbing pin engaging

2. To move down standard

   a) With the reverse lever in the down position
   b) Operate the same as raising
   c) CAUTION: If the jack is not loaded to at least 100 pounds when lowering step by step, the head will automatically drop to the base level

   What are some of the safety considerations when lowering the load?

3. Safety

   a) Supporting the load
      1) While moving the handle down (in both raising and lowering), you are supporting the load
      2) Releasing the handle will result in the handle moving rapidly upward (depending on the load)

            If your grip on the handle slips, why will the handle fly upward?

   3) Avoid leaning over or straddling the handle, it could ruin your day
4) If someone is assisting the operation by holding the top of the standard, have them hold the top handle instead

b) Always make sure jack is stable before starting an operation
   1) Both at base/anchor and load

c) Avoid working under raised loads
   1) Use additional supports, cribbing, etc.

d) Do not push a load off the back

4. Operation as a winch
   a) Bolt top handle in a vertical position
   b) Chain to anchor
      1) Adjust length
      2) Connect to top handle
   c) Chain to load
      1) Adjust to length and to hole in nose
   d) Put reverse lever
      1) In up position to pull
      2) Down position to back off
   e) Actuate the jack for pulling

5. Using the jack for pulling
   a) Place jack in vertical position in line between anchor and load
      1) Position base closer to load than to anchor
      2) This will give more lifting effect
   b) Run chain(s) from the load to the anchor
   c) Put chain over nose of jack with head in lowest position
d) Adjust chain to length

e) Actuate lifting mechanism to pull load

1) If jack is not on line between load and anchor, it will want to tip

2) It also may be necessary to place cribbing or other material under the base to increase its area

V. HYDRAULIC, SCISSOR, AND BUMPER JACKS

A. These tools are readily available and can be used in the same manner as the ratchet jack (when used as a jack) but their capacity is low

B. The pull will not be as far, but after the jack is extended fully, it can be retracted, the chain tightened, and the jack raised again

C. The hydraulic jack requires the use of a saddle on top of the piston for the chain to rest in

1. This can be constructed with a short piece of pipe to go over the end of the piston with a curved piece welded on top if it is to hold the chain
**SUMMARY:**

Review pulling, spreading, and prying operations with light hand tools. Always be prepared to use your backup tool in the event your primary (power or hydraulic) tool fails.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Principles of Vehicle Extrication*, IFSTA, Second Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** HOW TO DISPLACE VEHICLE SEATS USING A COME-ALONG AND CHAINS

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 4-4.1 and SBFS

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A come-along, long and short rescue chains, seat belt cutters, adjunct tools and equipment as needed, vehicle prop, and appropriate personal protective equipment

- **Behavior:** The student will displace vehicle seats using a come-along and chains

- **Standard:** Completing all operations within __________ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- Come-along
- Long and short rescue chains
- Seat belt cutter
- Adjunct tools and equipment as needed
- Vehicle prop
- Appropriate personal protective equipment

**REFERENCES:**

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors

**PREPARATION:** Fire fighters may have to displace the front seat of a vehicle to gain working room or to relieve pressure on the victim. By doing so, the disentanglement process becomes an easier and more efficient evolution.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place come-along and chains</td>
<td>1a. Near vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td>2. Size-up situation</td>
<td>2a. Confirming seat mechanism is not working</td>
</tr>
<tr>
<td>3. Release or cut seat belt</td>
<td>3a. Using seat belt cutter, if needed</td>
</tr>
<tr>
<td></td>
<td>b. Near floor edge</td>
</tr>
<tr>
<td>4. Place come-along</td>
<td>4a. On trunk or side quarter panel</td>
</tr>
<tr>
<td></td>
<td>b. Securely</td>
</tr>
<tr>
<td>5. Release cable</td>
<td>5a. Using enough cable slack to reach chain</td>
</tr>
<tr>
<td>6. Attach short chain (with hooks)</td>
<td>6a. Passing under the seat and back over the front corner edge of the seat</td>
</tr>
<tr>
<td></td>
<td>b. Grab hook facing down</td>
</tr>
<tr>
<td></td>
<td>c. Eye hook attached to cable</td>
</tr>
<tr>
<td>7. Attach long chain (with hooks)</td>
<td>7a. To vehicle frame member</td>
</tr>
<tr>
<td></td>
<td>b. To come-along</td>
</tr>
<tr>
<td>8. Operate handle</td>
<td>8a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Seat will pull back and up</td>
</tr>
<tr>
<td>9. Stop pulling operation</td>
<td>9a. When seat is back to safe distance</td>
</tr>
<tr>
<td></td>
<td>b. When interior fire fighter(s) advise that the seat is back far enough</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISPLACE A STEERING WHEEL/COLUMN USING A COME-ALONG

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A come-along and accessories, adjunct tools and equipment as needed, vehicle prop with victim (mannequin), and appropriate personal protective equipment

Behavior: The student will displace a steering wheel/column using a come-along

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

• Job breakdown
• Come-along and accessories
• Adjunct tools and equipment as needed
• Vehicle prop with victim (mannequin)
• Appropriate personal protective equipment

REFERENCES:

• "Car Busters" video series, Film Communicators
• Fire Service Rescue Practices, IFSTA, Fifth Edition, Chapter 9
• Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 3

PREPARATION: The come-along is a valuable tool that can be used to pull a steering wheel/column when necessary in the disentanglement process. It is vital that fire fighters master its efficient operation since lives may be in the balance and time of the essence. The challenge of professionals is to stay abreast of their field and to maintain a high level of training.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
</table>
| 1. Place come-along, tools, and equipment | 1a. Near vehicle  
|                                  |   b. Avoiding debris, mud, foot traffic  
|                                  |   c. Safely  |
| 2. Cover victim                   | 2a. Completely  |
| 3. Remove or open windshield      | 3a. Using appropriate tool  |
| 4. Place chain                    | 4a. Under front of vehicle  
|                                  |   b. On anchor point  
|                                  |   c. Frame member, if possible  |
| 5. Position chain                 | 5a. Around steering wheel  
|                                  |   b. Double wrap, if possible  
|                                  |   c. Below tilting joint  |
| 6. Place come-along               | 6a. On hood of vehicle  
|                                  |   b. Anchoring to anchor chain  |
| 7. Place cribbing                 | 7a. As needed  
|                                  |   b. Under come-along body  
|                                  |   c. Sliding track crib  |
| 8. Extend cable                   | 8a. Open end of hook facing up  |
| 9. Secure cable hook              | 9a. To chain on steering column  |
| 10. Operate come-along            | 10a. Pulling steering column up  
|                                  |   b. Fire fighter(s) must remain "clear" of the “throw” of the come-along cable in the event the cable fails  |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO OPEN A VEHICLE DOOR USING PANEL CUTTERS AND A PRY BAR

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.3 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Panel cutters (manual or power), pry bar, hammer or mallet, vehicle prop, and appropriate personal protective equipment

Behavior: The student will open a vehicle door using panel cutters and a pry bar

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Panel cutters (manual or power)
- Pry bar
- Hammer or mallet
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:
- "Car Busters" (video series), Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Extrication, IFSTA, First Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4
- Vehicle Rescue, Brady, Second Edition

PREPARATION:
When considering any accident situation where the victims are trapped, the fire fighter must quickly determine the best available access. Opening or removing vehicle doors will make victim access and disentanglement that much easier.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place tools and equipment</td>
<td>1a. Near vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td>2. Determine access</td>
<td>2a. &quot;Try before you pry&quot; concept</td>
</tr>
<tr>
<td></td>
<td>b. Checking for unlocked doors</td>
</tr>
<tr>
<td>3. Open and expose locking mechanism</td>
<td>3a. With panel cutters</td>
</tr>
<tr>
<td></td>
<td>b. Using hammer/mallet to start cut (manual panel cutters)</td>
</tr>
<tr>
<td>4. Reach inside</td>
<td>4a. Exposed area</td>
</tr>
<tr>
<td></td>
<td>b. Safely</td>
</tr>
<tr>
<td></td>
<td>c. Avoiding sharp metal edges</td>
</tr>
<tr>
<td>5. Trip lock</td>
<td></td>
</tr>
<tr>
<td>6. Open door</td>
<td>6a. Using pry bar if door is jammed</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF HYDRAULIC RESCUE TOOLS

TIME FRAME: 2:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of manual and powered hydraulic rescue tools by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Manual hydraulic tools
- Powered hydraulic tools

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Rescue, IFSTA, Sixth Edition
- Forcible Entry, IFSTA, Seventh Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition

PREPARATION: There is a variety of hydraulic tools used for rescue and forcible entry. Proper operating procedures must be followed. In the event powered hydraulic tools fail due to mechanical problems, manual hydraulic tools can serve as valuable backup appliances. Safety, both the victims' and the rescuers', is of prime concern when operating these tools.
I. INTRODUCTION

A. Hydraulic principle allows development of tools to aid fire fighters with forcible entry and extrication tasks
   1. Cut
   2. Push
   3. Spread
   4. Brace
   5. Lift/raise

B. Can be operated by manual or powered hydraulics
   1. Powered hydraulic tools have revolutionized the process of removing victims
      a) Wide range of uses
      b) Speed
      c) Superior power

II. MANUAL HYDRAULIC TOOLS

A. Characteristics
   1. Manual hydraulic tools operate on the same principles as powered, except
      a) Hydraulic pump is manually powered by a rescuer operating a pump lever
   2. Range in capacity between 4-20 tons
   3. Disadvantage
      a) Operate slower
      b) Labor intensive

B. Types
   1. Porta-power tool system
      a) A commercial shop tool adopted by the fire service
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Can be used on a variety of situations because of the many different tool accessories</td>
<td></td>
</tr>
<tr>
<td>c) Operates by transmitting pressure from the manual hydraulic pump through a hydraulic hose to a tool assembly</td>
<td></td>
</tr>
<tr>
<td>d) Advantage</td>
<td></td>
</tr>
<tr>
<td>1) Can be operated in narrow places where a jack cannot fit or be operated</td>
<td></td>
</tr>
<tr>
<td>e) Disadvantage</td>
<td></td>
</tr>
<tr>
<td>1) Assembly and operation is time consuming</td>
<td></td>
</tr>
<tr>
<td>2. Hydraulic jack</td>
<td></td>
</tr>
<tr>
<td>a) Designed for heavy lifting applications</td>
<td></td>
</tr>
<tr>
<td>b) Also an excellent compression device for shoring or stabilizing operations</td>
<td></td>
</tr>
<tr>
<td>c) Capacity up to 20 tons</td>
<td></td>
</tr>
<tr>
<td>d) Used in conjunction with cribbing</td>
<td></td>
</tr>
<tr>
<td>C. Porta-power basic components</td>
<td></td>
</tr>
<tr>
<td>1. Pump</td>
<td></td>
</tr>
<tr>
<td>a) Acts as a reservoir for hydraulic fluid and houses the pump</td>
<td></td>
</tr>
<tr>
<td>2. Hose</td>
<td></td>
</tr>
<tr>
<td>a) Connects pump and different appliances</td>
<td></td>
</tr>
<tr>
<td>3. Wedge</td>
<td></td>
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<tr>
<td>a) Small spreader</td>
<td></td>
</tr>
<tr>
<td>b) Capable of generating approximately 2,000 pounds of force at its tips</td>
<td></td>
</tr>
<tr>
<td>c) Spreads approximately 3-4 inches at its tips</td>
<td></td>
</tr>
</tbody>
</table>
4. Spreader
   a) Longer arms allow greater spreading capability
   b) Also generates approximately 2,000 pounds of force at tips
   c) Spreads approximately 10¾ inches at its tips

5. Ram
   a) Used for pushing operations in conjunction with various bases and extensions used to fit the desired situation
   b) The capacity and stroke of ram depends on its size

6. Accessories
   a) Ram toe
      1) Used in conjunction with plunger toe or other base in spreading objects
      2) Protective plastic ring must be removed from ram to install toe
   b) Extension tubes
      1) May pin together with lock pins thread together or slip together
      2) If tubes use lock pins, put them in from the same side
      3) When working in confined spaces, adjustments will be easier and the pins won’t be in the way
      4) Carry a tape measure with the tool

   Of what value is a tape measure?

- Ram can be built to the exact size without a waste of time
5) Extension tubes decrease the stability of the load

c) Support lock (adjustable) extension
   1) Can be built into ram allowing final adjustments to fit space
   2) Additional length without adding tubes
   3) After ram is fully extended, retract it and extend the adjustable extension, lock in place and extend ram again

d) Bases
   1) Numerous designs to fit different situations
   2) Some will increase surface area
   3) Some will compensate for shape or surface conditions

7. Use
   a) Spreading
      1) Set-up
         • If not preconnected, hose from pump is screwed into the connection on the appliance
         • Check the ends of the connections for any contamination
         • There may be protective caps on connections
      2) Operation
         • Usually used in pairs
         • Wedge and spreader
How can we quickly identify which pump goes to which tool?

3) For identification and communications, painting the wedge and its pump one color and the spreader and its pump another color is a big help

b) The tips of either tool can be placed between the objects to be spread
   1) It may be necessary to make or enlarge an opening with another tool
      • Halligan
      • Axe
      • Heavy pry bar, etc.

c) Actuate the pump handle to spread the tips
   1) The valve on the pump must be closed to obtain pressure
   2) If tips fail to spread, hydraulic fluid level may be down
   3) With pump end down, loosen nut on opposite end and remove to check level
   4) When pumping, hold the pump vertically in front of you
   5) Pump end down

   This keeps the maximum amount of hydraulic fluid available to the pump

Why should we keep the pump end down?
6) Use the time tested teamwork method of operating
   - "Up on the red," "Down on the red," "Up on the yellow," "down on the yellow"
   - Tool operator communicates with the pump operator

d) To bring the tips back together
   1) Open the valve on the pump to bleed off the pressure

8. Pushing
a) Setting up the ram
   1) Evaluate surfaces to be pushed against and select bases
   2) Measure distance between surfaces
      - A tape measure is helpful
   3) Select extensions to fit the space
   4) Assemble bases extensions and ram
   5) Attach pump and put in place
b) Operation
   1) Make sure valve on pump is closed
   2) Hold pump vertically with pump down
   3) If ram is fully extended and more distance is required
      - Retract ram and add extension
      - Consider use of adjustable extension
c) After the incident, place the Porta-Power back in-service
   1) Clean all tools and accessories
2) Inspect thoroughly
3) Top off hydraulic fluid as needed
4) Place back in-service for immediate use

III. POWERED HYDRAULIC TOOLS
A. Characteristics
   1. Receive their power from hydraulic fluid pumped through special high-pressure hoses
   2. May be portable or mounted on the engine

B. Types
   1. Spreaders
      a) Capable of pushing or pulling
      b) Can produce up to 22,000 psi of force at tips
      c) Tips may spread as much as 32 inches
   2. Shears
      a) Cut almost any metal object that can fit between the blades
         1) Also cuts plastics or wood
      b) Capable of producing 30,000 psi of cutting force
      c) Opening spread of 7 inches
   3. Combination spreader/shear
      a) Used by departments if resource dollars are limited
      b) Two arms equipped with spreader tips
         1) Used for pulling or pushing
      c) Inside edges of the arms equipped with cutting shears
      d) Capabilities less than those of individual units
4. Extension rams
   a) Designed for straight pushing operations
      1) Can be effective for pulling
   b) Closed length is 36 inches
   c) Extended length up to 63 inches
   d) Capable of a 15,000 psi pushing force

C. Components
1. Power unit
   a) Hydraulic pump
   b) Powered by gasoline or electric motor
   c) Supply pressure and volume of fluid for operator

2. Hydraulic fluid
   a) Each fluid is specific to the tool
      1) In accordance with manufacturer's recommendations and directions

3. Hydraulic hose
   a) Hose reels
   b) Lacking couplings

4. Transfer valve (dump valve)
   a) On cage between reels
   b) On reservoir – to bypass fluid

What type of hydraulic fluid does your department use for its tools?

How does the hydraulic fluid under pressure get to the working end?
D. Safety considerations

1. Establish a danger zone
   a) All nonessential personnel barred from area
   b) Victim protection is a must

2. Stabilize vehicle
   a) Provides stable platform on which to work
   b) Reduces risk of injury to victims/rescuers
   c) Car on its wheels is unstable
   d) The body of the car has to be stabilized to prevent unwanted motion of the vehicle

3. Determine need
   a) Open door
   b) Remove door
   c) Displace dash and steering column
   d) Flap/remove roof of vehicle
   e) Displace front seat
   f) Remove seat

4. Assign command personnel
   a) EMS
   b) Extrication
   c) Fire protection
   d) Traffic control
   e) Staging
      1) Apparatus
      2) Personnel

Why is a stable vehicle important?
5. Stage equipment

   a) Close to the scene, but not in the way of rescue operation
   b) Tools in the staging area should be connected to the hydraulic source and ready for operation

IV. GENERAL CONSIDERATIONS

   A. Do not mix and match your appliances.

   B. Power

      1. Putting a 20-ton pump on a 4-ton appliance does not give you a 20-ton appliance

      2. Major differences in pumps

         a) Reservoir capacity
         b) Stroke volume of pump

      3. Force = pressure x area

         a) Appliances that have their own piston are limited by the area of the piston
         b) Pump capacity has no effect

      4. All pumps generate the same amount of pressure

         a) Between 7,000-15,000 psi

      5. Large capacity pumps have bigger reservoirs

      6. Major differences in appliances

         a) Size
         b) Weight
         c) Surface area of piston
C. Rams  
   1. Stability of the ram decreases  
      a) With increase in length  
      b) When working with offset accessories that load it off its long axis  

V. ELEVEN BASIC SAFETY RULES  
   A. Gasoline-powered hydraulic tool operations are to be supervised by the Safety Officer  
   B. Appropriate PPE must be worn by all personnel involved in rescue and extrication operations  
      1. Including primary and secondary eye protection  
   C. Do not put hands or arms inside the arms or blades of an operating tool  
   D. Only one fire fighter shall operate the tool  
   E. Second fire fighter must standby and operate power unit  
   F. Ensure hydraulic line safety  
      1. Connect couplings carefully  
      2. Use safety lock rings on couplings  
      3. Some fluids are acid  
         a) All are under high pressure  
      4. Make sure hydraulic lines stay out of the arms or blades of the tool  
   G. Crewmembers not involved shall observe operations carefully to warn of hazardous conditions  
   H. Shore and crib purchases gained with tool  
   I. Check retaining pins and other accessories before operation  
   J. Close tool arms after completing an operation or when moving tool
K. After the incident clean tools and accessories
   1. Thoroughly clean all tools and equipment
   2. Inspect couplings and fittings for mud, debris
   3. Top off fuel or oil as needed
   4. Place back in-service for immediate use
SUMMARY:

There are two types of hydraulic tools used for forcible entry and extrication: hand-powered and gasoline-powered. The operations and capacities of these tools will vary with manufacturer.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:** INSPECTION AND MAINTENANCE OF HYDRAULIC RESCUE TOOLS

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 4-5.2 and SBFS

**BEHAVIORAL OBJECTIVE:**

**Condition:** A written test

**Behavior:** The student will confirm a knowledge of inspection and maintenance of hydraulic rescue tools by completing the written test


**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Manual hydraulic tools
- Powered hydraulic tools

**REFERENCES:**
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Fire Service Rescue, IFSTA, Sixth Edition
- Forcible Entry, IFSTA, Seventh Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition

**PREPARATION:** The student should have a general knowledge of the various types of hydraulic tools and their power units. This knowledge of inspection and maintenance procedures of these units will assure continued operational readiness.
I. INSPECTION AND MAINTENANCE OF HYDRAULIC UNITS

A. Manual systems
   1. Clean after every use
   2. Check pump unit for fluid leaks
      a) Cracks in pump housing
      b) Leaks around seals
      c) Bend pumping arm
   3. Inspect reservoir
      a) Visual inspection
      b) Use dip stick if applicable
   4. Follow manufacturer's procedure for additional maintenance

B. Power systems
   1. Clean unit after each use
   2. Inspect motor housing for fluid leaks
   3. Check filters
   4. Check plugs
   5. Check fuel/mix level
   6. Check motor oil level if appropriate
   7. Check hydraulic reservoirs
      a) Check for leaks
      b) Check for unit defects
      c) Check for fluid level
   8. Run unit if applicable
II. INSPECTION AND MAINTENANCE OF TOOLS AND ACCESSORIES

A. Manual systems
   1. Spreaders, wedges, cutters
      a) Clean after each use
      b) Check for leaks
      c) Check for defects
      d) Check for alignment
      e) Check under pressure
   2. Attachments
      a) Check chains for integrity
      b) Check adapters for integrity
      c) Check hooks for integrity
   3. Hose
      a) Check for cracks or defects in hose material
      b) Check couplings for integrity
      c) Clean hoses and couplings after use

B. Power systems
   1. Spreaders/wedges
      a) Check for nicks, or if broken
      b) Check for cracks
      c) Check alignment
      d) Check under pressure
      e) Clean after each use
   2. Cutters
      a) Check edges for nicks, cracks or breaks
      b) Check alignment
      c) Check for leaks
d) Clean after each use

3. Attachments
   a) Fittings and connections
      1) Check all fittings and connections
      2) Check under pressure
      3) Clean after each use
   b) Hook and adapters
      1) Check for integrity
      2) Clean after each use
   c) Chains
      1) Check for damaged links
      2) Clean after each use
SUMMARY:
Completely and properly inspected power tools will ensure a safe operation in the future while enhancing service life.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
HOW TO REMOVE A VEHICLE ROOF USING POWERED HYDRAULIC SHEARS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: Hydraulic shears, adjunct tools and equipment as needed, vehicle prop, and appropriate personal protective equipment

Behavior: The student will remove the roof of a vehicle using powered hydraulic shears

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Hydraulic shears
- Adjunct tools and equipment as needed
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:
- "Car Busters" video, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Extrication, IFSTA, First Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 3

PREPARATION: There are times at the scene of a vehicle accident when access to the victim is critical but normal means of access are blocked. In these situations, the fire fighter may have to remove the vehicle top. This job, if performed safely and efficiently, can mean the difference between saving or losing a life. The fire fighter, as a trained professional, can be that difference.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place hydraulic shears</td>
<td>1a. Near vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td>2. Advance hydraulic line</td>
<td>2a. From power unit</td>
</tr>
<tr>
<td></td>
<td>b. No kinks or twists</td>
</tr>
<tr>
<td>3. Connect hydraulic shears</td>
<td>3a. To hydraulic line</td>
</tr>
<tr>
<td></td>
<td>b. Ensuring connectors are clean</td>
</tr>
<tr>
<td></td>
<td>c. Male to female</td>
</tr>
<tr>
<td>4. Lock coupling</td>
<td></td>
</tr>
<tr>
<td>5. Check connection</td>
<td>5a. By push/pull</td>
</tr>
<tr>
<td>6. Remove all glass</td>
<td></td>
</tr>
<tr>
<td>7. Remove or open doors</td>
<td>7a. Prior to making cuts, if possible</td>
</tr>
<tr>
<td>8. Cut all door posts</td>
<td>8a. Supporting roof</td>
</tr>
<tr>
<td></td>
<td>b. Exception - &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td>c. Making cuts as low as possible</td>
</tr>
<tr>
<td></td>
<td>d. Cutting perpendicular to material being cut</td>
</tr>
<tr>
<td></td>
<td>e. All metal</td>
</tr>
<tr>
<td></td>
<td>f. Protection from sharp objects after cutting</td>
</tr>
<tr>
<td></td>
<td>g. Use post protectors, if available</td>
</tr>
<tr>
<td>9. Remove roof</td>
<td>9a. To safe area</td>
</tr>
<tr>
<td></td>
<td>b. Away from vehicle</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISPLACE A VEHICLE SEAT USING A POWERED HYDRAULIC JACK AND RAM EXTENSION

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A powered hydraulic jack and ram extension, crib block, seat belt cutters, vehicle prop, and appropriate personal protective equipment

Behavior: The student will displace a vehicle seat

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Powered hydraulic jack and ram extension
- Crib block
- Seat belt cutters
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators

PREPARATION: Fire fighters may have to displace the front seat of a vehicle to gain working room or to relieve pressure on the victim. By doing so, the disentanglement process becomes an easier and more efficient evolution.
## How To Displace A Vehicle Seat

Using A Powered Hydraulic Jack And Ram Extension

**Operations** | **Key Points**
--- | ---
1. Place hydraulic jack with extensions and crib block | 1a. Near vehicle  
   b. Avoiding debris, mud, foot traffic  
   c. Safely
2. Release or cut seat belts | b. Using seat belt cutter if needed  
   c. Near floor edge
3. Attach ram extension | 3a. To hydraulic jack  
   b. Using quick connect couplings
4. Place unit | 4a. In bottom of door frame or floor board  
   b. Crib block may be used at door frame to prevent unit from slipping  
   c. To bottom of seat
5. Pump unit | 5a. To push seat back
6. Release ram extension | 6a. Slowly
7. Detach ram extension | 7a. From quick connect coupling
8. Attach spreader extension | 8a. To quickly connect coupling
9. Place spreader | 9a. Under seat  
   b. Inside door frame
10. Pump unit | 10a. Forcing seat up
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISPLACE A VEHICLE SEAT USING A POWERED HYDRAULIC TOOL

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A powered hydraulic tool, seat belt cutters, vehicle prop, and appropriate personal protective equipment

Behavior: The student will displace a vehicle seat using a powered hydraulic tool

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Powered hydraulic tool
- Seat belt cutters
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7
- Principles of Extrication, IFSTA, First Edition
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

PREPARATION: Fire fighters may have to displace the front seat of a vehicle to gain working room or to relieve pressure on the victim. By doing so, the disentanglement process becomes an easier and more efficient evolution.
## OPERATIONS

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Place powered hydraulic tool</td>
</tr>
<tr>
<td>2.</td>
<td>Release or cut seat belts</td>
</tr>
<tr>
<td>3.</td>
<td>Position first tip</td>
</tr>
<tr>
<td>4.</td>
<td>Position second tip</td>
</tr>
<tr>
<td>5.</td>
<td>Open tool</td>
</tr>
</tbody>
</table>

## KEY POINTS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1a.</td>
<td>Near vehicle</td>
</tr>
<tr>
<td>1b.</td>
<td>Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td>1c.</td>
<td>Safely</td>
</tr>
<tr>
<td>2a.</td>
<td>Using seat belt cutter if needed</td>
</tr>
<tr>
<td>2b.</td>
<td>Near floor edge</td>
</tr>
<tr>
<td>3a.</td>
<td>On &quot;A&quot; post</td>
</tr>
<tr>
<td>3b.</td>
<td>About four inches above floor board</td>
</tr>
<tr>
<td>4a.</td>
<td>On lower seat frame</td>
</tr>
<tr>
<td>4b.</td>
<td>Above seat runner</td>
</tr>
<tr>
<td>5a.</td>
<td>Forcing seat down and back</td>
</tr>
</tbody>
</table>

NOTE: Bucket seats and bench seats that have bent runners from a frontal impact will rotate.
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO REMOVE A VEHICLE FRONT DOOR USING A POWERED HYDRAULIC TOOL

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A powered hydraulic tool, vehicle prop, and appropriate personal protective equipment

Behavior: The student will remove a vehicle front door using a powered hydraulic tool

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- Powered hydraulic tool
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:
- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4

PREPARATION: When considering any accident situation where the victims are trapped, the fire fighter must quickly determine the best available access. Opening or removing vehicle doors will make victim access and disentanglement that much easier.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Place powered hydraulic tool</td>
<td>1a. Near vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td>2. Check for airbags</td>
<td>2a. If so, appropriate precautions must be taken</td>
</tr>
<tr>
<td>3. Release or cut seat belts</td>
<td>3a. Using seat belt cutter if needed</td>
</tr>
<tr>
<td></td>
<td>b. Near floor edge</td>
</tr>
<tr>
<td>4. Remove glass</td>
<td>4a. From door window</td>
</tr>
<tr>
<td>5. Attach web strap or rope</td>
<td>5a. To door</td>
</tr>
<tr>
<td></td>
<td>b. To maintain control during removal</td>
</tr>
<tr>
<td></td>
<td>c. Never use your body to hold door closed</td>
</tr>
<tr>
<td>6. Position jaws</td>
<td>6a. Carefully</td>
</tr>
<tr>
<td></td>
<td>b. Into window</td>
</tr>
<tr>
<td>7. Open jaws</td>
<td>7a. Straddling the interior and exterior door panels from the top</td>
</tr>
<tr>
<td></td>
<td>b. Near the door handle</td>
</tr>
<tr>
<td>8. Close jaws</td>
<td>8a. Pinching both interior and exterior door panels together</td>
</tr>
<tr>
<td>9. Repeat Operations 7 and 8</td>
<td>9a. Until adequate opening is made in door jam</td>
</tr>
<tr>
<td>10. Insert tips</td>
<td>10a. Into door jam</td>
</tr>
<tr>
<td></td>
<td>b. Just below the exterior door handle</td>
</tr>
<tr>
<td>11. Open tips</td>
<td>11a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Continuing until door lock fails and door opens</td>
</tr>
<tr>
<td>12. Close jaws</td>
<td>12a. Slowly</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>13. Position jaws</td>
<td>13a. To remove hinges</td>
</tr>
<tr>
<td></td>
<td>b. One tip on inner surface of car door, above top hinge</td>
</tr>
<tr>
<td></td>
<td>c. One tip at the base of the &quot;A&quot; post</td>
</tr>
<tr>
<td>14. Open jaws</td>
<td>14a. Forcing door out and away</td>
</tr>
<tr>
<td></td>
<td>b. Until hinge breaks</td>
</tr>
<tr>
<td>15. Close jaws</td>
<td>15a. Slowly</td>
</tr>
<tr>
<td>16. Position tool</td>
<td>16a. Above bottom hinge</td>
</tr>
<tr>
<td></td>
<td>b. One tip on pillar</td>
</tr>
<tr>
<td></td>
<td>c. One tip on inner surface of car door, above hinge</td>
</tr>
<tr>
<td>17. Open jaws</td>
<td>17a. Until hinge breaks</td>
</tr>
<tr>
<td>18. Remove door</td>
<td>18a. To safe area</td>
</tr>
<tr>
<td></td>
<td>b. Away from vehicle</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISPLACE A STEERING WHEEL/COLUMN USING A POWERED HYDRAULIC TOOL AND CHAINS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

**Condition:** A powered hydraulic tool, chains, cribbing, victim(s), protective covering for victim(s), vehicle prop, and appropriate personal protective equipment

**Behavior:** The student will displace a steering wheel/column using a powered hydraulic tool and chains

**Standard:** Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Powered hydraulic tool
- Chains
- Cribbing
- Victim(s)
- Protective covering for victim(s)
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Fire Service Rescue Practices, IFSTA, Sixth Edition, Chapter 9

PREPARATION: In many accidents, the driver is forced into the steering wheel and access to the individual is blocked. Your ability to free such a victim quickly, safely, and efficiently can depend on your knowledge of the hydraulic-powered tool and its abilities. You must practice and prepare yourself because you may be called upon to set up this operation to save a life. Be ready!
### Operations and Key Points for Displacing a Steering Wheel/Column Using a Powered Hydraulic Tool and Chains

<table>
<thead>
<tr>
<th>Operations</th>
<th>Key Points</th>
</tr>
</thead>
</table>
| 1. Placed powered hydraulic tool, chains, and cribbing | 1a. Near vehicle  
 b. Avoiding debris, mud, foot traffic  
 c. Safely |
| 2. Advance hydraulic line           | 2a. From power unit  
 b. No kinks or twists |
| 3. Connect hydraulic tool           | 3a. To hydraulic line  
 b. Ensuring connectors are clean  
 c. Male to female |
| 4. Lock coupling                    | 5a. By push/pull |
| 5. Check connection                 |                                                 |
| **CAUTION:** Upon high-speed impact, a 5 mph bumper may become lodged in a compressed position. Such a bumper has been known to suddenly return to normal position, causing injury to persons in line of travel. | 6a. With protective covering  
 7a. For chain hookup  
 8a. To an anchor point  
 b. Frame member, if possible  
 c. Under front of vehicle  
 9a. To the steering column  
 b. Below tilting joints  
 c. Double wrap, if possible |
<p>| 6. Shield victim(s)                 |                                                 |
| 7. Remove or make opening in windshield |                                                 |
| 8. Secure first chain               |                                                 |
| 9. Secure second chain              |                                                 |</p>
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Position hydraulic tool</td>
<td>10a. On hood of vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Arms fully extended</td>
</tr>
<tr>
<td></td>
<td>c. Shackles attached facing same direction</td>
</tr>
<tr>
<td>11. Position chain</td>
<td>11a. No slack</td>
</tr>
<tr>
<td></td>
<td>b. Not touching hood of vehicle</td>
</tr>
<tr>
<td></td>
<td>c. Crib if necessary</td>
</tr>
<tr>
<td>12. Close hydraulic arms</td>
<td>12a. Completely</td>
</tr>
<tr>
<td>13. Check progress</td>
<td>13a. Of steering wheel/column movement</td>
</tr>
<tr>
<td>14. Repeat Operations 9-13</td>
<td>14a. Until steering wheel/column is displaced</td>
</tr>
<tr>
<td></td>
<td>b. Consider cutting the ring or spokes on the steering wheel, if more room</td>
</tr>
<tr>
<td></td>
<td>is needed</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISPLACE A DASHBOARD USING A POWERED HYDRAULIC RAM

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A power hydraulic ram and accessories, cribbing, adjunct tools and equipment as needed, victim(s), protective covering for victim(s), vehicle prop, and appropriate personal protective equipment

Behavior: The student will displace a dashboard using a powered hydraulic ram

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Power hydraulic ram and accessories
- Cribbing
- Adjunct tools and equipment as needed
- Victim(s)
- Protective covering for victim(s)
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4
**PREPARATION:** There may be times when you need to remove the dashboard away from the victim(s). Sometimes this can be done by pulling the steering wheel. Be aware though, that in newer cars with front wheel drive, tilt steering, and airbag systems, you may not be able to accomplish your task if you try to pull the steering wheel. You may in fact endanger the occupant and fire fighters by pulling a steering wheel with the above features. An option can be to push the dash using the power hydraulic ram. This can be done safely and efficiently giving you the room you need to operate.
<table>
<thead>
<tr>
<th><strong>OPERATIONS</strong></th>
<th><strong>KEY POINTS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carry power hydraulic ram</td>
<td>1a. To vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td>2. Advance hydraulic line</td>
<td>2a. From power unit</td>
</tr>
<tr>
<td></td>
<td>b. No kinks or twists</td>
</tr>
<tr>
<td>3. Connect hydraulic ram</td>
<td>3a. To hydraulic line</td>
</tr>
<tr>
<td></td>
<td>b. With quick connect couplings (male or female)</td>
</tr>
<tr>
<td></td>
<td>c. Ensuring connectors are clean</td>
</tr>
<tr>
<td>4. Check connection</td>
<td>4a. By push/pull</td>
</tr>
<tr>
<td>5. Shield victim(s)</td>
<td>5a. With protective covering</td>
</tr>
<tr>
<td>6. Remove vehicle glass</td>
<td>6a. If necessary</td>
</tr>
<tr>
<td>7. Open vehicle front door</td>
<td>7a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Allowing room to work</td>
</tr>
<tr>
<td>8. Build box crib</td>
<td>8a. Under the car</td>
</tr>
<tr>
<td></td>
<td>b. To support bottom of ram when force is applied</td>
</tr>
<tr>
<td>9. Cut windshield post</td>
<td>9a. Close to top of dash</td>
</tr>
<tr>
<td></td>
<td>b. Allowing dash to move forward and up</td>
</tr>
<tr>
<td>10. Cut &quot;V&quot; notch</td>
<td>10a. &quot;Relief cut&quot;</td>
</tr>
<tr>
<td></td>
<td>b. At bottom of door post</td>
</tr>
<tr>
<td></td>
<td>c. Between lower hinges and floor pan</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11. Place anchor end of ram</td>
<td>11a. On floor board, above cribbing OR</td>
</tr>
<tr>
<td></td>
<td>b. Against base of &quot;B&quot; post and rocker panel OR</td>
</tr>
<tr>
<td></td>
<td>c. On base of cribbing placed against the &quot;B&quot; post OR</td>
</tr>
<tr>
<td></td>
<td>d. Firmly against the support</td>
</tr>
<tr>
<td>12. Place tip of ram</td>
<td>12a. In door post</td>
</tr>
<tr>
<td></td>
<td>b. In area of top hinge</td>
</tr>
<tr>
<td></td>
<td>c. Solid spot</td>
</tr>
<tr>
<td></td>
<td>d. Strength of metal to prevent tip from tearing metal</td>
</tr>
<tr>
<td>13. Extend ram</td>
<td>13a. Slowly</td>
</tr>
<tr>
<td></td>
<td>b. Pushing away from victim</td>
</tr>
<tr>
<td>14. Stabilize</td>
<td>14a. With cribbing</td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DISPLACE A DASHBOARD USING A POWERED HYDRAULIC SPREADER

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A powered hydraulic spreader and accessories, adjunct tools and equipment as needed, victim(s), protective covering for victim(s), vehicle prop, and appropriate personal protective equipment

Behavior: The student will displace a dashboard using a powered hydraulic spreader

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Powered hydraulic spreader and accessories
- Adjunct tools and equipment as needed
- Victim(s)
- Protective covering for victim(s)
- Vehicle prop
- Appropriate personal protective equipment

REFERENCES:

- "Car Busters" video series, Film Communicators
- "Collision Rescue II" video, Media Distributors
- Essentials of Fire Fighting, IFSTA, Fourth Edition, Chapter 7
- Principles of Vehicle Extrication, IFSTA, Second Edition, Chapter 4
**PREPARATION:**

The fire fighter may encounter difficulty in rescuing victims trapped in vehicles because of a head-on collision. The dash and windshield posts can move to the rear, trapping the victim. In some cases, it is not feasible to push the seat back. In these cases, the powered hydraulic spreader can be used to raise the dash away from the victim.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Carry powered hydraulic spreader</td>
<td>1a. Near vehicle</td>
</tr>
<tr>
<td></td>
<td>b. Avoiding debris, mud, foot traffic</td>
</tr>
<tr>
<td></td>
<td>c. Safely</td>
</tr>
<tr>
<td>2. Advance hydraulic line</td>
<td>2a. From power unit</td>
</tr>
<tr>
<td></td>
<td>b. No kinks or twists</td>
</tr>
<tr>
<td>3. Connect hydraulic spreader</td>
<td>3a. To hydraulic line</td>
</tr>
<tr>
<td></td>
<td>b. With quick connect couplings (male or female)</td>
</tr>
<tr>
<td></td>
<td>c. Ensuring connectors are clean</td>
</tr>
<tr>
<td>4. Check connection</td>
<td>4a. By push/pull</td>
</tr>
<tr>
<td>5. Check for proper accessories</td>
<td>5a. Tips</td>
</tr>
<tr>
<td></td>
<td>b. Cutters</td>
</tr>
<tr>
<td>6. Shield victim(s)</td>
<td>6a. With protective covering</td>
</tr>
<tr>
<td>7. Remove vehicle glass</td>
<td>7a. If necessary</td>
</tr>
<tr>
<td>8. Open vehicle front door</td>
<td>8a. Safely</td>
</tr>
<tr>
<td></td>
<td>b. Making room for cuts</td>
</tr>
<tr>
<td>9. Build box crib</td>
<td>9a. Under front door post</td>
</tr>
<tr>
<td></td>
<td>b. To support tip of tool when raising dash</td>
</tr>
<tr>
<td>10. Cut windshield post</td>
<td>10a. Top of dash</td>
</tr>
<tr>
<td></td>
<td>b. At &quot;A&quot; post</td>
</tr>
<tr>
<td></td>
<td>c. 90 degrees to post</td>
</tr>
<tr>
<td></td>
<td>d. Releasing top of door post so it can raise freely</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 11. Cut "V" notch | 11a. At bottom of door post  
|              | b. As low as possible  
|              | c. Between the rail and the lower hinge |
| 12. Insert tips | 12a. Into "V" notch  
|              | b. One tip at top of cut  
|              | c. One tip at bottom of cut  
|              | d. Tool parallel with frame |
| 13. Open tool | 13a. Slowly  
|              | b. Forcing door post and dash up and towards front of vehicle  
|              | c. Cribbing as opening is made |
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF AIR BAGS AS A RESCUE TOOL

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level I

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of air bags as a rescue tool by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Principles of Extrication, IFSTA, First Edition, Chapter 4 and Forcible Entry, IFSTA, Seventh Edition, Chapter 2

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials


- Forcible Entry, IFSTA, Seventh Edition
- Principles of Extrication, IFSTA, First Edition

PREPARATION: Air bags are versatile tools. They can be adapted to lifting heavy objects or for forcible entry. Proper care during use and while stored will assure that they are ready for service when you need them. They operate quietly, reducing victim anxiety, and are easy to handle. Knowledge of the proper operation of air bags will allow fire fighters to affect the rescue of trapped victims or gain entry with relative ease.
## I. CONSTRUCTION

A. Pebble-grained neoprene rubber exterior

B. Reinforced
   1. Steel wire mesh
   2. Kevlar Arimid fiber

## II. TYPES

A. Three types
   1. High-pressure
   2. Medium-pressure
   3. Low-pressure

B. High-pressure
   1. Heavy lifting
      a) Up to 75 tons
   2. Only 1 inch thick when deflated
   3. Up to 20 inches in lift
   4. Sizes
      a) 6”x6” through 36”x36”
   5. 135 psi operating pressure

C. Medium and low-pressure
   1. Used for lifting and stabilizing large and heavy objects
   2. Considerably larger in size than high-pressure air bags
3. Lift up to 6 feet  
4. Operating pressure  
   a) Medium-pressure  
      1) 12-15 psi  
   b) Low-pressure  
      1) 7-10 psi

III. USE  
A. Lifting heavy objects from victims  
   1. All three types  
      a) Vehicles  
      b) Machinery  
      c) Structural components  
      d) Trees

B. Forcible entry  
   1. High-pressure  
      a) Spread security bars  
   2. Medium and low-pressure  
      a) Lift roll-up doors  

C. Sealing leaks in pipes and tanks  
   1. Low-pressure  
      a) In the end of pipes  
      b) Used with container patch kits

How high will medium- and low-pressure air bags lift?  
What forcible entry tasks can be performed with air bags?
### IV. SAFETY CONSIDERATIONS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Use air bags as part of a well thought-out operations plan</td>
</tr>
<tr>
<td>B.</td>
<td>Know the capabilities and limitation of the air bags</td>
</tr>
<tr>
<td>C.</td>
<td>Maintain components in good condition</td>
</tr>
<tr>
<td>D.</td>
<td>Maintain an adequate air supply</td>
</tr>
<tr>
<td>E.</td>
<td>Position bags against solid surfaces</td>
</tr>
<tr>
<td>F.</td>
<td>Inflate/deflate slowly</td>
</tr>
</tbody>
</table>

**IV. SAFETY CONSIDERATIONS (continued)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G.</td>
<td>Never work under a load that is only supported by air bags</td>
</tr>
<tr>
<td>H.</td>
<td>Shore as the bag rises</td>
</tr>
<tr>
<td></td>
<td>1. &quot;Pack and jack&quot;</td>
</tr>
<tr>
<td>I.</td>
<td>If box cribbing is used as a &quot;bed&quot; for air bags, top level must be solid</td>
</tr>
</tbody>
</table>

**APPLICATION**

- What safety considerations should you take when using air bags?
- Should rescuers work under loads supported only by air bags?
SUMMARY:
Proper use of air bags will assist the fire fighter during a variety of different scenarios. High-pressure air bags can be used to lift extremely heavy objects and are relatively small. Medium and low-pressure air bags can be used to lift and stabilize large and heavy objects, perform forcible entry tasks, and plug holes in pipes and containers. When used safely, air bags are a versatile and adaptable tool.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Principles of Extrication, IFSTA, First Edition, Chapter 4 and Forcible Entry, IFSTA, Seventh Edition, Chapter 2 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CONSIDERATIONS FOR PREPARING, PACKAGING, AND REMOVING A VICTIM FROM A VEHICLE

TIME FRAME: 0:15

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 4-4.1 and SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of preparing, packaging, and removing a victim from a vehicle by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Essentials of Fire Fighting, IFSTA, Fourth Edition
- Principles of Vehicle Extraction, IFSTA, Second Edition

PREPARATION:
The rapid care and treatment of trapped vehicle accident victims is a priority and is the main objective in vehicle extrication. Therefore, victim care, immobilization, and treatment must begin before removing them from the vehicle. With the knowledge and skills acquired through proper training, the fire fighter can further the chances of survival for the victim, as well as reduce further injuries.
I. PREPARING THE VICTIM
   A. Follow all EMS protocols
   B. Assess victim
      1. ABCs
         a) Airway
         b) Breathing
         c) Circulation
      2. Visual and verbal assessments
      3. Quick size-up to request resources from outside the vehicle to stabilize victim
   C. Identify packaging requirements
   D. Reassure the victim
      1. Explain to them what is going on
      2. Remember they will be hurt, confused, and scared
   E. Manually stabilize the head with your hands
   F. Assure exit opening is appropriate size to extricate victim without further injuries
      1. Cover sharp edges

II. PACKAGING THE VICTIM
   A. Follow all EMS protocols
   B. Apply C-collar
   C. Apply KED if needed and available
   D. Stabilize other injuries as appropriate
      1. Control bleeding
2. Assess fractures and immobilize

E. Maintain C-spine immobilization throughout incident

III. REMOVING THE VICTIM

A. Following all EMS protocols

B. At least three rescue personnel should be involved in moving victim

C. Maintain C-spine immobilization

D. Turn victim
   1. Maintaining spinal alignment
   2. In-line with vehicle width

E. Position backboard
   1. Rest foot of backboard on edge of seat cushion
   2. Have one more rescuer hold head of board
      a) Head of backboard should be slightly lower than foot of backboard
      b) Facilitates in the movement of the victim to the board from the vehicle

F. Move victim from the vehicle onto the backboard
   1. Move victim as a unit as smoothly as possible
   2. On command from the rescuer at the head
   3. Victim is to be protected from any further injury
   4. As a team, move victim to a safe position from the vehicle
      a) Place backboard, with victim, onto ground
      b) Elevate backboard off ground
      c) Remember the spine is not immobilized until the victim is secured to the backboard
SUMMARY:

Before the extrication of vehicle accident victims, the fire fighter will be required to properly assess, stabilize, and treat them. The rescuer must perform a thorough physical examination, and stabilize real or possible injuries, particularly injuries to the neck and spine. Many tools are available to provide stabilization including C-collars, the KED, and other splinting devices.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

The wildland fire fighting unit of the Fire Fighter I curriculum was added in 2001. The State Board of Fire Services (SBFS) adopted 310-1, "The Wildland and Prescribed Fire Qualification System Guide," published by the National Wildfire Coordinating Group (NWCG). The SBFS mandated its inclusion into the Fire Fighter I program. Most of the lesson plans are based on existing curricula from the NWCG and CDF.

OBTAINING RESOURCES

Because of the long history of wildland fire fighting curriculum development by the NWCG and CDF, there are extensive resources already existing for instructors. Some of these are listed in the "Materials Needed" and "References" sections of the lesson plans. To make it easier for the instructors, information on how to obtain these resources is listed below.

California Department of Forestry and Fire Protection

CDF resources may be available "on-loan" from your local unit.

National Wildfire Coordinating Group

All the materials provided by the NWCG are available by fax or mail. Each item is issued an NFES number and must be used when ordering.

Mailing Address: National Interagency Fire Center
Attention: Great Basin Cache Supply Office
3833 South Development Avenue
Boise, ID 83705

NWCG Fax Number: (208) 387-5573 or (208) 387-5548

For questions about ordering or ordering procedures, call the Great Basin Cache Supply Office at (208) 387-5104. Website address: www.blm.gov/fna/gbk/index.htm

The following is a list of all the NWCG references used in Unit T - Wildland Fire Fighting.

<table>
<thead>
<tr>
<th>NFES NUMBER</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFES 0065</td>
<td>Fireline Handbook</td>
</tr>
<tr>
<td>NFES 1407</td>
<td>Extreme Fire Behavior and Tactics</td>
</tr>
<tr>
<td>NFES 1510</td>
<td>S-130 Instructor's Guide</td>
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<tr>
<td>NFES 1570</td>
<td>Your Fire Shelter pamphlet</td>
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<td>NFES 1571</td>
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<tr>
<td>NFES 1859</td>
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<td>NFES 1860</td>
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<tr>
<td>NFES 1861</td>
<td>Introduction to Fire Behavior</td>
</tr>
<tr>
<td>NFES 2036</td>
<td>Wildfire Handtools video</td>
</tr>
<tr>
<td>NFES 2086</td>
<td>PMS-416 Instructor's Guide</td>
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<tr>
<td>NFES 2088</td>
<td>Standards for Survival video</td>
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<td>NFES 2103</td>
<td>Firefighter Safety in Wildland/Urban Interface Fires video</td>
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<tr>
<td>NFES 2132</td>
<td>Fire Behavior in the Wildland/Urban Interface video</td>
</tr>
<tr>
<td>NFES 2170</td>
<td>S-205 Instructor's Guide</td>
</tr>
<tr>
<td>NFES 2236</td>
<td>Fire Weather video</td>
</tr>
<tr>
<td>NFES 2243</td>
<td>Fireline Safety Reference</td>
</tr>
</tbody>
</table>
TOPIC: WILDLAND FIRE BEHAVIOR

TIME FRAME: 2:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the three principal environmental elements affecting the start and spread of a wildland fire by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the S-190 Instructor's Guide, NWCG (NFES 1859), 1994 Edition, Unit 1

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Introduction to Fire Behavior" video, NWCG (NFES 1861), 1994 Edition (Optional)

REFERENCES:

PREPARATION: Understanding wildland fire behavior is basic and essential knowledge that the fire fighter needs to posses. This knowledge will assist in developing tactics necessary to effectively control a wildland fire and using resources effectively. Being efficient and effective in fire suppression are survival prerequisites.
I. METHODS OF HEAT TRANSFER

A. Radiation
   1. A ray or wave that dries and possibly ignites surrounding fuels

B. Convection
   1. Lighter and warmer air rises upward
      a) Embers in the column can ignite other fuels (spot fires)

C. Conduction
   1. Heat passing from one particle of fuel to another (spoon heated by a warm drink)
      a) Wood is a poor conductor
      b) Least important method of heat transfer


II. FUEL TYPES

A. Grasses
B. Shrubs
C. Timber
D. Logging slash

NOTE: If available, show slides of various fuel types/models at different times of the year. Discuss the effects of fire spread.
III. FUEL CHARACTERISTICS
   A. Fuel moisture
      1. Amount of water in fuel
      2. Prime factor in determining burning capability of fuel
      3. Light fuels take on and lose moisture faster than heavier fuels
   B. Size and shape
      1. Light fuels
         a) Burn out rapidly because they're surrounded by oxygen
         b) Easily extinguished
         c) Examples
            1) Grasses
            2) Pine needles, etc.
      2. Heavy fuels
         a) Burn slowly
         b) Only when interiors are exposed to oxygen after outside is burned off
         c) Examples
            1) Limbs
            2) Logs
            3) Tree trunks, etc.
   C. Fuel loading
      1. Quantity of fuels available for combustion in a given area
   D. Fuel arrangement
      1. Horizontal continuity
         a) Uniform fuels
            1) Fuels evenly distributed over the area
b) Patchy fuels
   1) Fuels unevenly distributed over the area (continuity is broken)

2. Vertical arrangement
   a) Ground fuels
      1) Deep duff
      2) Tree roots
      3) Buried logs, etc.
   b) Surface fuels
      1) Needles or leaves
      2) Duff
      3) Small dead wood
      4) Stumps
      5) Downed logs
      6) Low shrubs, etc.
   c) Aerial fuels
      1) Green or dead materials in the upper canopy
      2) Branches and crowns
      3) Snags
      4) Hanging moss
      5) Tall shrubs, etc.

IV. WEATHER

A. Temperature
   1. The higher the air temperature, the higher the ground and fuel temperatures

How does temperature affect the burning characteristics of fuels?
2. The higher the ground and fuel temperatures, the easier the fuels are to ignite
3. It's possible to have a 50°F or more difference between fuel temperatures in the sun versus shade

How does wind affect the spread of fire?

B. Wind
1. Increases oxygen supply
2. Influences direction of fire spread
3. Carries firebrands
4. Preheats fuels ahead of the fire

How does relative humidity contribute to fire behavior?

C. Relative humidity
1. Ratio of the amount of moisture in the air to the amount which the air can hold at the same temperature, if it were saturated
2. Fuels and air are always exchanging moisture

D. Precipitation
1. Moisture in liquid or solid form that reaches the earth's surface
2. Fuel moisture is affected by the amount and duration of the precipitation

NOTE: Show slides of various topographical contours and discuss relative fire spread.

V. TOPOGRAPHY
A. Aspect
1. The direction a slope is facing in relation to the sun
2. South and southeast slopes
   a) More directly exposed
   b) Sparser fuels than other aspects
   c) Lower fuel moistures

3. North-facing slopes
   a) More shaded
   b) Heavier fuels
   c) Lower temperatures
   d) Higher humidities
   e) Higher fuel moistures

B. Slope
   1. Degree of incline of a hillside

Why are steep slopes a concern to wildland fire fighters?

   2. The steeper the slope, the faster the fire burns
   3. Rolling burning material may ignite fuels below the main fire

C. Shape of the country
   1. Box canyons
      a) Air drawn in from canyon bottom creates a very strong upslope draft (similar to a wood-burning stove)

   2.窄 narrow canyons
      a) Wind eddies and strong upslope drafts may be expected at sharp bends in canyon

   3. Wide canyons
      a) Cross-canyon spotting is common
4. Ridges  
   a) Fires burning along lateral ridge lines may change direction because of air flow up from canyon

5. Saddles  
   a) Wind blowing through saddles can increase in speed as it passes through the constricted area and spread out on the lee side of the fire

D. Elevation  
   1. Height of the terrain above the mean sea level  
   2. Fuels at lower elevations dry out earlier in the year  
   3. At different elevations, fuels receive different levels of precipitation and exposure to winds

E. Barriers  
   1. Any obstruction to the spread of fire  
      a) Natural  
         1) Rivers, lakes  
      b) Fabricated  
         1) Roads, highways

Show Part III of "Introduction to Fire Behavior" video
SUMMARY:

Understanding how a wildland fire spreads with respect to fuels, weather, and topography will help keep fire fighters safe. Being able to predict fire spread will assist suppression forces in efficient and timely containment.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: FIRE WEATHER

TIME FRAME: 3:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of fire weather by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Fire Weather" video, NWCG (NFES 2236), 1994 Edition (optional)

REFERENCES:

PREPARATION: Once a wildland fire starts, burning is generally very rapid and continuous. Many factors affect the fire's development. Being aware of changing weather conditions and predicting new patterns are key ingredients in safely controlling the wildland fire.
I. GENERAL WINDS AND COLD FRONTS
   A. General/gradient winds
      1. Caused by high and low pressure systems
      2. Influenced and modified in lower atmosphere by terrain
   B. The boundary line between a cooler air mass which is replacing a warmer air mass
      1. Southeast to southwest winds \textit{ahead} of the front
      2. West to northwest winds \textit{behind} the front with cooler air

II. INDICATORS OF A COLD FRONT PASSAGE
   A. Cumulus clouds approaching from the west or northwest
   B. Large clouds of dust may precede the front's arrival
   C. Wind shifts from southeast to southwest
   D. As front arrives, winds are strongest, gusty, and erratic
   E. As front passes, winds are still gusty, and erratic, but are cooler and out of the west or northwest
### III. COLD FRONTS

**A. Dangerous conditions**
1. Wind direction abruptly changes
2. Head of fire may run from north to northeast
3. Winds may shift to west or northwest
   a) After front passes
   b) Driving fire head to east or southeast
4. Rapid drop in relative humidity within 24 hours

### IV. FOEHN WINDS

**A. Characteristics of Foehn winds**
1. A dry wind with strong downward components
2. Usually, but not always, it is unseasonably warm
3. May reach speeds of 40-60 mph but can be as high as 90 mph
4. Relative humidity will drop at onset of winds
5. Decrease in fuel moisture

**B. Common Foehn winds**
1. Chinook
   a) East side of Rockies
V. THUNDERSTORMS

A. A storm produced by cumulonimbus clouds and always accompanied by lightning and thunder
   1. Usually attended by strong wind gusts, heavy rain, and sometimes hail
   2. Usually of short duration (seldom over 2-3 hours)

B. Visual indicators
   1. Tall, building cumulus clouds
   2. Cauliflower appearance of clouds
   3. Dark, flat base
   4. Virga or rain falling out the bottom
   5. Ice crystal top
      a) Usually anvil shape
      b) Cloud well above freezing level
      c) Fuzzy appearance
C. Direction of movement is generally in direction of winds aloft
   1. Anvil points to direction of movement

D. Downdraft winds
   1. Reach the ground
   2. Spread radically in all directions
   3. Wind velocities will often be 25-35 mph but can reach as high as 60 mph

E. Surface winds
   1. Strongest in direction of thunderstorm travel
   2. Wind speed and direction can be altered by topography and vegetation

F. Dangers to fire fighters
   1. Produces strong, gusty surface winds affecting the direction the fire will burn
   2. Downdraft winds will be quite erratic but always away from the thunderstorm
   3. Produces lightning

VI. LOCAL WINDS
A. Local winds are so named because of the effect that local temperature differences and terrain have on their creation
B. Sea breeze
   1. Daytime breeze
   2. Cooler air from high pressure over coastal waters moves onshore
3. Replaces heated air rising off the warmer land mass
4. Wind speeds between 10-30 mph along west coast states

C. Land breeze
   1. Light, nighttime breeze
   2. Originates over the relatively cool land surface
   3. Flows out over warmer coastal waters
   4. Typical wind speed is between 3-10 mph

D. Slope winds
   1. Local wind conditions that take place in mountain topography where the differential effects of heating and cooling occur
   2. General patterns
      a) Upslope winds during the day
      b) Downslope winds at night
   3. Downslope winds are usually no stronger than 2-5 mph
   4. Upslope winds are often between 3-8 mph
   5. Change from downslope to upslope is gradual
      a) May become calm for an hour or more during the change
   6. South-facing slopes warm more than others
      a) Causes stronger updrafts during the day

E. Upslope winds
   1. Under light general wind conditions, air flows up the slope during the day

What are the general wind patterns for slope winds?
2. Warm air rises  
   a) Valley air gets warmer than the air on the mountain top and rises  
3. Maximum upslope winds occur about midafternoon  

F. Downslope winds  
1. Under light general wind conditions, air flows down the slope at night  
2. Cold air sinks  
   a) Air along the mountain tops at night cools faster than the air in the valley  
3. Maximum downslope flow occurs after midnight  

G. Dangers of slope winds  
1. During midafternoon, upslope winds are at a peak causing a slope fire to experience rapid spread  
2. At night, a slope fire may reverse direction and burn downhill if flow is strong enough  
   a) If augmented by Foehn winds, the danger to fire fighters increases  

H. Valley winds  
1. Result of temperature differences between air in the valley and air at same elevation over the adjacent plain  
2. Flow up valley during the day and down valley during the night  

What are some of the dangers associated with slope winds?  

What are valley winds?
3. Up valley winds start late in the morning
   a) Later than upslope winds
4. Reach speeds of 10-15 mph during the afternoon
5. Down valley winds begin after dark and reach speeds of 5-10 mph

VII. ATMOSPHERIC STABILITY

A. Stable air
   1. Resistant to vertical movement
   2. Little upward or downward movement

B. Unstable air
   1. Has lots of "mixing" with upward movement

2. Visual indicators of unstable air
   a) Clouds grow vertically and smoke rises to great heights
   b) Cumulus type clouds
   c) Gusty winds
   d) Good visibility
   e) Dust devils and fire whirls

3. Visual indicators of stable air
   a) Clouds in layers
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>b) Stratus type clouds</td>
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<tr>
<td>c) Smoke column drifts apart after limited rise</td>
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<tr>
<td>d) Poor visibility due to smoke or haze</td>
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<tr>
<td>e) Fog layers</td>
<td></td>
</tr>
<tr>
<td>f) Steady winds</td>
<td></td>
</tr>
</tbody>
</table>

What is the definition of an inversion?

C. Inversion

1. A layer in the atmosphere where the temperature increases with altitude
2. Under the inversion, smoke and warm gases will rise only until their temperature equals that of the surrounding air
3. Then, smoke flattens out and spreads horizontally because it has lost its lift
4. Night inversions
   a) Also known as surface inversions
   b) Common during calm weather
   c) Trap smoke
   d) Poor visibility in valleys
5. When inversions lift or break, fire behavior can change abruptly
6. Can also cause hazardous flying conditions

What is a thermal belt?

D. Thermal belt

1. A region of warmer air, on the middle third slope
2. Characterized by the highest minimum temperature and the lowest nighttime relative humidity
### PRESENTATION

3. Within thermal belt, wildland fires can remain active throughout the night

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### APPLICATION

What is subsidence?

#### E. Subsidence
1. A large scale sinking of air associated with high pressure systems
2. Air from higher elevations warms and dries as it descends to lower elevations
3. Although this air is stable, it can lead to increased fire activity because it's warmer and drier
4. Usually a factor in development of Foehn winds

What are dust devils?

#### F. Dust devils
1. Under intense heating, air near the ground rises in upward-spiraling motions in columns and chimneys
2. Most common indicator of unstable air
3. Occur on hot days over dry ground when skies are clear and winds are light
4. Size may range from 10 feet to over 100 feet in diameter with heights from 10-4,000 feet
5. Wind speeds can range from 20-50 mph

What are fire whirls?

#### G. Fire whirls
1. Essentially, burning gases rising and twisting like dust devils
2. Can pick up large embers and spew them far across fire lines
3. Occur most often where heavy concentrations of fuel are burning
4. Most commonly found on lee side of ridges
VIII. INDICATORS OF PROBLEM AND EXTREME FIRE BEHAVIOR

A. Problem fire behavior
   1. Fire activity that presents potential hazard to fire line personnel

B. Extreme fire behavior
   1. Highest level of problem fire behavior
   2. Rapid rate of spread
   3. Intense burning
   4. Spotting
   5. Crowning

C. Indicators
   1. Clues used to size-up and anticipate fire behavior
   2. Fuel indicators
      a) Unusually dry fuels
      b) Large amount of light fuels
      c) Fuels exposed to direct sunlight
      d) Fuels dried by prolonged drought
      e) Ladder fuels
      f) Crown foliage dried by surface fire over a large area
      g) Concentration of snags
   3. Topography indicators
      a) Steep slopes
      b) Chutes, saddles, box canyons
         1) Provide conditions for "chimney effect" to occur
      c) Narrow canyons
         1) Increase possibility for fire to spread by spotting across drainages
4. Weather indicators
   a) Strong wind
   b) Sudden changes in direction and/or velocity of wind when weather fronts move through the area
   c) High clouds moving fast
      1) May indicate unusual surface winds to follow
   d) Unexpected calm
   e) Thunderstorms above or in close proximity (downdrafts)
   f) Unusually high temperatures and low relative humidities
   g) Bent smoke column

5. Fire behavior indicators
   a) Watch smoke column for direction of fire travel and changes in intensity
   b) Many simultaneous fires starting over a large area picking up in intensity
   c) Small groups of trees or brush begin to "torch"
   d) Frequent spot fires
   e) Fire whirls beginning to develop inside the main fire
   f) Crown fires
SUMMARY:

Being able to understand fire weather is essential if you are to understand and recognize potential changes in fire behavior. Once weather can be anticipated, tactics can be adjusted accordingly and control efforts can be reduced.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: WILDLAND FIRE FIGHTER PREPAREDNESS AND PERSONAL PROTECTIVE EQUIPMENT

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of wildland fire fighter preparedness and appropriate personal protective equipment by completing the written test


MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3

PREPARATION: Wildland fire fighters may be required to spend days or even weeks involved in active fire fighting. During that time, they must be prepared to meet their safety and personal needs. Safety equipment can make the difference between life and death, minor or career-ending injuries. Fire fighters are required to have their safety equipment with them at all times. There are also many personal items that can make the fire fighter more comfortable and able to maintain a state of readiness.
I. PERSONAL GEAR

A. Fire fighters work better if they are properly equipped

B. Length of time on the fire line can be extensive
   1. Fire fighters must be prepared

C. Personal gear bag
   1. Extra clothing
   2. Personal hygiene items
   3. Comfort items for time off the line

D. Long-term assignments
   1. Clothing items
      a) Uniform, sweatshirt and pants, jacket, underwear, socks, athletic shoes, shower thongs, bandannas
   2. Hygiene items
      a) Sunscreen, lip balm, hand lotion, prescription drugs, pain relievers, sanitary napkins and tampons, soap, washcloth, shampoo, toothbrush and toothpaste, razor, foot powder, antacids, toilet paper, hand wipes
   3. Entertainment items
      a) Radio, cards, books
   4. Miscellaneous
      a) Ear plugs, sunglasses, sleeping bag, sleeping pad, space blanket, money, credit card, cell phone, can opener, spoon, metal cup, extra rations
## PERSONAL PROTECTIVE EQUIPMENT

### Wildland safety uniform

1. **Pants and shirt**
   - a) Consist of fire resistant material
   - b) Local requirements vary
   - c) Can contribute to heat stress
   - d) Fire fighters must be aware of need for hydration

2. **Hard hat**
   - a) Provides protection when worn properly
   - b) Includes chin strap
   - c) Should have shroud that covers neck and collar

3. **Eye protection**
   - a) Goggles/safety glasses
   - b) To be worn during all fire fighting operations

4. **Gloves**
   - a) Leather or other approved fabric
   - b) Often lighter than structure gloves and unlined

5. **Boots**
   - a) Leather

---

**What are some drawbacks of wildland safety clothing?**

**How are wildland gloves different from structure gloves?**
What are some concerns about foot protection?

b) 8-inch high lace-up to provide ankle support
   1) Boots that lace to the toe can snag twigs and cause tripping

c) Heavy soles
d) No steel toes to prevent due to heat transfer
e) Boots can burn or melt in hot ashes or embers

6. Socks
   a) Medium weight wool or part wool is recommended
   b) Change socks frequently

7. Web gear
   a) Harness and/or belt that carries fire shelter, canteens and extra equipment
   b) Must be worn with shelter during all fire fighting operations

What piece of personal gear must be carried on all fire fighting operations?
SUMMARY:

Fire fighters working on wildland incidents are expected to work long hours under extreme conditions. It is incumbent that they protect themselves while working, and use rest periods to recharge completely and prepare themselves for the next operational period. Proper use of personal protective equipment and maintenance of a well-equipped gear bag are essential for keeping fire fighters ready for wildland fire fighting.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: WILDLAND FIRE FIGHTING SAFETY

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3-18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of wildland fire fighting safety including general aspects and LCES by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Units 1 and 11

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Standards for Survival" video, NWCG (NFES 2088), 1987 Edition (optional)
- Fireline Safety Reference, NWCG (NFES 2243), 1993 Edition (1 for each student)

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8

PREPARATION: More fire fighters die fighting wildland fires than any other type. It is imperative that, in order to insure their survival and that of their crew, fire fighters have a clear understanding of the risks associated with wildland fire fighting and the means used to avoid injury and death. Following the ten standard orders and eighteen "watch outs" will help the fire fighter stay alive.
## GENERAL SAFETY

A. Fire fighters must have
   1. Knowledge and skill in methods of avoiding accidents, injury, and exposure to danger
   2. An ability and attitude that grows with experience and training
   3. A level of physical fitness that allows them to not only perform their job, but expend the effort needed to avoid danger

B. Types of hazards

   1. Subjective hazard
      a) The fire fighter has direct control over the hazard
      b) Condition of equipment, decision making
   2. Objective hazard
      a) Lightning, other weather
      b) Fire weakened timber
      c) Rolling rocks, logs

   3. Environmental hazards
      a) Heat stress
      b) Hypothermia
      c) Low visibility
   4. Biological hazards
      a) Snakes
      b) Insects

What are the two general categories of hazards?

What are some environmental hazards?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>c) Animals</td>
<td>What types of equipment hazards can there be?</td>
</tr>
<tr>
<td>d) Plants</td>
<td>What types of problems can we encounter with vehicles?</td>
</tr>
<tr>
<td>e) Microorganisms (giardia, bacteria, etc.)</td>
<td>What kind of hazards can the weather cause?</td>
</tr>
</tbody>
</table>

5. Equipment hazards
   a) Saw and tool injuries
   b) Noise
   c) Heavy equipment

6. Vehicle hazards
   a) Operating around personnel
   b) Mechanical failure
   c) Shifting cargo

7. Fire environment hazards
   a) The fire itself
   b) Smoke
   c) Erratic winds

   d) Trees and snags
      1) Living
         • Felling operations

   How do we categorize trees in terms of hazard potential?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Blow down</td>
<td></td>
</tr>
<tr>
<td>• Widowmakers</td>
<td></td>
</tr>
<tr>
<td>• Equipment removal</td>
<td></td>
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<tr>
<td>2) Dying</td>
<td></td>
</tr>
<tr>
<td>• More susceptible to falling</td>
<td></td>
</tr>
<tr>
<td>• Insect activity indicates disease</td>
<td></td>
</tr>
<tr>
<td>3) Dead (snags)</td>
<td></td>
</tr>
<tr>
<td>• Fall easily</td>
<td></td>
</tr>
<tr>
<td>• Very susceptible to blowdown or downdrafts from aircraft</td>
<td></td>
</tr>
<tr>
<td>• Watch out for snags burned out at the base or trunk</td>
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</tr>
</tbody>
</table>

What are some of the human factors related to safety?

8. Human related attitudes
   a) Poor attitude (morale, fear, macho)
   b) Physical conditioning
   c) Experience and training levels
   d) Fatigue

C. Safety procedures in hazardous areas
   1. Report all unsafe conditions or activities to the supervisor
      a) It is the responsibility of all fire fighters to act as Safety Officers
      b) They must report unsafe conditions promptly

Whose responsibility is it to report hazards?
If you see a dead snag how do you let everyone else know?

2. Flag unsafe areas
3. Either leave the area alone or make it safe before working in it

II. SAFETY GUIDELINES
A. The 18 Watch-Out Situations

1. You are on a fire that has not been scouted or sized-up

   a) Questions to ask to reduce risk
   1) Can you observe the fire personally, or use scouts?
   2) Do you know the location of the fire perimeter?
   3) Do you know the direction of the fire spread?
   4) Do you know the fuels and their condition?
   5) Do topographic hazards exist?
   6) Does enough information exist to establish a plan of attack?
   7) Do other dangers exist?

   b) If questions can't be answered or if in doubt
   1) Post lookouts

Show "Standards for Survival" video

How can you mitigate this problem?

What should you do to reduce those risks?
2) Establish escape routes and safety zones
3) Back off if the situation is too complex

2. You are in country you have not seen in daylight
   a) Questions to ask to reduce risks
      1) Can the resources you are replacing give you a through briefing?
      2) Can you observe the area or use scouts?
      3) Have escape routes and safety zones bee established and thoroughly scouted?
      4) Are escape routes and safety zones marked for night use?
      5) Have potential dangers been located, can they be dealt with?
   b) If questions can't be answered or if in doubt
      1) Post lookouts
      2) Check communications
      3) Back off if situation is too complex

3. Safety zones and escape routes have not been identified
   a) Safety zones and escape routes must be identified and understood by all crewmembers during every fire

   How can you reduce these risks?
b) Questions to ask to reduce the risks
   1) Can you identify them by scouting?
   2) Are they large enough to accommodate everyone without using fire shelters?
   3) Does the escape route need clearing and marking?
   4) Do you know how much warning time you need to get to your safety zone?
   5) Does everyone know the escape routes and safety zones?
   6) Can you create a safety zone if a natural one does not exist?

What should you do if you cannot answer these questions?
   1) Back off until you find safety zones and escapes

4. You are unfamiliar with the local weather and other factors that may influence fire behavior
   a) Questions to ask to reduce risk
      1) Can you ask questions of local experts?
      2) Does the Incident Action Plan give you adequate weather information?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3) Can you get information from resources that have been on the fire?</td>
<td></td>
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<tr>
<td>4) Is there any other way to obtain information?</td>
<td></td>
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<tr>
<td>b) If questions can't be answered or if in doubt</td>
<td></td>
</tr>
<tr>
<td>1) Base all actions on current and expected fire behavior</td>
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</tbody>
</table>

**NOTE:** Refers to one of the 10 Standard Fire Orders.

2) Post lookouts, establish escape routes and safety zones

3) Take extra caution

5. You are uninformed regarding strategy, tactics, and hazards

a) Questions to ask to reduce the risks

1) Can communications be established to find out strategy, tactics, or hazards?

2) Can scouting safely identify potential hazards?

3) Have strategy, tactics, or hazards changed since last informed?

4) Can you get a briefing from your supervisor?

b) If questions can't be answered or if in doubt

1) Post lookouts

2) Establish safety zones and escape routes

What are some ways to get strategy and tactics information?
3) Consider backing off until you are informed.

4) Don't leave a staging area or briefing until you have all the pertinent information.

6. You are not clear on your instructions and assignment.

a) Questions to ask to reduce risk
   1) Did you get all the necessary information?
      - Tasks
      - Location of assignment
      - Communication information
      - Hazards
      - Weather and behavior expected
   2) Did you understand the information?
   3) How long is the assignment expected to take?
      - Are there deadlines?
   4) What is the status of adjoining divisions?

b) If questions can't be answered or if in doubt
   1) Take the time to get it right
   2) Take notes and ask questions
   3) Repeat the information back.

What information do you need regarding assignments?
7. You have no communications with your crewmembers, your supervisor, or adjoining forces
   a) Questions to ask to reduce risks
      1) Has a good communications link been established with all parties?
      2) Can communications be established?
   b) If questions can't be answered or if in doubt
      1) Back off if situation becomes too complex
      2) Only if the situation is simple and safe should operations continue without communications

8. You are constructing a fire line without a safe anchor point
   a) Questions to ask to reduce risks
      1) Is the location not currently, or in the future likely to be, threatened by fire spread?
      2) Are there adequate safety zones and escape routes?
      3) Can you develop your starting point into an anchor point?
      4) Have you posted good lookouts?
      5) Do you have good communications?
b) If questions can't be answered or if in doubt
   1) Start the line in another location

9. You are building a fire line downhill and there is fire below you

a) Questions to ask to reduce risk
   1) Has the area been scouted for fire perimeter and behavior?
   2) Will wind direction be at your back?
   3) Will it stay at you back?
   4) Is the area free of chimneys and gullies?
   5) Are there adequate safety zones and escape routes as you progress down the hill?
   6) Do you have an anchor point to begin fire line construction?
   7) Can you complete your burnout downhill as you go to provide an anchor point and safety zones?
   8) Have lookouts been posted?
   9) Do you have good communications, especially with lookouts and crews working towards you?
  10) Can the line be completed and burnt out before the fire reaches the line?
  11) Do you have the adequate resources to complete the assignment?

What are some questions to ask regarding downhill line construction?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>12) Is aerial support available if needed?</td>
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<tr>
<td>13) Has everyone been briefed on the assignment, fire behavior, weather, communications, escape routes, safety zones, hazards, and tactics?</td>
<td></td>
</tr>
<tr>
<td>b) If questions can't be answered or if in doubt</td>
<td></td>
</tr>
<tr>
<td>1) Back off</td>
<td></td>
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<tr>
<td>2) Consider other tactics that provide for safety first</td>
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<tr>
<td>10. You are attempting a frontal assault on the fire</td>
<td></td>
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<tr>
<td>a) Questions to ask to reduce risks</td>
<td></td>
</tr>
<tr>
<td>1) Has the fire been scouted and sized up?</td>
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</tr>
<tr>
<td>2) Is your position defensible?</td>
<td></td>
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<tr>
<td>3) Are escape routes and safety zones adequate?</td>
<td></td>
</tr>
<tr>
<td>4) Do you have an anchor point?</td>
<td></td>
</tr>
<tr>
<td>5) Do you have adequate resources to complete the assault?</td>
<td></td>
</tr>
<tr>
<td>6) Are you informed on strategy, tactics, and hazards?</td>
<td></td>
</tr>
<tr>
<td>7) Is the terrain favorable to holding the fire?</td>
<td></td>
</tr>
<tr>
<td>b) If questions can't be answered or if in doubt</td>
<td></td>
</tr>
<tr>
<td>1) Reassess your tactics, post lookouts!</td>
<td></td>
</tr>
</tbody>
</table>
11. There is unburned fuel between you and the fire

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</thead>
<tbody>
<tr>
<td>a) Questions to ask to reduce risk</td>
<td></td>
</tr>
<tr>
<td>1) Can you see the fire?</td>
<td></td>
</tr>
<tr>
<td>2) Is the fire spread in a direction away from you?</td>
<td></td>
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<tr>
<td>3) Will your position be defensible when the fire reaches you?</td>
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<tr>
<td>4) Is your line anchored?</td>
<td></td>
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<tr>
<td>5) Are your escape routes and safety zones adequate?</td>
<td></td>
</tr>
<tr>
<td>b) If questions can't be answered or if in doubt</td>
<td></td>
</tr>
<tr>
<td>1) Consider a different location to make a stand</td>
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<tr>
<td>2) Post lookouts</td>
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</table>

12. You cannot see the main fire and you are not in contact with anyone who can

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>a) Questions to ask to reduce risks</td>
<td></td>
</tr>
<tr>
<td>1) Are you informed on expected fire behavior and weather?</td>
<td></td>
</tr>
<tr>
<td>2) Do you have safety zones and escape routes?</td>
<td></td>
</tr>
<tr>
<td>3) Will you receive adequate warning to go to your safety zone?</td>
<td></td>
</tr>
<tr>
<td>4) Are you informed on strategy, tactics, and hazards?</td>
<td></td>
</tr>
</tbody>
</table>
b) If questions can't be answered or if in doubt
   1) Back off
   2) Re-evaluate your position, limit your exposure

13. You are on a hillside where rolling material can ignite fuel below you
   a) Questions to ask to reduce risks
      1) Can you locate/construct a fire line to prevent material rolling below?
      2) Will you get enough warning of rolling material to prevent being hit by it?
      3) Can you see where any material that rolls below you goes and what it does?
      4) Is the area free of large amounts of flashy fuels?
      5) Is the area free of chimneys/gullies and steep slopes?
      6) Do you have two escape routes so that you can go either way?

   b) If questions can't be answered or if in doubt
      1) Post lookouts
      2) Consider locating line in a defensible position

14. You notice the weather is getting hotter and drier
   a) Questions to ask to reduce risks
      1) Do you have a workable plan if fire behavior increases?
      2) Do you have a plan if the fire reaches you earlier than expected?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</thead>
<tbody>
<tr>
<td>3) Is the rate of spread the same?</td>
<td>How can you get local weather information?</td>
</tr>
<tr>
<td>4) Are your escape routes and safety zones still adequate?</td>
<td></td>
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<tr>
<td>5) Will you have adequate warning if you need to sue the safety zones?</td>
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</tbody>
</table>

b) If questions can't be answered or if in doubt
1) Take weather observations more frequently
2) Base all actions on current and expected fire behavior
3) If fire behavior increases you must re-examine your plan, and risk analysis
4) Post more lookouts if more warning time is needed

15. You feel and increase in the wind or a change in direction

a) Questions to ask to reduce risks
1) Is the wind at your back?
2) Will it stay at your back?
3) Do you have a plan if the fire reaches you faster than expected?
4) Do you still have adequate warning time?
5) Will you be able to handle any additional spotting?
6) Is there little probability of the fire hooking around you?
7) Can you still carry out your strategy and/or tactics?

b) If questions can't be answered or if in doubt

1) Re-examine your situation
2) Base all actions on current and expected fire behavior
3) If fire behavior increases you must re-examine your plan and risk analysis

16. You are getting frequent spot fires across the fire line

a) Questions to ask to reduce the risks

1) Can you handle increased spotting?
2) Do you have a plan for long-range spotting?
3) Is help available if necessary?
4) If fire behavior increases, is your position still defensible?
5) Do you have more than one safety zone in case you are cut off?
6) Do the lookouts have a good view of the situation?
7) Is the primary burning period ending?

b) If questions can't be answered or if in doubt

1) Be ready to retreat
2) Keep your guard up even if spotting has not occurred for a few hours
17. You notice that the terrain and fuels will make escape to a safety zone difficult

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>a) Questions to ask to reduce risks</td>
<td></td>
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<tr>
<td>1) Does the crew's condition allow for fast travel?</td>
<td></td>
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<tr>
<td>2) Will you get adequate warning to make it to your safety zone?</td>
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<tr>
<td>3) Can escape routes be improved to make travel faster?</td>
<td></td>
</tr>
<tr>
<td>4) Are escape routes marked?</td>
<td></td>
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<tr>
<td>5) Will posting more lookouts give adequate warning?</td>
<td></td>
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<tr>
<td>b) If questions can't be answered or if in doubt</td>
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<tr>
<td>1) Consider other tactics that will allow you to be in a safer location</td>
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</tbody>
</table>

18. You notice firefighters are napping on the fire line

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>a) Questions to ask to reduce risks</td>
<td></td>
</tr>
<tr>
<td>1) Are lookouts posted?</td>
<td></td>
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<tr>
<td>2) Is the area free of hazards?</td>
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<tr>
<td>3) Are you still within agency work and rest policies?</td>
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<tr>
<td>4) Does your crew need a break? Have they been pushed too hard?</td>
<td></td>
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<tr>
<td>b) If questions can't be answered or if in doubt</td>
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<tr>
<td>1) Sleep firefighters in shifts, if necessary</td>
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</table>

How do fuels and terrain affect safety?

How can you address this problem?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>2) Post lookouts</td>
<td></td>
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<tr>
<td>3) Sleep as a group and only with permission from your fire line supervisor</td>
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<tr>
<td>4) Never sleep in the green, always in the black</td>
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</table>

19. Summary  
   a) The more "no" answers to the questions the higher probability of entrapment  
   b) Always consider  
      1) Is there a better, safer way?  
      2) What is being protected?  
      3) Does the value of the threatened area outweigh the risk of entrapment?  

B. The 10 Standard Fire Orders  

**NOTE:** Distribute *Fireline Safety Reference*, NWCG (NFES 2243), 1993 Edition to students.  

1. Keep informed on FIRE WEATHER conditions and forecasts  
2. Know what your FIRE is DOING at all times – observe personally, use scouts  
3. Base all actions on current and expected BEHAVIOR of FIRE  
4. Have ESCAPE ROUTES for everyone and make them known  
5. Post a LOOKOUT when there is a possible danger  
6. Be ALERT, keep CALM, THINK clearly, ACT decisively  
7. Maintain prompt COMMUNICATION with your crew, your boss, and adjoining forces
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>8. Give clear INSTRUCTIONS and be sure they are understood</td>
<td></td>
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<tr>
<td>9. Maintain CONTROL of your crew at all times</td>
<td></td>
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<tr>
<td>10. Fight fire aggressively but provide for SAFETY first</td>
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</tbody>
</table>
SUMMARY:

The most important aspect of fire fighting is safety. This is particularly important during wildland fire fighting operations due to the extreme risks involved and the numbers of people injured or killed each year. It is imperative that fire fighters be able to recognize and act upon situations that will put them or their crews in danger.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: LOOKOUTS, COMMUNICATIONS, ESCAPE ROUTES, AND SAFETY ZONES (LCES)

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of lookouts, communications, escape routes, and safety zones (LCES) by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Extreme Fire Behavior and Tactics" video, NWCG (NFES 1407), 1996 Edition
- S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 1 (for overhead transparencies and handouts)
- Fireline Safety Reference, NWCG (NFES 2243), 1993 Edition (1 for each student)

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6
- S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 1

PREPARATION: More fire fighters die fighting wildland fires than any other type. It is imperative that, in order to ensure their survival and that of their crew, the fire fighter has a clear understanding of the risks associated with wildland fire fighting and the means used to avoid injury and death. The use of LCES will help ensure that fire fighters take proper steps to avoid disaster, and respond quickly and appropriately when it occurs.
I. INTRODUCTION TO LCES
   A. Four basic components
      1. Lookouts
      2. Communications
      3. Escape routes
      4. Safety
   B. Uses "18 Watch-Outs" to
      1. Evaluate the assignment
      2. Identify the hazards
      3. Analyze the risks
      4. Implement steps to insure safety
      5. Interconnects with the 10 Standard Fire Orders

II. LOOKOUTS

A. When should a lookout be posted?
   1. During all fire fighting operations
   2. Most important during presence of 18 Watch-Outs
B. Back off if the situation is too complex
   1. Base all actions on current and expected fire behavior
C. Reassess your tactic
   1. Fire fighters traditionally have found themselves getting into trouble while

What are the four components of LCES?

What are some situations in which a lookout should be posted?
What should a lookout watch for when building line downhill?

a) Building line downhill

1) Has the area been scouted for fire perimeter, fire behavior, chimneys, and gullies?
2) Have adequate safety zones and escape routes been established?
3) Post lookouts with good communications that can observe the fire below
4) Establish an anchor point
5) Burnout the fire line, if possible, as you proceed down the hill
   - Strengthens the line
   - Provides for safety zone

b) Indirect fire line operations

1) Fire fighters are removed from the best safety zone, the burn, as well as the ability to see the fire
2) The need for a good safety zone and anchor point is paramount
3) Base all actions on current and expected fire behavior
4) Keep current on fire status
5) Maintain prompt communications
6) Post lookouts, have adequate safety zones and escape routes
7) Lookouts need to be able to see both the hazard and the fire fighters

What is the best safety zone?
### PRESENTATION

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>8)</td>
<td>Lookouts must be trained to observe the wildland fire environment and to recognize and anticipate changes</td>
</tr>
</tbody>
</table>
| 9) | New, inexperienced fire fighters should not be given the position of lookouts  
  - This puts the crew in extreme danger, as they cannot recognize potential risks |
| 10) | The number of lookouts is determined by the size of the fire and the terrain |

### APPLICATION

Who should be assigned to be lookouts?

### III. COMMUNICATIONS

A. Under what conditions would you need communications

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<thead>
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<tbody>
<tr>
<td>1.</td>
<td>In country not seen in daylight</td>
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<tr>
<td>2.</td>
<td>Safety zones and escape routes not identified</td>
</tr>
<tr>
<td>3.</td>
<td>Unfamiliar with weather and local factors influencing fire behavior</td>
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<tr>
<td>4.</td>
<td>Uniformed on strategy, tactics, or hazards</td>
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<tr>
<td>5.</td>
<td>Instructions and assignments not clear</td>
</tr>
<tr>
<td>6.</td>
<td>No communication link with crewmembers, supervisors, and adjoining forces</td>
</tr>
<tr>
<td>7.</td>
<td>Constructing line without a safe anchor point</td>
</tr>
<tr>
<td>8.</td>
<td>Building a fire line downhill with fire below</td>
</tr>
<tr>
<td>9.</td>
<td>Attempting a frontal assault on a fire</td>
</tr>
<tr>
<td>10.</td>
<td>Unburned fuel between you and the fire</td>
</tr>
</tbody>
</table>
11. Cannot see the main fire, not in contact with anyone who can
12. On a hillside where rolling material can ignite fuel below
13. Wind increases or changes direction
14. Getting frequent spot fires across the line
15. Terrain and fuels make escape to safety zones difficult

What are two essential characteristics of methods used to alert fire fighters?

B. The method used to alert fire fighters of approaching hazards must be prompt and clear
C. Communication devices
   1. Radios
   2. Phones
   3. Word-of-mouth
   4. Flagging

NOTE: Refer to Unit T-Topic 27, "Scouting & Communicating."
D. If you have doubts – BACK OFF

What is the definition of an escape route?

IV. ESCAPE ROUTES
A. The path the fire fighter takes from a location exposed to danger, to an area free from danger
B. Must be continually re-evaluated as conditions change
   1. Always remember to pay attention to the presence of the 18 Watch-Outs
C. More than one escape route must be available to the firefighter
   1. In front of the firefighter
   2. To the rear of the firefighter
D. Particularly important during indirect attack due to distance from the burn
E. **Must** be established at all times

What is the definition of a safety zone?

### V. SAFETY ZONES

A. A location where threatened firefighters may find refuge from danger without having to deploy a fire shelter
B. **Must** be established at all times during fire line operations
   1. Particularly important if any of the 18 Watch-Outs exist
C. Fire line intensity and safety zone topographic location determines the safety zone effectiveness

How big should a safety zone be?

D. Should be large enough so that all occupants can withstand the impact of the anticipated flame impingement and radiant heat **without needing to deploy shelters**
E. Firefighters need to say alert to changing safety zone and escape route locations
F. As line construction proceeds, position changes in relation to safety zones and escape routes
G. Constantly re-examine your situation
### H. Deployment zone

1. A deployment zone is an area in which you deploy a shelter when unable to reach a safety zone
   a) Improvement of the zone depends on the time before being overrun by fire

<table>
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<tr>
<th>PRESENTATION</th>
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<tbody>
<tr>
<td>H. Deployment zone</td>
</tr>
<tr>
<td>1. A deployment zone is an area in which you deploy a shelter when unable to reach a safety zone</td>
</tr>
<tr>
<td>a) Improvement of the zone depends on the time before being overrun by fire</td>
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<tr>
<th>APPLICATION</th>
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<tbody>
<tr>
<td>Show &quot;Extreme Fire Behavior and Tactics&quot; video</td>
</tr>
</tbody>
</table>
SUMMARY:

The most important aspect of fire fighting is safety. This particularly important during wildland fire fighting operations due to the extreme risks involved and the numbers of people injured or killed each year. It is imperative that fire fighters be able to recognize and act upon situations that will put them or their crews in danger. LCES will enable them to keep a high level of awareness at all times.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
SAFETY CONSIDERATIONS WHEN WORKING AROUND DOZERS

0:15

Level I

1997 NFPA 1001 3-3.18

A written test

The student will confirm a knowledge of the safety considerations when working around dozers by completing the written test

With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8

Writing board with markers/erasers

Appropriate audiovisual equipment

Appropriate audiovisual materials

Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8


The bulldozer's ability to rapidly construct fire lines makes it a widely used fire suppression tool. Because of the dozer's size, power, and limited operator visibility there are definite safety rules to follow when working near and around one. You need to know this for your safety and the safety of the people you are with.
## I. TERMINOLOGY

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<thead>
<tr>
<th>A. Tractor</th>
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<tbody>
<tr>
<td>B. Canopy</td>
</tr>
<tr>
<td>C. Winch</td>
</tr>
<tr>
<td>D. Tracks</td>
</tr>
<tr>
<td>E. Dozer blade</td>
</tr>
<tr>
<td>1. Angle</td>
</tr>
<tr>
<td>2. Straight</td>
</tr>
<tr>
<td>F. Medium dozer</td>
</tr>
<tr>
<td>G. Heavy dozer</td>
</tr>
<tr>
<td>H. Dozer operator</td>
</tr>
<tr>
<td>I. Dozer swamper</td>
</tr>
</tbody>
</table>

## II. DOZER SAFETY

| A. Make dozer operator or swamper aware of your location |
| B. Be alert for rocks and other rolling materials       |
| C. Do not walk directly in front or in back of dozer    |
|   1. Limited dozer operator visibility                  |
| D. Keep hose lays off the constructed fire line         |
| E. Do not approach the dozer until it has stopped and the operator has signaled you |
|   1. Remain in full view of operator at all times       |

What is some of the technology used when discussing dozers?

Who must be aware of your location when working near dozers?

When is it safe to approach the dozer?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Never get on or off a moving dozer to communicate with dozer operator</td>
<td></td>
</tr>
<tr>
<td>G. Do not permit anyone but the dozer operator to ride on the dozer</td>
<td></td>
</tr>
<tr>
<td>H. Watch for spot fires</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Should you even get on a moving dozer?</td>
</tr>
<tr>
<td></td>
<td>Can dozers be effective for making safety zones quickly for a strike team?</td>
</tr>
<tr>
<td></td>
<td>What winch safety precautions can be taken?</td>
</tr>
<tr>
<td>I. Dozer can quickly construct safety zones</td>
<td></td>
</tr>
</tbody>
</table>

### III. WINCH SAFETY

| A. Do not stand within bight of cable |
| B. Always wear gloves while operating the winch |
| C. Wear appropriate PPE when handling wire or cable |
| D. Use standardized hand signals |
| 1. Face vehicle |
| 2. Thumb-up |
| a) Take cable in |
| 3. Thumb-down |
| a) Let cable out |
| 4. Palms forward |
| a) Stop |
| 5. Right hand thumb pointed right |
| a) Turn left |
| 6. Left hand thumb pointed left |
| a) Turn right |
SUMMARY:

Visibility of a dozer operator is limited. Therefore, crews working near and around dozers need to pay attention to what they are doing and where they are working in relation to the dozer. Stay safe, keep visible, and never get on a moving dozer.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: SAFETY CONSIDERATIONS WHEN WORKING NEAR AIRCRAFT

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of safety considerations when working near aircraft by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 8

PREPARATION: In recent years, a number of newer aircraft have come into the air tanker field, allowing fire fighters to choose from a wider variety. Air attack now offers a modern, sophisticated attack weapon. More often than not, air attack forces will be available for use on wildland fires, especially when exposures or excessive damage potential exists. Because working around these aircraft can be extremely dangerous, it is essential that you are aware of the safety considerations that must be observed.
I. AIR OPERATIONS
   A. Operations are directed by an Air Attack who is in charge of air operations
      1. Air Attack flies above the fire and tells the pilots where their drops are to be made
      2. Air Attack Operations are always coordinated with the IC who is directing all suppression operations

II. FIXED WING AIRCRAFT (AIR TANKERS)

   A. Terminology
      1. Air Attack Coordinator
      2. Air tanker
      3. Fire retardants
         a) Retards or slows combustion
         b) Combination of water, chemicals, and color agent
         c) Main ingredient is fertilizer
         d) Continues to work long after water evaporated
      4. Retardant line
      5. Vortex
      6. Pretreatment of advanced fuels
### PRESENTATION

7. Direct attack  
8. Dry run  

**B. Use**

1. Aircraft are used on wildland fires with the intention of attaining prompt control  
   a) Air attack is most effective when  
      1) Making fast initial attack on small fires  
      2) When followed up by fast, aggressive ground action  
   b) Air tankers are used for making fire retardant drops from the air to the fire line

2. Three types of air tanker drops  
   a) Split  
      1) Multiple runs with a drop on each run  
   b) Trail  
      1) Continues with a drop on each run  
   c) Salvo  
      1) One large dump of everything

### APPLICATION

Can you name three types of drops from an air tanker?

### III. ROTARY WINGED AIRCRAFT

**A. Terminology**

1. Helitack  
2. Copter, helicopter

What is some terminology associated with rotary wing (helicopter) aircraft?
3. Base heliport, heliport, helibase  
4. Helicopter Coordinator, Helibase Manager  
5. Helitack Mobile Service Unit (HMSU)  
6. Main rotor, tail rotor  
7. Skids  
8. Rigid tank, bucket  
9. Seat belts and shoulder harness

How are rotary wing aircraft used in a wildland situation?

B. Use  
1. Reconnaissance  
2. Ferrying personnel or supplies  
3. Evacuation  
4. Water drops  
5. Search and rescue

IV. SAFETY
A. Safety rules regarding air tanker operations were developed for use by all personnel working on the fire line

B. Retardant/water drops  
1. If you are about to be dropped on  
   a) Move out of the target area if there is time  
   b) Stay away from large, old trees  
      1) Limbs or tops may break off and cause injury  
   c) Retardant weighs 9 pounds per gallon

What do you do if you are about to be dropped on?
d) Never stand up in the path of an air drop
   1) This greatly increases your chances of injury

e) The most dangerous area for ground personnel in a low drop area is the center 15-20 feet of the pattern

f) If possible, grab something solid and get behind it

How should you be positioned on the ground?

3) Lie down on your stomach facing the incoming air drop
   1) Have helmet and google on
   2) Keep feet spread apart for better body stability and digging in
   3) Cover your face, if possible

   4) Hold tools firmly out to the side and away from your body

Where should your tools be during a drop?

2. After the retardant/water drop has been made

a) You have a follow-up advantage on the fire

2b) Most retardants are slippery, so be sure to take this as a warning
   1) Watch you footing
   2) Wipe off your hand tools, especially the handles

What conditions can exist after an air drop?
c) Heavy application retardant on surface roads can be hazardous and should be washed down as soon as possible

d) Retardant may also damage agricultural or ornamental vegetation and action should be taken to minimize this damage

e) Remove retardant from apparatus
   1) May damage finish

C. Helicopter considerations

1. Approach and departure
   a) Get the pilot's attention and permission before approaching the helicopter
   b) Always approach or depart in a crouched position
      1) Gusts of wind could cause the rotor blades to drop dangerously low to the ground
   c) Your safety helmet must be held securely by your hand to prevent it being blown away and/or up into the rotor blades
   d) Never approach or depart a helicopter from ground which is upslope from main rotor
      1) When turning at a high speed or under bad lighting conditions, rotors are almost invisible

What are some safety considerations to observe when approaching and departing a helicopter?
### PRESENTATION

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<tr>
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<tbody>
<tr>
<td><strong>2. Working around heliport</strong></td>
<td></td>
</tr>
</tbody>
</table>
| a) | Stay at least 100 feet away from helicopters at all times unless you have a specific job that requires otherwise  
  1) Your presence can cause confusion and disrupt the pilot's concentration |
| b) | Do not face a landing helicopter unless you are wearing goggles |
| c) | Do not remain in the area that is constantly under the flight path of any helicopter |
| d) | No smoking within 50 feet of the helicopter or the fueling areas |
| e) | Learn and use the standard helicopter hand signals |
| f) | Carry all long-handled tools in such a manner that the handles will not be inadvertently raised into the rotor path |
| e) | Keep clear of the main and tail rotors at all times  
  1) Do not walk to rear of helicopter when entering or exiting |

### APPLICATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Should you even approach a helicopter from the tail?</td>
<td></td>
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<tr>
<td>What are the safety issues when working around a heliport?</td>
<td></td>
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<tr>
<td>When riding in-flight what safety considerations should you observe?</td>
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<tr>
<td><strong>3. In-flight safety</strong></td>
<td></td>
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<tr>
<td>a)</td>
<td>No smoking in the helicopter</td>
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<tr>
<td>PRESENTATION</td>
<td>APPLICATION</td>
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<tr>
<td>b) Use the seat belt and keep it secured until the pilot instructs you to leave the helicopter</td>
<td></td>
</tr>
<tr>
<td>c) Make sure all loose gear and helmets, maps, papers, etc., are held securely in your hands to prevent them being blown about the helicopter or out the windows</td>
<td></td>
</tr>
<tr>
<td>d) Never slap the doors of a helicopter</td>
<td></td>
</tr>
<tr>
<td>1) The doors do not have spring loaded locks so the handles must be physically turned to secure the door</td>
<td></td>
</tr>
<tr>
<td>e) Do not let any of your gear get in the way of the pilot or his controls</td>
<td></td>
</tr>
<tr>
<td>f) Never throw ANYTHING out of the helicopter</td>
<td></td>
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<tr>
<td>g) Do not talk to the pilot during take-off and landing</td>
<td></td>
</tr>
<tr>
<td>h) Be alert for hazards such as other aircraft and especially telephone and power lines</td>
<td></td>
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</tbody>
</table>
SUMMARY:

Aircraft can be a very valuable tool in combating wildland fires. It is extremely important that all ground crews understand and follow all safety precautions. You may work regularly around aircraft on brush fires and EMS calls, but you may also be called upon to be a part of that crew as a line EMT or for paramedic skills. You have to retain this important information for your safety.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, Third Edition, Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF FIRE SHELTERS

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the Characteristics and functions of fire shelters by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the PMS-416 Instructor's Guide, NWCG (NFES 2086), 1987 Edition

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Your Fire Shelter (pamphlet), NWCG (NFES 1570), 1995 Edition

REFERENCES:

PREPARATION: Over the past few years, it has been recognized that the fire shelter is a valuable tool for saving fire fighters' lives. Fire shelters were designed to provide personal protection in an emergency where fire fighters may be trapped. However, fire shelters should never be considered a substitute for good tactics or proven safety practices. People have died in poorly deployed shelters. In order for the shelter to be effective, the user must be well-trained and trained to use the shelter within seconds when a fire flare-up situation occurs threatening to overrun the fire fighter's position.
I. INTRODUCTION

A. The fire shelter is an effective lifesaving device
   1. On one fire alone it was credited with saving 73 lives

B. The fire shelter is not a means to take chances and is not a substitute for following the Standard Fire Orders

C. In the South Canyon Fire in 1994, people died even though they were in properly deployed shelters

II. FIRE SHELTER

A. Two most important functions of the fire shelter
   1. To provide cooler, breathable air to protect your lungs and airways
      a) You can survive third-degree burns
      b) You cannot survive scorched lungs and airways
   2. To minimize radiant heat

B. Mandatory carrying
   1. Shelters shall be worn during all fire fighting operations

C. Deployment
   1. There are instructions for proper deployment inside the shelter's carrying case
      a) Don't rely on them in an actual entrapment situation
      b) There may not be time to read the instructions
   2. Select a deployment site in a natural firebreak
      a) Wide dozer line

What are the two most important functions of the fire shelter?
b) An area already burned over
c) An area containing only a light fuel

3. Scrape or burn out a 4 feet x 8 feet or larger spot
   a) If time permits

4. Avoid areas with heavy brush, trees with low branches, logs, snags, and flammable supplies

5. Keep away from narrow draws, chutes, and chimneys
   a) Tends to funnel smoke, flames, and hot gases

6. If there is no pull tab, or if it breaks off in your hand, use a knife or something sharp to open the vinyl bag
   a) Use care not to damage the shelter

7. Place the shelter so your feet are toward the oncoming flame front
   a) The foot end will become the hottest spot in the shelter and it is easier to hold it down with your feet

What should you take into the shelter?

D. Items to wear and take into the fire shelter

1. Gloves
   a) Without gloves on, it is very difficult to hold down the shelter while in the entrapment

2. Fieldpack and hardhat
   a) The fieldpack and hardhat will help keep the shelter away from your body
   b) Remove any hazardous item(s) from the fieldpack and toss them away from the deployment area
### 3. Radio
   a) Maintain communications with other trapped fire fighters by radio if you have one or by shouting back and forth

### 4. Water
   a) Drink water so you continue to sweat, which aides body cooling
   b) Never wet clothing or wear moistened face or respiratory protection like a wet bandana

### E. Other items of concern

1. Smoke
   a) Smoke is frequently not a problem in actual shelter deployments, because the wind sucks the smoke out of the shelter
      1) However, holes and tears may allow additional smoke to enter
   b) Usually, the greatest amount of smoke will be present when you first get under the shelter

2. Inhalation of heat and smoke
   a) Keep you nose pressed to the ground, as much as possible
   b) Digging a shallow hole for your face and breathing through a dry bandana will help reduce the inhalation of heat and smoke

3. Pinholes and tears
   a) Pinholes and small tears in the shelter will not reduce your protection

---

How can you reduce the inhalation of heat and smoke?
b) No matter how big the hole or tear the shelter may have, you are still better off inside it

4. Length of stay
   a) There is no fixed time to stay under the shelter
   b) Leaving too soon can expose your lungs to super-heated air or excessive smoke
   c) The best strategy is to stay under the shelter until you notice temperatures have significantly cooled or a supervisor tells you it is safe to come out

5. Double occupancy
   a) Never plan to share a shelter
   b) In actual entrapments, two people have used one shelter, but the risk of injury increases dramatically by sharing
   c) The shelter is designed for one person and the extra space is needed for insulation

6. Entrapment without a fire shelter
   a) Look for an indentation in the ground
   b) Do not use a chute, chimney, drainage etc.
   c) The number one priority is to protect your lungs and airways

III. INSPECTION
   A. Inspection interval
      1. Inspections should be made at the beginning and end of each fire season and whenever a shelter is carried on a person or in a vehicle for more than 14 days
What is the most common type of damage?

2. Abrasion is the most common damage
   a) Remove the shelter from service if
      1) The vinyl bag is gray and you cannot see the shelter
      2) Aluminum particles are in the bottom of the bag

3. Look for tears along folded edges
   a) If tears in the foil exceed 1 inch long, remove the shelter from service

4. If dents or punctures in the foil are over 1 inch wide or if ½ inch or more of foil is missing, remove the shelter from service

5. A shelter deployed for inspection or demonstration should not be used on the fire line

IV. CARE AND HANDLING
   A. Keep the shelter away from sharp objects that may puncture it
   B. Don't load heavy objects on top of the shelter
   C. Avoid as much rough handling as possible
   D. Don't lean against objects when wearing the shelter
   E. Don't sit on the shelter or use it as a pillow
SUMMARY:

A fire shelter is an aluminized, heat reflective, personal protective pup tent. It is required when performing fire line work. It is simple to use. It has been proven to work in actual field conditions and is an accepted life-saving device.

It is not a justification for slighting quality training in fire behavior, or a reason to ignore erratic and extreme fire behavior indicators. It is not a substitute for the Standard Fire Orders or a replacement for the "Watch Out Situations." It is not a reason to forget to use common sense or an excuse for mediocre performance. It is a fire fighters last-ditch attempt to avoid the consequences of fire fighting mistakes! It is intended as YOUR LAST RESORT!

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

FIRE FIGHTER I

TOPIC: HOW TO DEPLOY A FIRE SHELTER, STANDING METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A training fire shelter and appropriate wildland personal protective equipment

Behavior: The student will deploy a fire shelter using the standing method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:
- Job breakdown
- One training fire shelter per two students
- Appropriate wildland personal protective equipment

REFERENCES:
- Manufacturer's instructions for fire shelter
- Your Fire Shelter (pamphlet), NWCG (NFES 1570), 1995 Edition

PREPARATION:
Over the past few years, it has been recognized that the fire shelter is a valuable tool for saving fire fighters lives. Fire shelters were designed to provide personal protection in an emergency situation when conditions result in fire fighters being trapped in wildland fires. Fire shelters were not designed to provide for noncompliance with proven safety practices or policies. Know and follow your Standard Fire Orders and the situations that shout "Watch Out!"
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open carrying case</td>
<td>1a. Unfastening top flap</td>
</tr>
<tr>
<td>2. Pull shelter</td>
<td>2a. From carrying case</td>
</tr>
<tr>
<td></td>
<td>b. Working hand on top of shelter</td>
</tr>
<tr>
<td></td>
<td>c. Other hand anchoring base of case</td>
</tr>
<tr>
<td>3. Open plastic protective case</td>
<td>3a. Grasping red pull tab ring</td>
</tr>
<tr>
<td></td>
<td>b. Pulling straight and firmly down side of case</td>
</tr>
<tr>
<td></td>
<td>c. Tearing the plastic case</td>
</tr>
<tr>
<td>4. Remove shelter</td>
<td>4a. From plastic protective case</td>
</tr>
<tr>
<td></td>
<td>b. Fully removing shelter from case</td>
</tr>
<tr>
<td>5. Unfold the shelter accordion folds</td>
<td>5a. Grasping either end</td>
</tr>
<tr>
<td></td>
<td>b. Extending to full length, without releasing end fold</td>
</tr>
<tr>
<td></td>
<td>c. Without releasing shelter</td>
</tr>
<tr>
<td>6. Unfold the shelter tri-fold</td>
<td>6a. To full width</td>
</tr>
<tr>
<td></td>
<td>b. Without releasing shelter</td>
</tr>
<tr>
<td>7. Open shelter</td>
<td>7a. Assuring that wind is to fire fighter's back</td>
</tr>
<tr>
<td></td>
<td>b. Without releasing shelter</td>
</tr>
<tr>
<td></td>
<td>c. Using feet to anchor end of shelter, as needed</td>
</tr>
<tr>
<td></td>
<td>d. Using free hand for further extension</td>
</tr>
<tr>
<td></td>
<td>e. Sides, ends, and peak fully extended</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
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<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>8. Enter shelter</td>
<td>8a. Body turned sideways</td>
</tr>
<tr>
<td></td>
<td>b. Stepping over lower hold down straps</td>
</tr>
<tr>
<td></td>
<td>c. Ducking head under upper hold down straps</td>
</tr>
<tr>
<td></td>
<td>d. Turning face out of opening</td>
</tr>
<tr>
<td>9. Position body and shelter</td>
<td>9a. Feet shoulder width apart</td>
</tr>
<tr>
<td></td>
<td>b. Feet anchoring lower end</td>
</tr>
<tr>
<td></td>
<td>c. Feet behind hold down straps</td>
</tr>
<tr>
<td></td>
<td>d. Arms extended upward and to the sides</td>
</tr>
<tr>
<td></td>
<td>e. Body behind upper hold down straps</td>
</tr>
<tr>
<td></td>
<td>f. Facing away from the oncoming fire</td>
</tr>
<tr>
<td>10. Drop to ground</td>
<td>10a. On knees</td>
</tr>
<tr>
<td></td>
<td>b. Feet towards oncoming fire</td>
</tr>
<tr>
<td>11. Lie flat</td>
<td>11a. On stomach</td>
</tr>
<tr>
<td>12. Anchor shelter</td>
<td>12a. Maintaining maximum airspace in shelter</td>
</tr>
<tr>
<td></td>
<td>b. Anchoring flaps with head, arms, and legs</td>
</tr>
<tr>
<td></td>
<td>c. Full perimeter ground to shelter flap seal</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: HOW TO DEPLOY A FIRE SHELTER, LYING-DOWN METHOD

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A training fire shelter and appropriate wildland personal protective equipment

Behavior: The student will deploy a fire shelter using the lying-down method

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

• Job breakdown
• One training fire shelter per two students
• Appropriate wildland personal protective equipment

REFERENCES:

• 4300 Handbook, CDF, Current Edition
• Manufacturer’s instructions for fire shelter
• S-130 Instructor’s Guide, NWCG (NFES 1510), 1995 Edition, Unit 11, Lesson C
• Your Fire Shelter (pamphlet), NWCG (NFES 1570), 1995 Edition

PREPARATION:

All fire fighting personnel shall carry the fire shelter during all fire fighting operations. A fire shelter is intended to be used only as a tool of last resort, when fire entrapment is imminent and escape is not possible. During an entrapment, the fire will produce extreme temperatures and super-heated noxious gasses. The lowest temperatures and cleanest air in this environment is found near the ground. To take full advantage of this, the fire fighter must be able to deploy a fire shelter while lying on the ground.
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<td></td>
<td>b. Working hand on top of shelter</td>
</tr>
<tr>
<td></td>
<td>c. Other hand anchoring base of case</td>
</tr>
<tr>
<td>3. Lie down</td>
<td>3a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. On back or side</td>
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<tr>
<td></td>
<td>c. Head as close to ground as possible</td>
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<tr>
<td></td>
<td>d. Head away from fire if wind does not adversely effect fire shelter</td>
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<tr>
<td></td>
<td>deployment</td>
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<td></td>
<td>e. Head into wind if wind pushes shelter and adversely effects fire</td>
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<td></td>
<td>fighter's control of fire shelter</td>
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<tr>
<td>4. Open plastic protective case</td>
<td>4a. Grasping red pull tab ring</td>
</tr>
<tr>
<td></td>
<td>b. Pulling straight and firmly down side of case</td>
</tr>
<tr>
<td></td>
<td>c. Tearing the plastic case</td>
</tr>
<tr>
<td>5. Remove shelter</td>
<td>5a. From plastic protective case</td>
</tr>
<tr>
<td></td>
<td>b. Fully removing shelter from case</td>
</tr>
<tr>
<td>6. Unfold the shelter accordion folds</td>
<td>6a. Grasping either end</td>
</tr>
<tr>
<td></td>
<td>b. Extending to full length, without releasing end fold</td>
</tr>
<tr>
<td></td>
<td>c. Without releasing shelter</td>
</tr>
<tr>
<td>7. Unfold shelter tri-folds</td>
<td>7a. To full width</td>
</tr>
<tr>
<td></td>
<td>b. With hands (shelter may not open with feet)</td>
</tr>
<tr>
<td></td>
<td>c. Without releasing shelter</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8. Open shelter</td>
<td>8a. One hand inside each corner at one end and spreading apart with hands</td>
</tr>
<tr>
<td></td>
<td>b. Feet at end opposite end opposite hands and spreading apart</td>
</tr>
<tr>
<td></td>
<td>c. Alternately pushing feet and hands up into shelter's interior until fully opened</td>
</tr>
<tr>
<td></td>
<td>d. Never releasing control of shelter</td>
</tr>
<tr>
<td>9. Enter shelter</td>
<td>9a. Lowering down over body and head with sides, ends, and peak fully extended</td>
</tr>
<tr>
<td>10. Anchor shelter</td>
<td>10a. To ground</td>
</tr>
<tr>
<td>11. Roll over inside shelter</td>
<td>11a. While maintaining a minimum of three anchored corners</td>
</tr>
<tr>
<td></td>
<td>b. While moving one hand to secure corner being held by second hand</td>
</tr>
<tr>
<td></td>
<td>c. Bringing second hand across to secure unanchored corner</td>
</tr>
<tr>
<td></td>
<td>d. Repeating sequence with feet while rolling onto stomach</td>
</tr>
<tr>
<td>12. Rotate shelter and body position</td>
<td>12a. Until feet are towards fire</td>
</tr>
<tr>
<td></td>
<td>b. If necessary</td>
</tr>
<tr>
<td>13. Anchor shelter</td>
<td>13a. Maintaining maximum airspace in shelter</td>
</tr>
<tr>
<td></td>
<td>b. Anchoring flaps with head, arms, and legs</td>
</tr>
<tr>
<td></td>
<td>c. Full perimeter ground to shelter flap seal</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
Be prepared:

Every ground cover fire will burn in a different pattern. This pattern is influenced by wind, slope, fuel, weather, or a combination of any or all of them. As fire pattern begins to take shape, however, certain typical features or parts of the fire begin to develop. You must know the correct terminology when describing the parts of a fire. Your safety, as well as that of others, depends on it.
NOTE: Draw a typical ground cover fire on the writing board, omitting names of parts of fire. Write the parts in as you describe their meaning.

I. THE PARTS OF A GROUND COVER FIRE

A. Point of origin
   1. Place where fire started

B. Flank
   1. Every fire has two flanks or sides
   2. Identified by standing at point of origin, facing the fire's head
      a) Right flank is on observer's right hand
      b) Left flank is on observer's left hand

C. Head
   1. Area where fire is burning the fastest or hottest
   2. Remember, a fire can have more than one head

D. Island
   1. An unburned area within a fire's perimeter

E. Finger
   1. Portion of fire extending outward from the perimeter

F. Hot spots
   1. Spots along fire perimeter that are burning more vigorously than the rest of the perimeter

G. Spot fire
   1. A fire that starts outside of the main fire perimeter after being ignited by hot embers from the main fire

What is the difference between hot spots and spot fires?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Burn</td>
<td></td>
</tr>
<tr>
<td>1. The burned area inside the fire's perimeter</td>
<td></td>
</tr>
<tr>
<td>I. Green</td>
<td></td>
</tr>
<tr>
<td>1. The area of unburned fuel outside of the fire's perimeter</td>
<td></td>
</tr>
<tr>
<td>J. Pocket</td>
<td></td>
</tr>
<tr>
<td>1. Area of unburned fuel between two fingers or between a finger and the rest of the fire</td>
<td></td>
</tr>
<tr>
<td>K. Heel</td>
<td></td>
</tr>
<tr>
<td>1. Portion of fire farthest away from the head</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What is a pocket?</td>
</tr>
<tr>
<td></td>
<td>2. At or near the point of origin</td>
</tr>
</tbody>
</table>
SUMMARY:
To achieve effective communications concerning wildland fire, all fire fighters must know the respective parts of the fire. Your safety depends upon your ability to correctly describe and relay your location or needs.

EVALUATION:
The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:
Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: WILDLAND FIRE STRATEGY

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the wildland fire strategy by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- S-130 Instructor’s Guide, NWCG (NFES 1510), 1995 Edition, Unit 6 (for overhead transparencies and handouts)

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6
- Wildland Firefighting, Bill Clayton, David Day, and Jim McFadden

PREPARATION:
Upon arrival at a fire scene, the initial attack Incident Commander has to size-up the situation and decide on what type of attack to make to safely and effectively extinguish a wildland fire. The fire fighter must be expected to carry out that strategy in the form of tactics. To do so, the fire fighter must have a basic understanding of wildland fire strategy.
I. METHODS OF ATTACK USED ON WILDLAND FIRES

A. Direct attack
   1. Involves working directly on the fire edge

2. Advantages
   a) Crews can escape to safety in burned areas
      1) Generally considered the safest part of the fire
   b) Fire is stopped with least spread and minimum acreage
   c) Full advantage is taken of burned-out areas along the control line
   d) No need for standby personnel to watch unburned areas
   e) Reduces need for burning out

3. Disadvantages
   a) Personnel subject to heat, smoke, and flame
   b) Control line is long and irregular and must follow fire edge
   c) Does not take advantage of natural fire barriers
   d) More mop-up and closer patrol required
   e) Not effective against fast moving hot fires

What is a direct attack?

What is the advantage of a direct attack?

What are some disadvantages of a direct attack?
4. Direct attack tactics include
   a) Pincer
   b) Tandem
   c) Envelopment

**NOTE:** These three tactics are covered in Unit T-Topic 24, "Mobile Attack."

B. Indirect attack

1. Uses pre-existing roads, natural barriers, or constructed fire lines ahead of the main fire
2. Lines are either burned out or held by ground and air forces and becomes the final control lines

3. Backfire
   a) A fire set along an inner edge of a fire control line with the expectation that it will be influenced by the advance of the main fire and thus burn out the intervening flammable vegetation
   b) Decision to backfire is made at the IC or Operations Section Chief level
      1) Due to impact a backfire operation has on the rest of the incident

4. Burnout
   a) A suppression method used in direct or parallel attack consisting of removing, by fire, the unburned fuels between the fire edge and the fire control line
### Presenter: FIRE FIGHTER I

#### PRESENTATION

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>b)</td>
<td>Decision to burnout is made at the Crew Leader level</td>
</tr>
<tr>
<td>c)</td>
<td>Does not influence main fire behavior or operations on the rest of the incident</td>
</tr>
</tbody>
</table>

What are some advantages of an indirect attack?

### 5. Advantages

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>a)</td>
<td>Permits easier work for crew because of less smoke, heat, and flame contact</td>
</tr>
<tr>
<td>b)</td>
<td>Reduces length of fire edge and shortens control line</td>
</tr>
<tr>
<td>c)</td>
<td>Permits crews to take advantage of natural fire barriers</td>
</tr>
</tbody>
</table>

What are some disadvantages of an indirect attack?

### 6. Disadvantages

<p>| | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Fire can catch fire fighters working in unburned fuel</td>
</tr>
<tr>
<td>b)</td>
<td>Fire can outflank and put crew in jeopardy</td>
</tr>
<tr>
<td>c)</td>
<td>Increased acreage burned</td>
</tr>
<tr>
<td>d)</td>
<td>Burning out can get out of control</td>
</tr>
<tr>
<td>e)</td>
<td>Requires lookouts to watch fire line and prevent entrapment</td>
</tr>
</tbody>
</table>

What is a parallel attack?

### C. Parallel attack

1. Fire line is constructed parallel to perimeter, but farther out than in direct attack
2. May be needed due to fire intensity and inability to work closely
3. Can be used to burn across unburned fingers
4. Intervening strips of unburned fuel are immediately burned out

D. Combination attack
   1. Be flexible, if the direct attack is not working start thinking about going indirect or parallel
   2. Conditions may warrant simultaneous direct and indirect attack
      a) On different parts of the fire
      b) On same flank as conditions change
SUMMARY:

The four tactics of indirect, direct, parallel, and combination are used in some form during the control of all wildland fires. Fire fighters must have a basic understanding of the types of wildland fire strategy if they are to do their job effectively.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Firefighting, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HANDLINE CONSTRUCTION

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the methods, safety considerations, advantages, and disadvantages of direct and indirect handline construction utilizing wildland fire fighting hand tools by completing the written test

Standard: With a minimum of 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 6 (for overhead transparencies and handouts)

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition

PREPARATION: Control handlines constructed by hand are one of the oldest methods of wildland fire suppression. This method is used in areas too steep for mechanized equipment, in areas where mechanized equipment would cause severe damage to the environment, or where use of mechanized equipment would be otherwise impractical. We use prisoners, hotshot crews, and at times you to "tool up" and cut a handline.
I. HANDLINE CONSTRUCTION
   A. Perimeter control
   B. The act of constructing a continuous line around the perimeter of a wildland fire with hand tools
      1. Whether it be done by machines or fire fighters
   C. The objective is to remove flammable material down to mineral soil in order to stop the combustion process

II. HANDLINE LOCATION
   A. In determining the location to begin handline construction, the safety of personnel is the first concern
      1. Escape routes and safety zones must be identified and communicated to all members
      2. Use safest route through green to fire perimeter or spot fire
      3. Use lookouts
      4. Avoid areas of potential rolling, slipping, or falling material
      5. Avoid snags or widow makers, where possible
      6. Use direct attack, if at all possible
      7. Watch for mechanized equipment above the control line
      8. All crewmembers shall maintain at least a 10-foot interval between themselves and other members to prevent injuries from tool use
         a) Jargon is "Keeping your dime"
What does the "dime" refer to?

1) 10-foot interval = 10 cents (dime)

9. In green fuel
   a) Lead person takes first area
      1) Closest to the outside edge of fire
   b) Next person takes area adjacent to first person's work
      1) One step closer to fire's edge
   c) Pattern continues until desired handline width is covered
   d) Remaining tools clean up and improve the handline
   e) As personnel tire, they rotate back to the end of the handline

10. "Pull the black back"

   a) Personnel pull the burned fuel along the fire edge
      1) Back into the burn
      2) Down into mineral soil
      3) Narrow width is all that is necessary

Do we pull burned fuel into the green?

B. Factors to consider
   1. Should begin at a secure anchor point
   2. Termination point should also be established
      a) To measure progress

What are some factors affecting the selection of handline location?
### PRESENTATION

3. Take advantage of sparsely covered areas
4. Take advantage of barriers, roads, trails, and ridge tops
   a) This will expedite handline construction and control of the fire
   b) Assess practicality of burning out irregular control handline
      1) Shortens handline
      2) Easier mop up
5. Keep handlines as straight as possible
   a) Avoid sharp angles because fire will jump the handline more readily at the angle
6. When possible take advantage of terrain to avoid an undercut handline
   a) An undercut handline is below grade to catch rolling debris
   b) Usually undercut handline is by a dozer or plow
   c) A trench is constructed by hand tools
      1) A trench is a type of undercut handline
   d) This will reduce the need for trenching to catch rolling embers, pinecones, tree limbs, logs, etc.
7. Use direct method of attack, if possible
   a) To reduce the final acreage of the fire
   b) Usually the safest way to attack the fire

### APPLICATION

How can the terrain assist you in handline construction?

What are the advantages of direct attack?
### PRESENTATION

1. Takes advantage of inactive handline

8. Where firing operations are planned locate handlines to give uphill start for firing operation

9. Block off high hazard type fuels where possible by leaving them outside of constructed handlines

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>a) Snags standing or on ground</td>
<td></td>
</tr>
<tr>
<td>b) Heavy fuel concentrations</td>
<td></td>
</tr>
<tr>
<td>c) Live oak trees</td>
<td></td>
</tr>
</tbody>
</table>

10. Where fire is spreading rapidly or is very hot, locate handline to give time for handline construction and burning out (indirect method)

11. If numerous spot fires occur within a small area, select the most open area possible and place a handline around the entire area instead of a handline around each spot fire

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>a) Less handline to cut, therefore quicker</td>
<td></td>
</tr>
<tr>
<td>b) Mark a trail from the main fire to the spot fire</td>
<td></td>
</tr>
<tr>
<td>c) Cut your way into spot fire, do not crash through brush and get trapped</td>
<td></td>
</tr>
</tbody>
</table>

### APPLICATION

- Do handlines work in conjunction with firing operations?
- What are some examples of high hazard fuels?
- If the flames are large or the fire is moving rapidly, can cutting handline be effective?
III. HANDLINE CONSTRUCTION TECHNIQUES

A. Hookline order
   1. Cutting tools to the front
      a) Cutting the fuels
   2. Scraping tools to the rear
      a) Scraping and completing the handline down to bare mineral soil

C. One strike technique
   1. Each crewmember is responsible for clearing a small portion of the handline width and then moving forward
      a) Each succeeding crewmember widens existing handline

D. Bump up technique
   1. Some tools and positions in the hookline order are more tiring than others
   2. Have each crewmember "bump up" periodically to a different tool/position
      a) Prevents crew fatigue

   Why do we bump up?
   What is meant by leap frogging?

E. Leap frog technique
   1. Each crew is responsible for clearing a small section of the handline to its full width and then passing other crews to clear another unworked section of handline

IV. HANDLINE CONSTRUCTION METHODS

A. Handline can be no narrower or wider than specified by the supervisor
   1. If too narrow, will compromise the effectiveness of the fire line
2. If too wide, affects the production rate of the handline construction

What is hot spotting?

B. Hot spotting

1. Defined as checking the spread of a fire at points of more rapid spread or special threat
2. Usually the initial step where prompt control is the top priority
3. A practice often used by fire crews as well as by engine crews and helitack crews
   a) Control or check the rapidly spreading points of the fire
   b) Knock down localized flare-ups
4. Less active sections of the fire are left to the trailing crew

What is the object or goal of cutting handline?

5. The object is to hold the fire in place until a continuous control handline can be constructed

6. When hot spotting
   a) Increase the width of handline
   b) Go to extremes in scattering cut material to prevent slopovers
   c) Contain several hot spots by leaving one or more fire fighters at each spot after knockdown is reasonably assured

How can a shovel be used in a hot spot?

7. Hot spotting is accomplished by using
   a) Hand tools to throw dirt at the base of the flame to cool and smother it and to construct handline
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Water to lower the fuel temperature below its ignition temperature</td>
<td></td>
</tr>
<tr>
<td>8. During initial attack hot spotting is done to check the spread of small heads or fingers and to prevent the fire from getting into</td>
<td></td>
</tr>
<tr>
<td>a) Fuels in which the fire will burn faster</td>
<td></td>
</tr>
<tr>
<td>b) Heavy masses of fuel such as logs or snags</td>
<td></td>
</tr>
<tr>
<td>c) Fuels where handline construction will be more difficult</td>
<td></td>
</tr>
<tr>
<td>d) Fuels on steeper slopes</td>
<td></td>
</tr>
<tr>
<td>e) Exposures</td>
<td></td>
</tr>
<tr>
<td>9. Requires tremendous physical effort from fire fighters and basic knowledge of fire behavior due to exposure to</td>
<td></td>
</tr>
<tr>
<td>a) Ambient air temperature</td>
<td></td>
</tr>
<tr>
<td>b) Heat from the fire</td>
<td></td>
</tr>
<tr>
<td>c) Physical exertion</td>
<td></td>
</tr>
<tr>
<td>d) Potentially extreme fire behavior</td>
<td></td>
</tr>
<tr>
<td>10. Also accomplished by fire engines, air tankers, and/or dozers</td>
<td></td>
</tr>
<tr>
<td>a) Can also be used in hot spotting</td>
<td></td>
</tr>
<tr>
<td>b) Attacking one hot spot after another instead of establishing a continuous handline along the fire's edge</td>
<td></td>
</tr>
<tr>
<td>c) Purpose is to contain the fastest burning parts of the fire first and then to complete the handline later for full control</td>
<td></td>
</tr>
</tbody>
</table>

Can engines and air tankers pick up spot fires?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>
| 11. Hot spotting is also appropriate when equipment and personnel are in short supply  
   a) Fire spread is limited  
   b) Fewer acres burned  
   c) Less handline to be constructed  
12. Remember that wind direction or topography can change a flank into a dangerous head                                                                                                         | What is the purpose of a scratch handline?                                   |
| C. Scratch handline  
1. Usually constructed just wide enough to temporarily hold the fire in check, until a finished handline is constructed  
2. May be extremely narrow  
3. Need not be continuous                                                                                                                                  | What is cold trailing?                                                      |
| C. Cold trailing  
1. Method of controlling a partly dead fire edge by  
   a) Carefully inspecting and feeling with the hands to detect any fire  
   b) Digging out and extinguishing every live spot  
   c) Lining any live edge, tying cold edge to cold edge  
D. Finished handline                                                                                                                                            | Does anyone know the general rule for the width of a fire line? |
| 1. Approximately 1½ times wider than the height of the adjacent cover fuels                                                                 |-|
### Handline Construction

**PRESENTATION**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the minimum width for fire line?</td>
<td>a) Should not be less than 18 inches wide regardless of fuel height</td>
</tr>
<tr>
<td></td>
<td>2. All flammable vegetation and ground fuels are removed and the control handline is cleaned down to bare mineral soil</td>
</tr>
<tr>
<td></td>
<td>3. Roots are to be cut at both ends and removed from the control handline</td>
</tr>
<tr>
<td></td>
<td>4. All burned/charred material should be thrown well back into the burn</td>
</tr>
<tr>
<td></td>
<td>a) No windrows</td>
</tr>
<tr>
<td></td>
<td>1) Accumulations or piles of unburned fuel left along the fire line</td>
</tr>
<tr>
<td></td>
<td>5. All green fuels should be scattered on the unburned side of the handline</td>
</tr>
<tr>
<td></td>
<td>a) Do not windrow them</td>
</tr>
<tr>
<td></td>
<td>6. Islands of unburned or singed materials are cut and scattered or are cold trailed, if burning out is not safe or practical</td>
</tr>
<tr>
<td></td>
<td>7. Unburned fuel left between the fire and the control handline should be burned or cut, and scattered</td>
</tr>
<tr>
<td></td>
<td>8. All overhanging branches above the control handline must be cleared</td>
</tr>
<tr>
<td></td>
<td>9. Spot fires are treated the same as the main fire</td>
</tr>
</tbody>
</table>

**APPLICATION**

What if you encounter roots in your fire line?

What should you do if you have overhanging trees over your fire line?
### Trenching

1. **Also known as an undercut or underslung line**

2. **Construction**
   
   a) **Build across a slope, below the burned area, to catch any burning material that could roll downhill and cross the control line**
   
   1) Pinecones
   2) Mossy rocks
   3) Plant roots
   4) Small logs
   5) Stumps and similar fuels from crossing the handline

   b) **Inside wall should be tapered**
   
   1) Permit rolling material into the trench

   c) **Outside wall should be sheer**
   
   1) Minimize the chances of jumping out of trench and over the berm

3. **Berm**
   
   a) The lower, downhill side of the trench
   
   b) Made up of bare mineral soil or rocks
4. **Size**  
ad) Minimum should be 1 foot deep and 1 foot wide  
b) Must be of sufficient depth to prevent it from filling when crew walk in or above it  
c) Depth and width determined by  
   1) The size and quantity of the potentially rolling fuels  
   2) The steepness of the slope  
d) Wider and deeper trenches must be constructed if  
   1) The slope is very steep  
   2) The rolling material is large  
   3) Heavy accumulations of rolling material must be held

5. **Do not walk on the berm as it smashes it down**  
ad) Walk in the trench or below the undercut handline

6. **Effective hand tools for trenching**  
ad) **Pulaski**  
   1) Used to loosen the soil using the grubbing edge  
b) **McLeod and shovels**  
   1) Used to  
      - Clean the trench out  
      - Shape it  
      - Build the berm
**SUMMARY:**

Constructing handlines to control the spread of wildland fires is often the only technique available. The work is tiring and demanding under the best of circumstances. Failing to properly locate a handline and take advantage of labor saving techniques can have devastating results.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF WILDLAND HAND TOOLS

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the various types of commonly used wildland hand tools, their common uses, and the proper maintenance procedures for each tool by completing the written test.

Standard: With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3.

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Wildland hand tools
- "Wildfire Handtools" video, NWCG (NFES 2036), 1986 Edition

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition

PREPARATION: A variety of hand tools have been developed or adapted for wildland fire suppression operations. When properly maintained and used, they are tremendously effective for checking fire spread. No fire fighter should ever be on the fire line without a tool, either a nozzle, shovel, McLeod, or Pulaski or you will be at risk and ineffective at putting our small fires.
I. HAND TOOL CLASSIFICATION
   A. Grouped according to their primary use

   1. Cutting tools
      a) Brush hook
      b) Pulaski
   2. Scraping tools
      a) McLeod
      b) Combination (combi-tool)
   3. Raking tools
      a) McLeod
      b) Wire broom
   4. Grubbing or trenching tool
      a) Pulaski
   5. Digging tools
      a) Long handled round point shovel
         1) The most common
      b) Short handled round point shovel

II. SAFETY CONSIDERATIONS
   A. When using tools
      1. Maintain 10-foot interval
2. Maintain firm footing
3. Watch for obstructions
   a) Overhead
   b) Within arc of swing
4. Wear appropriate PPE
   a) Pay particular attention when gloves are wet
      1) Blisters and steam burns
      2) Tools can slip through wet gloves
5. Don't get head of tool too near your body
6. Concentrate on impact area
   a) Prevent ricochet or glancing blow
   b) Avoid rocks and other hard objects
   c) Avoid hazards
7. Use proper tool for the job

B. When carrying tools
   1. Grasp at balance point with head forward

When can gloves pose a hazard?
- Pay particular attention when gloves are wet
  1) Blisters and steam burns
  2) Tools can slip through wet gloves

What are some natural hazards that can prove painful?
- Beehives/ground wasps
- Electrical wires
- Barbed wire

What is the proper method to carry hand tools?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Would you want to carry the tool on the uphill or downhill side?</td>
</tr>
<tr>
<td>2. Carry on downhill side</td>
<td>When passing tools, which side of the tool do you pass?</td>
</tr>
<tr>
<td>a) During a fall you usually go forward</td>
<td></td>
</tr>
<tr>
<td>3. Carry horizontally</td>
<td></td>
</tr>
<tr>
<td>a) Parallel to the ground</td>
<td></td>
</tr>
<tr>
<td>4. Sound off when passing another person with &quot;coming through&quot; and wait for that person to yield the right-of-way</td>
<td></td>
</tr>
</tbody>
</table>

C. When passing tools
1. Pass handle (butt) first
2. At arm's length from other person
3. Never toss
4. Always acknowledge acceptance
   a) "Got It"

D. In camp
1. Shield the head of the tool as much as possible
2. Use tool guards whenever practical
3. Tape cutting edges after filing
4. Place all crew tools in the same area

III. USING CUTTING TOOLS
A. Swinging the tool
1. Maintain control of tool head
2. Keep firm grip
3. Keep eye on target
4. Cut at a 45° angle in relation to the fuel
5. Cut away from the body, legs, and feet
6. Cut perpendicular to the crew
7. Maintain level, controlled swing
8. Swinging with one knee in contact to the ground when room is limited is an option

B. Chipping with the tool
   1. Start a "V" pattern
   2. Converge with 45° angle cuts

C. Grubbing with the tool
   1. Take short, controlled strokes
   2. Penetrate the dirt surface
   3. Leave the dirt for the scraping crew

IV. USING SCRAPING TOOLS
   A. McLeod
      1. General use
         a) Cutting edge, corners, and side
            1) Grass
            2) Light brush
         b) Raking tines
            1) Pine needles
            2) Duff
            3) Litter
      2. Scraping
         a) Use pulling and scraping motion
         b) Apply downward pressure on the tool
         c) Do not use to chop
      3. Cutting, trenching, and grubbing
         a) Short, chopping strokes only
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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</thead>
<tbody>
<tr>
<td>B. Shovel</td>
<td></td>
</tr>
<tr>
<td>1. Digging</td>
<td></td>
</tr>
<tr>
<td>a) Place foot of one heel on the shovel</td>
<td></td>
</tr>
<tr>
<td>b) Press down</td>
<td></td>
</tr>
<tr>
<td>1) Using your body weight</td>
<td></td>
</tr>
<tr>
<td>2. Removing material</td>
<td></td>
</tr>
<tr>
<td>a) Keep knees bent</td>
<td></td>
</tr>
<tr>
<td>b) Lift with the legs</td>
<td></td>
</tr>
<tr>
<td>3. Moving material</td>
<td></td>
</tr>
<tr>
<td>a) Brace forearm on thigh for power</td>
<td></td>
</tr>
<tr>
<td>4. Scraping</td>
<td></td>
</tr>
<tr>
<td>a) Roll shovel face toward direction of scrape</td>
<td></td>
</tr>
<tr>
<td>1) Until edge is contacting the ground</td>
<td></td>
</tr>
<tr>
<td>b) Brace forearm on thigh for power</td>
<td></td>
</tr>
<tr>
<td>5. Trenching</td>
<td></td>
</tr>
<tr>
<td>a) Use digging and scraping actions to create</td>
<td></td>
</tr>
<tr>
<td>b) Pulaski may be used to loosen the dirt</td>
<td></td>
</tr>
<tr>
<td>6. Chopping</td>
<td></td>
</tr>
<tr>
<td>a) Use forward half of cutting edge</td>
<td></td>
</tr>
<tr>
<td>7. Cooling</td>
<td></td>
</tr>
<tr>
<td>a) Mix dirt with hot materials</td>
<td></td>
</tr>
<tr>
<td>b) Throw dirt at base of flames</td>
<td></td>
</tr>
<tr>
<td>1) Overhand, side arm, or fan pattern</td>
<td></td>
</tr>
<tr>
<td>2) Use leg strength and a reaching motion to add distance</td>
<td></td>
</tr>
<tr>
<td>8. As a shield</td>
<td></td>
</tr>
<tr>
<td>a) Use the blade to cover your face and protect from radiant heat</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY:

In order for you to effectively prepare for wildland fire handline construction, you must be able to identify wildland hand tools and know the various situations in which they can be used.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: INSPECTION AND MAINTENANCE OF WILDLAND HAND TOOLS

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of inspection and maintenance of wildland hand tools by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3

MATERIALS NEEDED:
- Writing board/pad with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Wildfire Handtools" video, NWCG (NFES 2036), 1986 Edition

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3

PREPARATION: A variety of hand tools have been developed or adapted for wildland fire suppression operations. When properly maintained and used, they are tremendously effective for checking fire spread.
I. **INSPECTION**

A. Tool head
   1. Cracks
   2. Damaged cutting head
   3. Rust
   4. Safety guards

B. Tool handle
   1. Smooth
   2. Unbroken
   3. Secure
   4. Unpainted
      a) Lightly oiled (teak or linseed oil)

II. **SHARPENING**

A. Procedures
   1. Secure tool in vise
      a) Protect handle and head from damage
   2. Use gloves
   3. Use file with handle and a file guard in place
   4. Rest the palm of the hand on the tip of the file
      a) Do not wrap the fingers over the tip of the file
   5. Sharpen in a motion away from the body

---

**APPLICATION**

What are some examples of the damage that tools must be inspected for?

What would you inspect the handle for?

What is the appropriate PPE for sharpening tools?
6. Remove tools from the vise, if leaving the area
7. Make visual check for sharpness
   a) Don't run finger across blade

B. Sharpening the Pulaski
1. Taper cutting edge 2 inches wide
   a) Even bevel on each side
2. Bevel grubbing edge
   a) \( \frac{3}{8} \) inch wide
   b) 45° angle

C. Sharpening the McLeod
1. 45° cutting edge
2. Bevel on outside of face
3. Keep cutting edge straight and square

D. Sharpening a shovel
1. Sharpen to within 4 inches of heel
2. Sharpen to a point

III. STORAGE
A. Store in a clean, cool, dry area
B. Store in a secure area or in the proper compartment
C. Separate in-service (sharp) and out-of-service (dull/broken) tools
D. Always keep the tool guard in place or cover sharpened edges with tape
E. Secure tools properly in tool racks

Should shovels be sharpened?

Show "Wildfire Hand Tools" video.

How should tools be stored?
SUMMARY:

In order for you to effectively cut a handline, you must be able to inspect and maintain wildland hand tools.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF BACK PUMPS

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of back pumps by completing the written test

Standard: With a minimum 80% accuracy according to the information presented in class and that contained in the Fundamentals of Wildland Firefighting, IFSTA, Third Edition, Chapter 3

MATERIALS NEEDED:

- Writing board/pad with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Back pump

REFERENCES:

- Fundamentals of Wildland Firefighting, IFSTA, Third Edition

PREPARATION: Back pumps are versatile, extinguishing tools. Used alone they are effective at suppressing small, isolated fires. Used and an adjunct to hose lays, they can increase the effectiveness and speed of fire edge control.
What are some situations where a back pump would be useful?

I. FUNCTIONS
   A. Hot spotting
   B. Initial attack on small remote fires
   C. Mop-up
   D. Back up for initial attack
      1. Mobile attack
      2. Hose lay
      3. Air drops

II. COMPONENTS
   A. Tank
   1. Five gallon capacity for water
   2. Class A foam may be added
   3. Weighs approximately 48 pounds when filled
   4. Composition
      a) Fiberglass
      b) Steel
      c) Rubber
         1) Collapsible
         2) Also known as a bladder bag
   B. Tank filler
      1. Top of tank
      2. Male threads
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Filler cap</td>
<td>Why is it important to keep the vent hole clear?</td>
</tr>
<tr>
<td>1. Vent hole</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Must be kept clear to prevent formation of a vacuum</td>
</tr>
<tr>
<td>D. Tank strainer</td>
<td>What is the strainer designed to remove?</td>
</tr>
<tr>
<td>1. Basket perforated with BB size holes</td>
<td></td>
</tr>
<tr>
<td>2. Designed to remove debris when tank being filled</td>
<td></td>
</tr>
<tr>
<td>E. Back of tank</td>
<td></td>
</tr>
<tr>
<td>1. Concave</td>
<td></td>
</tr>
<tr>
<td>F. Trombone support/handle</td>
<td></td>
</tr>
<tr>
<td>G. Hose assembly</td>
<td></td>
</tr>
<tr>
<td>1. Routes water from bottom of tank to pump</td>
<td></td>
</tr>
<tr>
<td>2. Flexible hose for maximum maneuverability</td>
<td></td>
</tr>
<tr>
<td>3. Attached to tank with clamps</td>
<td></td>
</tr>
<tr>
<td>H. Trombone assembly</td>
<td></td>
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<tr>
<td></td>
<td>What type of pump is on a back pump?</td>
</tr>
<tr>
<td></td>
<td>What are some of the components of the trombone assembly?</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>1. Positive displacement - piston pump</td>
<td></td>
</tr>
<tr>
<td>2. Components</td>
<td></td>
</tr>
<tr>
<td>a) Tips</td>
<td></td>
</tr>
<tr>
<td>b) Nozzle</td>
<td></td>
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<tr>
<td>c) Handle</td>
<td></td>
</tr>
</tbody>
</table>
d) Pump barrel or chamber

e) Adjusting nut

f) Check valve - discharge

g) Check valve - suction

I. Two adjustable shoulder straps
   1. With clips for carrying trombone pump

III. BASIC OPERATION

A. Atmospheric pressure exerts downward force on water in tank via vent hose in tank filler cap

B. This downward force moves water into and through hose

C. Chamber size in trombone is expanded by lengthening stroke
   1. Pressure lowers and water fills pump chamber
      a) Through suction valve in an effort to equalize pressure

D. Chamber size in trombone is reduced with shortening or compression stroke
   1. The suction valve closes and the discharge valve opens
      a) Allowing water to forcefully escape via the nozzle
      b) Stream reach under normal conditions is 30-40 feet

E. Operate the pump with an in-and-out motion

F. Some nozzles are provided with two tips
   1. Straight stream
### PRESENTATION

2. Broken stream  
   a) Tip tends to clog

3. Option is using a straight stream with a finger over the tip to create a broken stream  
   a) Keep nozzle close to fuel to insure penetration  
   b) Use a fanning motion

### IV. SAFETY

- Adjust straps to distribute weight evenly and hold tank securely to body  
- Always use leg muscles when lifting tank  
- Be aware of additional weight

**What are some problems associated with wearing the back pump?**

1. Back fatigue  
2. Uneven terrain can cause instability and potential injuries

### V. MAINTENANCE

- Keep clean  
- Inspect components for dents and/or cracks  
- Replace packing when worn  
- Replace shoulder straps if worn or damaged  
- Tighten hose assembly clamps  
- Hose assembly protected from direct sunlight, chemicals, or obstructions  
   1. Must be protected from freezing

**What is an optional method of applying water with a straight stream?**
### Storage

1. **On apparatus**
   a) Securely fastened

2. **At station**
   a) Away from corrosives and acids
   b) Out of direct sunlight

---

**PRESENTATION**

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>G. Storage</td>
<td></td>
</tr>
<tr>
<td>1. On apparatus</td>
<td></td>
</tr>
<tr>
<td>a) Securely fastened</td>
<td></td>
</tr>
<tr>
<td>2. At station</td>
<td></td>
</tr>
<tr>
<td>a) Away from corrosives and acids</td>
<td></td>
</tr>
<tr>
<td>b) Out of direct sunlight</td>
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</tbody>
</table>

**APPLICATION**

- How should the pump be stored on the apparatus?
- How should the pump be stored at the station?
SUMMARY:

The back pump is a versatile and useful tool. It can be used in every phase of wildland fire control operations. Simple in design and operation, it has few moving parts and is easily maintained. Fire fighters should beware, however, that a back pump is deceptively heavy and awkward. Back strains and other injuries can occur if safe lifting and carrying techniques are not employed.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:**
CHARACTERISTICS AND FUNCTIONS OF FUSEES AS A FIRING TOOL

**TIME FRAME:**
0:15

**LEVEL OF INSTRUCTION:**
Level I

**AUTHORITY:**
1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**
- **Condition:** A written test
- **Behavior:** The student will confirm knowledge of the characteristics and functions of fusees as a firing tool by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fundamentals of Wildland Fire Fighting*, IFSTA, Third Edition, Chapter 3

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Fusee

**REFERENCES:**

**PREPARATION:**
The fusee is an effective device used for burning out control lines and backfiring on wildland fires. It provides a method of firing grass, pine needles, leaves, brush, and similar dry fuel that ignite readily and radiate sufficient heat to sustain combustion. The compound that makes up the fusee when ignited is subject to splattering and can cause severe burns if not handled properly.
I. COMPONENTS
   A. Fusee cap
   B. Striker cap
   C. Striker
   D. Body/solid core
   E. Igniter
   F. Hollow tube

II. CHARACTERISTICS
   A. Normally 10-18 inches in length
   B. Burn from 15-30 minutes
   C. Burns at 1400°F

III. FUNCTIONS
   A. A warning device
   B. A firing device

IV. SAFETY
   A. Wear full wildland personal protective equipment
      1. Slag can burn personal protective equipment and cause severe burns
   B. Initiate burning operations only at direction of supervisor
      1. Exception
         a) May initiate burning operations in emergency conditions to save life or high value property
   C. Notify all adjacent resources when burning operation is beginning
   D. Do not carry lighted fusee on the green side of the control line
      1. Dripping or sputtering slag may ignite fuels

How are fusees used?
E. Use an extension to create distance between yourself and the flaming fuel
   1. May insert additional fusees for sequential burning
      a) With the igniter exposed
      b) Into the hollow base of the first fusee
   2. May insert wooden dowel/handle into the hollow tube at the base of the first fusee
   3. Do not use metal handles due to heat conductivity

F. Normally burn strips of fuel adjacent to the control line
   1. To widen control line

G. Proceed slowly
   1. To ensure that fuel continues to burn
   2. To eliminate islands and possibility of reburn

H. Vapors from fusee are toxic and you should avoid breathing them

I. Contact with water may cause small explosive-like reactions

J. Avoid looking directly at lighted fusee
   1. Extreme brightness may damage or impair vision

K. Avoid using fusees near flammable liquids

L. Do not use damaged fusees

What are some health and safety considerations when working with fusees?
### V. MAINTENANCE

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>A.</td>
<td>Store fusees in a cool dry area</td>
</tr>
<tr>
<td>B.</td>
<td>Keep clean and dry</td>
</tr>
<tr>
<td>C.</td>
<td>Store away from water and oil</td>
</tr>
<tr>
<td>D.</td>
<td>Store out of direct sunlight</td>
</tr>
<tr>
<td>E.</td>
<td>Rotate stock of fusees to keep fresh supply</td>
</tr>
<tr>
<td>F.</td>
<td>Do not stack heavy items on fusees</td>
</tr>
</tbody>
</table>

How should fusees be stored?
**SUMMARY:**

Using fusees to initiate firing operations is an effective method of quickly establishing or widening control lines. Firing operations can dramatically reduce the amount of line that would otherwise be constructed by crews or bulldozers, and free up resources for other assignments.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fundamentals of Wildland Fire Fighting*, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF A DRIP TORCH

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of a drip torch by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3

MATERIALS NEEDED: • Writing board with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials • Drip torch


PREPARATION: The drip torch is used by fire fighters to backfire or burnout vegetation fires. Though used only occasionally, the fire fighter must be able to quickly assemble and operate the drip torch in a safe and proper manner. This device can be used to save you work or to save lives.
I. DESCRIPTION

A. Definition
1. Drip torch
   a. Handheld
   b. Unpressurized flammable liquid tank
   c. With a wick attached at the nozzle
   d. Designed to burn vegetation
2. Used by wildland fire agencies
   a. To perform backfire and burning-out operations
3. Also known as a backfire torch or orchard torch

B. Specifications
1. Weight
   a) Empty
      1) 5 pounds, 6 ounces
   b) Full
      1) 16 pounds
2. Height
   a) Sealed
      1) 14 inches
   b) Operational
      1) 23 2/3 inches
3. Capacity
   a) 1 1/4 gallon capacity
   b) Do not fill more than 3/4 full to allow for expansion
What is the fuel mixture for a drip torch?

a) Recommend 2 parts diesel to 1 part gasoline

Why is there a fuel trap in the spout?

a) Designed to prevent flame from reaching fuel tank

Why is there a fuel trap in the spout?

a) Designed to prevent flame from reaching fuel tank

A. Fuel tank and handle
B. Fuel
C. Spout and nozzle
   1. Fuel trap

D. Gasket
E. Tank lock ring
F. Flow plug
G. Wick and wick holder
H. Air breather valve
I. Torch holder and hold down spring
   1. Attached to engine

A. Remove torch from engine
B. Shake torch to mix fuel and set torch down in cleared area
C. Unscrew lock ring
D. Remove and resecure flow plug in retainer
E. Remove spout from fuel tank
F. Inspect rubber gasket and fuel supply
G. Set spout upright on torch with wick pointing opposite handle
H. Screw lock ring on fuel tank tightly
I. Open air vent ¾ of the way

IV. OPERATION
A. Spread fuel on cleared ground where torch will be used, then ignite
B. Light torch from ground fire
C. Carry upright until ready for use
D. Tilt torch downward when using
E. May be used in a swinging motion by
   1. Holding with either hand
F. Watch where you spread fire
G. Each droplet of fuel should ignite if fuel is mixed properly

V. DISASSEMBLY
A. Extinguish torch
B. Allow wick to cool
C. Remove lock ring
D. Invert spout, put inside tank
E. Replace lock ring securely
F. Replace flow plug
G. Close air breather valve

VI. MAINTENANCE
A. Check tank
   1. Leaks
   2. Dents
### VII. SAFETY

**A. Appropriate wildland PPE**
1. Wear at all times  
2. Change clothing, if fuel spills on them  
3. Keep torch away from clothing and boots  
4. Glove may be removed to open breather valve only

**B. Fueling**
1. Do not mix too rich  
   a) May explode upon ignition  
2. Allow all parts to cool sufficiently prior to handling, refueling, or disassembling  
3. Fuel trap on spout prevents flashback  
4. Do not open or fill near  
   a) Open flame  
   b) Hot sparks or embers  
   c) Personnel that are smoking  
5. Light fuel on ground; do not light the wick
C. **During use**
   1. Start at top of hill and work down
   2. Carry torch by the handle only
   3. Have escape route planned
   4. Keep fuel flowing so wick doesn't burn out
   5. Blow torch out when not in use
   6. Do not carry lighted torch on the green side of the control line
SUMMARY:

This torch is used for backfiring or firing out vegetation. Most commonly known as a backfire torch, it contains flammable liquids that are inherently dangerous. By staying proficient on the assembly, use, and safe operation of this tool you will be prepared to operate this firing tool when requested.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: HOW TO USE A DRIP TORCH

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: An engine company with charged hoseline, drip torch, fuel, matches or fusee, appropriate wildland personal protective clothing, and a simulated fire line in an area cleared of combustible materials

Behavior: Under simulated fire conditions, the student will assemble a drip torch, fire out a 25-foot section of simulated fire line, and disassemble the drip torch

Standard: Completing all operations within __________ according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Engine company with charged hoseline
- Drip torch
- Fuel
- Matches or fusee
- Appropriate wildland personal protective equipment
- A simulated fire line in an area cleared of combustible materials

REFERENCES:

- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 3

PREPARATION: The drip torch is a valuable tool in all types of firing operations. Quite often, when it is necessary to use this tool, time is critically short. In such cases, it is imperative that you can assemble and place the drip torch in operation immediately.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Remove drip torch</td>
<td>1a. From engine storage compartment</td>
</tr>
<tr>
<td></td>
<td>b. After releasing hold-down strap</td>
</tr>
<tr>
<td>2. Shake torch</td>
<td>2a. Vigorously</td>
</tr>
<tr>
<td></td>
<td>b. To mix fuel</td>
</tr>
<tr>
<td>3. Place torch</td>
<td>3a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. In an area clear of combustible material</td>
</tr>
<tr>
<td>4. Loosen and remove lock ring</td>
<td>4a. Turning counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Placing it on clean surface</td>
</tr>
<tr>
<td>5. Loosen and remove fuel flow plug</td>
<td>5a. Turning counterclockwise</td>
</tr>
<tr>
<td>6. Reposition fuel flow plug</td>
<td>6a. Turning clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Into threaded retainer</td>
</tr>
<tr>
<td>7. Remove fuel spout</td>
<td>7a. From inverted position</td>
</tr>
<tr>
<td></td>
<td>b. From tank</td>
</tr>
<tr>
<td>8. Inspect spout assembly components</td>
<td>8a. Gasket</td>
</tr>
<tr>
<td></td>
<td>b. Spout</td>
</tr>
<tr>
<td></td>
<td>c. Wick</td>
</tr>
<tr>
<td>9. Inspect fluid level</td>
<td>9a. Tank ¾ full maximum</td>
</tr>
<tr>
<td></td>
<td>b. Two parts diesel to one part gasoline</td>
</tr>
<tr>
<td>10. Reposition spout assembly</td>
<td>10a. Upright</td>
</tr>
<tr>
<td></td>
<td>b. On top of the tank</td>
</tr>
<tr>
<td></td>
<td>c. With wick pointed opposite torch handle</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11. Secure lock ring</td>
<td>11a. Sliding over spout assemble</td>
</tr>
<tr>
<td></td>
<td>b. Threaded end down</td>
</tr>
<tr>
<td></td>
<td>c. Seating threads on lock ring with threads on tank</td>
</tr>
<tr>
<td></td>
<td>d. Turning lock ring clockwise</td>
</tr>
<tr>
<td></td>
<td>e. Hand tight</td>
</tr>
<tr>
<td>12. Open air vent</td>
<td>12a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. ¾ of the way open</td>
</tr>
<tr>
<td>13. Pour fuel</td>
<td>13a. On ground</td>
</tr>
<tr>
<td></td>
<td>b. Small quantity</td>
</tr>
<tr>
<td>14. Light fuel</td>
<td>14a. With match or fusee</td>
</tr>
<tr>
<td>15. Light torch wick</td>
<td>b. Inverting drip torch to saturate wick with fuel</td>
</tr>
<tr>
<td></td>
<td>c. Holding torch over flame until wick ignites</td>
</tr>
<tr>
<td>16. Begin firing operation</td>
<td>16a. Torch remains inverted</td>
</tr>
<tr>
<td></td>
<td>b. Walking parallel to designated fire control line</td>
</tr>
<tr>
<td></td>
<td>c. Igniting fuel in direction of travel</td>
</tr>
<tr>
<td>17. Continue firing operations</td>
<td>17a. Trailing burning fuel slightly behind or</td>
</tr>
<tr>
<td></td>
<td>b. Swinging torch back and forth spreading burning fuel to the front and rear</td>
</tr>
<tr>
<td></td>
<td>c. Walking parallel to the fire line</td>
</tr>
<tr>
<td>18. Stop firing operation</td>
<td>18a. Upon reaching designated point</td>
</tr>
<tr>
<td></td>
<td>b. Blowing out wick</td>
</tr>
<tr>
<td>OPERATIONS</td>
<td>KEY POINTS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>19. Allow torch to cool</td>
<td>19a. Before storage</td>
</tr>
<tr>
<td>20. Remove lock ring</td>
<td>20a. Counterclockwise</td>
</tr>
<tr>
<td></td>
<td>b. Placing on clean surface</td>
</tr>
<tr>
<td></td>
<td>c. Letting wick burn out</td>
</tr>
<tr>
<td></td>
<td>d. Snuffing out with gloved hands</td>
</tr>
<tr>
<td>21. Remove spout assembly</td>
<td>21a. From top of tank</td>
</tr>
<tr>
<td></td>
<td>b. Placing on clean surface</td>
</tr>
<tr>
<td>22. Refill tank</td>
<td>22a. ¾ full maximum</td>
</tr>
<tr>
<td>23. Insert spout assembly</td>
<td>23a. Into tank</td>
</tr>
<tr>
<td></td>
<td>b. Wick first</td>
</tr>
<tr>
<td>24. Replace lock ring</td>
<td>24a. Threaded end down</td>
</tr>
<tr>
<td></td>
<td>b. Seated with threads on tank</td>
</tr>
<tr>
<td></td>
<td>c. Turning clockwise</td>
</tr>
<tr>
<td></td>
<td>d. Hand tight</td>
</tr>
<tr>
<td>25. Replace fuel flow ring</td>
<td>25a. To block fuel discharge</td>
</tr>
<tr>
<td></td>
<td>b. Turning clockwise</td>
</tr>
<tr>
<td></td>
<td>c. Hand tight</td>
</tr>
<tr>
<td>26. Close air vent</td>
<td>26a. Turning clockwise</td>
</tr>
<tr>
<td></td>
<td>b. Hand tight</td>
</tr>
<tr>
<td>27. Return drip torch</td>
<td>27a. To engine storage compartment</td>
</tr>
<tr>
<td></td>
<td>b. Wiping down exterior of torch</td>
</tr>
<tr>
<td>28. Secure drip torch</td>
<td>28a. With hold-down strap</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF WILDLAND HOSE LAYS

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3.3-18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of wildland hose lays by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition

PREPARATION: A hose lay is an effective tactic in wildland fire suppression. Fire fighters must be able to perform all phases of the attack expeditiously with a minimum of confusion. Techniques may vary slightly depending upon local conditions, number of fire fighters, etc.; however, the basics of hose lay attack are the same everywhere. The success of the hose lay will always depend on the ability of each fire fighter to perform the assigned task.
I. TERMINOLOGY
A. Adapters
B. Anchor point
C. Brass
D. Charged line
E. Couplings
F. Field shut-off
G. Fog stream
H. Hose clamp
I. Hose person
J. Hose tees
K. Laterals
L. Narrow fog stream
M. Nozzle person
N. Progressive hose lay
O. Simple hose lay
P. Straight stream
Q. Wet line

II. CHARACTERISTICS
A. Hoseline
   1. 2½” woven jacket
      a) Supply lines
      b) Structure protection lines
   2. 1½” woven jacket
      a) Attack lines for actively burning wildland fire
      b) Supply or tank filler lines
   3. 1” woven jacket
      a) Mop-up
### B. Nozzle

1. **1" or 1½" straight stream with tip** used when long reach is required  
   - a) Cool flame ahead of nozzle person

2. **1" or 1½" combination stream**  
   - a) Most often used because of versatility

### C. Appliances

1. **Hose tees**  
   - a) Diverts water from hose lay into 1-inch laterals

2. **Spanner wrench**  
   - a) Tightens couplings when necessary

3. **Hose clamp**  
   - a) Interrupts flow of water to nozzle without returning to engine

4. **Gated wye**  
   - a) Separates one line into two lines  
     - b) 2½" x 1½" x 1½"  
     - c) 1½" x 1½" x 1½"

5. **Adapters**  
   - a) 1½" National Hose (NH) to 1" National Pipe Straight Hose (NPSH)  
     - 1) Reduces hose lay diameter from 1½" to 1"
b) 1½” double female NH
   1) Joins two opposing hose lays where they come together on a fire perimeter

c) 1½” double male NH

III. USE
   A. A hose lay attack can be either the entire means of suppression or a portion of an overall suppression effort

   B. Hose lays are most effective when
      1. Engine cannot reach or travel the fire line
         a) Steep terrain
         b) Heavy brush or timber
         c) Fire too intense
         d) Rock outcroppings encountered
      2. Water source distant from fire
         a) Creeks
         b) Ponds
         c) Lakes
         d) Hydrants
         e) Swimming pools
         f) Ditches

      When should a hose lay be used?
      How could this happen?
      What are some alternative water sources?
3. Large or remote areas needing protection  
   a) Numerous lines being used simultaneously  
   b) Numerous exposures requiring protection  
   c) More than one fire or spot fire  
   d) Fire crew support/protection  
   e) Dozer support/protection

IV. WILDLAND HOSE LAY TYPES  
A. Simple hose lay  
   1. Consist of consecutively coupled lengths of hoseline without hose tees or laterals  
      a) Hydrant to engine  
      b) Engine to engine  
      c) Engine to fire  
         1) Where laterals would normally not be needed  
      d) Exposure protection  
   2. Advantages  
      a) Completed faster  
         1) Especially when dry  
      b) Less staffing required  
      c) Less water required  
      d) Less hoseline required  
   3. Disadvantages  
      a) No hose lay protection between nozzle and engine  
         1) Rekindles  
         2) Slopovers
b) If laterals are needed, hose lay will have to be shut down to add hose tees and laterals

c) Mop-up will take longer and require more work

d) Unacceptable for medium and heavy fuels

B. Progressive hose lays

1. Consists of consecutively coupled lengths of hoseline with hose tees and laterals placed at every second coupling

   a) Simultaneous attack of fire as the hose lay progresses along fire edge

   b) Protects hose lay from slopovers and spot fires

   c) Where exposure protection is anticipated

   d) Tees are normally placed every 200 feet

What is a progressive hose lay?

2. Advantages

   a) Provides good protection for crews that are working directly on hot line

   b) Good line protection

      1) Immediate protection or attack on slopovers, rekindles, and hot spots

   c) Easier and faster transition to mop-up since breakdown not required

   d) Should always be used on

      1) Medium to heavy fuel fires

      2) Matted light fuels

What are some of the advantages?
What are some of the disadvantages of progressive hose lays?

3. Disadvantages
   a) Slower to lay
   b) Requires more staffing
   c) Requires more equipment
   d) Requires larger volumes of water

V. DEPLOYING HOSELINE

A. Wildland hose packs
   1. Many different types are available
      a) Gnass pack
      b) Single or double donut in canvas pack
      c) Ganser bar, ojai, delta packs

B. Hoseline deployment methods
   1. Underhand or bowling method
      a) Unroll downhill and away from fire
      b) Rubber band should be placed over coupling and remain on hoseline
   2. Drop and drag
      a) Drop hose pack
      b) Grasp couplings and drag hoseline from pack

C. Do not
   1. Stretch hoseline to full length
   2. Allow some slack in line

Why should you leave some slack in the line?

a) Replacement of a broken length
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Moving hoseline to safe location</td>
<td></td>
</tr>
<tr>
<td>1) From one side of fire line to other</td>
<td></td>
</tr>
<tr>
<td>2) Out of the way of fire crews, dozers, etc.</td>
<td></td>
</tr>
<tr>
<td>3. Roll into fire</td>
<td></td>
</tr>
<tr>
<td>4. Roll uphill</td>
<td></td>
</tr>
<tr>
<td>5. Drop couplings</td>
<td></td>
</tr>
<tr>
<td>6. Charge hoseline until fully unrolled</td>
<td></td>
</tr>
<tr>
<td>a) Unless specific hose roll allows, such as gnass</td>
<td></td>
</tr>
<tr>
<td>7. Roll toward anyone</td>
<td></td>
</tr>
</tbody>
</table>

**VI. HOSELINE CLAMPING**

A. Operations

1. Replace burst lengths of hoseline
2. Extend hose lay without shutting down water supply at engine
3. Prevent water from draining down hillside

B. Techniques

1. Forester hose clamp
   a) Most common type

   b) Place clamp at least 18 inches behind coupling
   c) Use care when clamping so as not to pinch hoseline
   d) Lock clamp slowly while rolling hoseline into proper position
   e) Open nozzle to release pressure in line

When would you need to clamp the hoseline?

How is a hose clamp applied?
How can a hoseline be clamped in the absence of a hose clamp?

2. "S" clamp or field shut-off
   a) Procedure
      1) Fold the hoseline back on itself to form an "S" shape
      2) Place knees and hands on the kinks
      3) Apply downward pressure to stop the flow of water
      4) Open nozzle to release pressure in the line
   b) Advantages
      1) Hose clamp not required
      2) Less chance of harming hoseline
   c) Disadvantages
      1) Difficult to accomplish with high pressure
      2) May require two fire fighters
      3) Water not fully shutoff

3. Field knee shut-off
   a) One person operation
   b) Fold hoseline back on itself
   c) Place fold behind knee
   d) Squat down and apply pressure directly on kink
   e) Open nozzle slowly to check if water flow is sufficiently shut down
VII. MECHANICS OF A HOSE LAY

A. Responsibilities and task assignments vary depending upon
   1. Area
   2. Number of personnel
   3. Size of hoseline

B. Crew leader
   1. Responsible for the safety of the crew and engine
      a) Ensures the engine is in a safe and cleared area before leaving, windows rolled up
      b) Ensures engine's wheels are properly chocked
      c) Informs crewmembers of their assignments
      d) Engages pump
      e) Connects hoseline to proper pump discharge
      f) Sets desired pump pressure
   2. May supervise the fire line or stay with the engine depending on conditions

C. Nozzle person
   1. Upon arrival at the fire
      a) Pulls preconnect or unrolls a length of 1½" hoseline
### PRESENTATION

- **b)** Hands female coupling to pump operator for hook-up to pump discharge
- **c)** Connects nozzle
- **d)** Ensures hoseline is completely unrolled before line is charged
- **e)** Calls "WATER!"
  1) To have line charged
- **f)** Approaches the fire only with a charged line
  1) Air removed from hoseline
  2) Adequate water flow
  3) Correct water pattern
- **g)** Establishes an anchor point
  1) To a road or other suitable barrier to fire's spread
  2) If anchor cannot be established, some type of patrol will have to be maintained behind hose lay
    - Possibly a hose lay in both directions

2. Attacks the fire up the flank toward the head
   - **a)** Generally the least active and safest attack method

3. Continues around fire using a narrow fog on the fire edge
   - **a)** Should work from/in the burned area

4. Advances at a rate that ensures complete extinguishment of the fire
   - **a)** Is line secured behind you?

---

**Before proceeding, what should the nozzle person always ensure?**
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. If the probability of slop-over, rekindle, or spot fires is great, the hose lay must be progressive</td>
<td></td>
</tr>
<tr>
<td>a) Hose tees and laterals laid</td>
<td></td>
</tr>
<tr>
<td>6. Uses narrow fog or straight stream to cool fire out in front and to cool down heavy fuels burning near the fire line</td>
<td></td>
</tr>
<tr>
<td>7. Conserves water as much as possible</td>
<td></td>
</tr>
<tr>
<td>a) Works as close as possible to fire</td>
<td></td>
</tr>
<tr>
<td>b) Shuts down nozzle when water is not needed</td>
<td></td>
</tr>
<tr>
<td>8. Ensures hoseline is not pulled or rolled into hot material or placed in fuel where it can burn</td>
<td></td>
</tr>
<tr>
<td>a) Nozzle and hoseline should be kept between the nozzle person and the fire</td>
<td></td>
</tr>
<tr>
<td>b) Keeping one foot in the burn and the other foot in the green</td>
<td></td>
</tr>
<tr>
<td>9. It is generally the responsibility of the nozzle person to make sure all crewmembers are carrying out assignments in the absence of the crew leader</td>
<td></td>
</tr>
</tbody>
</table>

D. Other crewmembers (hose person, brass person)

1. Upon arrival at fire |
   a) Chock engine |
   b) Get additional hoseline and equipment off the engine |
       1) Prepare to assist the nozzle person |
   c) Backup nozzle person |
   d) Pull hoseline |
   e) Watch for spot fires and slopovers

What functions do other crewmembers have?
f) Indicate to nozzle person when present length of hoseline is about to run out

g) Unroll new length of 1½" hoseline when needed
   1) Ensure hoseline is completely unrolled

h) Clamp off hoseline when directed by nozzle person

i) Help with hoseline connections and placement of hose tees

j) Leave roll of 1" hoseline at all hose tees

k) Continuously check the hose lay
   1) Breaks
   2) Hose laying in hot material
   3) Spot fires
   4) Slopovers

l) Replace broken hoseline lengths

m) Operate lateral lines as necessary

How should you secure damaged hoseline?

1) Ensure all damaged hoseline is identified
   • According to your SOPs

2) Remove broken length

3) Insert new length of hoseline

n) If enough fire fighters are available, backup personnel with hand tools and back pumps is advisable
   1) Saves water

How should you secure damaged hoseline?
2) Allows pockets to be worked or burned out
   • Firing out operations may save needless use of water
   • No freelancing!

   • Firing or burning out must be approved by supervisor

3) Follow up with a scratch line will help hold and secure the fire line

VIII. HOSE LAY PICK UP

A. Shoulder carry
   1. Using this method, each person can carry 2 to 4 lengths of hoseline per trip off the fire line
   2. Drain water from hoseline
   3. Stretch hoseline lengths out to full extension
   4. Place either coupling to rear or place in your back pocket
   5. Fold hoseline alternately back and forth over your shoulder to about knee level
      a) Hoseline is easy to handle
      b) Drains completely
      c) Less work than other methods
      d) Less tangles and knots
      e) Reduces likelihood of tripping

B. Watermelon roll
   1. Drain water from hoseline
   2. Grab nozzle in right hand
   3. Grab hoseline with left hand about 4 feet away
## PRESENTATION

4. Pick up the hoseline by forming a figure eight around the wrists until reaching the end

C. Rerolling hoseline
   1. Should always be done before leaving fire
      a) Allows for reuse if dispatched to another fire en route to station
   2. Easier to handle and pack on engine
   3. Use hose roller or by hand
   4. While rolling check for
      a) Burns or damage
      b) Dirt, grit or nicks in threads
      c) Gaskets
      d) All hoseline accounted for

## IX. SAFETY CONSIDERATIONS

A. Simple hose lay
   1. No protection between nozzle person and engine

B. Progressive hose lay
   1. Slower control of fire
   2. Possibility of using too much water or unwisely expending pressure by lateral operators

C. Unrolling hoseline
   1. Underhand or bowling motion usually best
      a) Have a good grip near couplings
         1) Prevents couplings from striking fire fighter in the face
         2) Protects coupling

What are some safety considerations for simple/progressive hose lays?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Drop and drag is best method in confined area</td>
<td></td>
</tr>
<tr>
<td>D. Hoseline clamping operations</td>
<td></td>
</tr>
<tr>
<td>1. Lock and release hose clamps slowly</td>
<td></td>
</tr>
<tr>
<td>2. Do not pinch fingers in hose clamp</td>
<td></td>
</tr>
<tr>
<td>3. Field clamp and field knee shut-off</td>
<td></td>
</tr>
<tr>
<td>a) Difficult to use if the pressure is too high</td>
<td></td>
</tr>
<tr>
<td>b) Open nozzle slowly before removing to check water flow</td>
<td></td>
</tr>
<tr>
<td>c) Maintain constant grip and pressure until operation is completed</td>
<td></td>
</tr>
<tr>
<td>4. Make sure clamp is effectively reducing water pressure before attempting connections</td>
<td></td>
</tr>
<tr>
<td>E. At fire scene</td>
<td></td>
</tr>
<tr>
<td>1. Wear all protective and safety equipment</td>
<td></td>
</tr>
<tr>
<td>2. Leave engine only in a safe area</td>
<td></td>
</tr>
<tr>
<td>3. Chock engine</td>
<td></td>
</tr>
<tr>
<td>4. Check engine pressure before starting to work</td>
<td></td>
</tr>
<tr>
<td>5. Use the best stream pattern for the situation</td>
<td></td>
</tr>
<tr>
<td>6. Do not use a ¾&quot; hard line as an attack line on actively burning fire</td>
<td></td>
</tr>
<tr>
<td>7. Establish an anchor point</td>
<td></td>
</tr>
<tr>
<td>8. Work at a steady pace</td>
<td></td>
</tr>
<tr>
<td>a) Do not over exert yourself and become exhausted</td>
<td></td>
</tr>
<tr>
<td>9. Extinguish all fire on the line as you proceed</td>
<td></td>
</tr>
<tr>
<td>a) Knock down hot spots and dangerous areas</td>
<td></td>
</tr>
</tbody>
</table>

What are some safety factors to consider when constructing hose lays?
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Do not leave fire behind you</td>
<td>Why is it important to know what is happening behind you?</td>
</tr>
<tr>
<td>11. Slow up or stop if visibility is not adequate</td>
<td></td>
</tr>
<tr>
<td>a) You must know where you are going</td>
<td></td>
</tr>
<tr>
<td>12. Always know what is going on behind you</td>
<td></td>
</tr>
<tr>
<td>a) Hot spots</td>
<td>What is the danger here?</td>
</tr>
<tr>
<td>b) Slopovers</td>
<td></td>
</tr>
<tr>
<td>c) Hoseline in hot ashes</td>
<td></td>
</tr>
<tr>
<td>d) Signals from crew</td>
<td></td>
</tr>
<tr>
<td>13. During the entire hose lay attack, keep your mind on your work and pay attention</td>
<td></td>
</tr>
<tr>
<td>14. Do not rely completely on the nozzle for protection</td>
<td></td>
</tr>
<tr>
<td>a) May run out of water</td>
<td></td>
</tr>
<tr>
<td>b) Hoseline may burn or burst</td>
<td></td>
</tr>
<tr>
<td>c) Someone may clamp off hoseline</td>
<td></td>
</tr>
<tr>
<td>d) May run out of water in engine</td>
<td></td>
</tr>
<tr>
<td>e) Pressure may drop as other lines are added</td>
<td></td>
</tr>
<tr>
<td>15. Estimate or check continuously on amount of water left</td>
<td></td>
</tr>
<tr>
<td>a) If short</td>
<td></td>
</tr>
<tr>
<td>1) Do not get committed to hazardous areas</td>
<td></td>
</tr>
<tr>
<td>2) Keep control of what you have</td>
<td></td>
</tr>
</tbody>
</table>
16. On large fires where very long and complicated hose lays attacks are being used, radio communication is a must

17. Mop-up is as important as fire suppression
   a) The fire is not considered extinguished until mop-up is completed
SUMMARY:

Hose lays are an effective method of wildland fire suppression. Fire fighters must be able to perform all phases of the attack expeditiously with a minimum of confusion. Techniques may vary slightly depending upon local conditions, number of personnel, etc.; however, the basics of the hose lay attack are the same. The success of the hose lay will depend on the ability of each fire fighter to perform his or her assigned task.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: USING WATER ON WILDLAND FIRES

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of using water on wildland fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

PREPARATION: Water is essential for the extinguishment of wildland fires. Many times water application is the job of the fire fighter on the ground in the form of hose lays. In order to properly apply water, you must understand how to effectively and efficiently use the resources available.
I. WATER DELIVERY COMPONENTS

A. Fittings and connections
   1. Tees
      a) Often used to bring smaller hoseline off a main line
      b) Used on progressive hose lays
   2. In-line shut-off (Gizmo)
      a) Valve adjusts to reduce flow or shut-off water
      b) Can be used in place of hose clamps

B. Nozzles
   1. Used to control distribution of water
   2. Made of plastic, brass, aluminum, etc.
   3. May be adjustable or fixed stream

C. Hoseline
   1. Types
      a) Synthetic or cotton
      b) Should be single jacket
      c) Sizes range from 1"-1¼" for wildland
      d) 50'-100' lengths
   2. Hose rolls and loads
      a) Vary according to local standards
      b) Must be easily deployable
      c) May be in packs, beds, or reels
II. DELIVERY SYSTEMS AND COMPONENTS

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What is the most common delivery system?</td>
</tr>
</tbody>
</table>

A. Hose lays
   1. Most common delivery system
   2. Simple
   3. Progressive
   4. Mobile

B. Hand signals
   1. More or less water
   2. Tank level
   3. Pressure change needed
   4. Hoseline needs

C. Nozzle patterns
   1. Straight stream
      a) Used when fire can't be reached with fog stream
      b) Greater penetration for dense fuels
         1) Duff
         2) Matted grass
      c) Used to reach hot roots or beds in mop-up
      d) Larger amount of water can reduce heat
   2. Fog stream
      a) Also known as spray stream
      b) Used to cover larger area than straight stream

What nozzle patterns are commonly used?
### APPLICATION

What are two advantages to using a fog stream?

<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>c) Advantages</td>
<td>What does &quot;one foot in the black&quot; mean?</td>
</tr>
<tr>
<td>1) Uses smaller volume of water than straight stream</td>
<td></td>
</tr>
<tr>
<td>2) Used for personal protection</td>
<td></td>
</tr>
</tbody>
</table>

### III. APPLYING WATER

A. Walk with one foot in black, one in green when possible

1. Staying on fire edge or close to safety

B. Apply water parallel to the fire line

1. Not side-to-side, "Z," or circle pattern

C. Apply water at base of flames

D. Use water additives to increase effectiveness

E. Anchor fire well before proceeding

F. Keep nozzle close to burning fuel when practical

G. Keep nozzles off the shoulder

H. Check behind frequently for flare-ups

I. Use minimum amount of water to extinguish fire, but don't be overly conservative

J. Shut nozzle down if not needed

K. Change nozzle pattern as necessary

L. Protect hoseline from burning or excessive wear

M. Water is most effective when used in conjunction with hand tools
### How do hand tools help with water application?

1. Use hand tools to rake and stir
2. Add more water and rerake as needed
3. Use cutting tools to access dense fuels such as stumps or logs

### IV. AIRCRAFT

A. Can reach inaccessible areas
B. Apply water or retardant
C. May support ground operations
D. Fixed-wing or rotor-wing
SUMMARY:

Effective use of water is essential for wildland fire suppression. Fire fighters must understand, and be able to use the resources available to them. Proper water conservation allows fire fighters to suppress more fire and insure personal safety. Good communication through hand signals improves efficiency and increased safety.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6 order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** HOW TO CONSTRUCT PROGRESSIVE HOSE LAYS

**TIME FRAME:** 0:30

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

**Condition:** Sufficient hoselines, hose clamp, nozzle, fire engine, appropriate site, and appropriate wildland personal protective equipment

**Behavior:** The students will construct a progressive hose lay

**Standard:** Completing all operations within _______ according to the job breakdown

**MATERIALS NEEDED:**

- Job breakdown
- 3 100-foot lengths of 1½" hoseline (the first being preconnected)
- 1 hose clamp
- 1 nozzle
- Fire engine
- Appropriate site
- Appropriate wildland personal protective equipment

**REFERENCES:**

- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

**PREPARATION:** In areas near a water supply, hose lays may be the most effective suppression method. If the area is not accessible by vehicle, a progressive hose lay must be constructed. Firefighters must be proficient in extending charged hoselines rapidly in order to effectively extinguish wildland fires.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pull 1½&quot; preconnected hoseline</td>
<td>1a. To fire's edge</td>
</tr>
<tr>
<td>2. Simulate extinguishing fire edge</td>
<td>2a. Moving forward until the hoseline is nearly stretched out</td>
</tr>
<tr>
<td>3. Unroll second length of hoseline</td>
<td>3a. Not into fire</td>
</tr>
<tr>
<td>3b. &quot;Drop and drag&quot; method</td>
<td></td>
</tr>
<tr>
<td>4. Shut-off nozzle</td>
<td>4a. Calling for clamp</td>
</tr>
<tr>
<td>5. Clamp hoseline</td>
<td>5a. 12-18 inches behind the nozzle</td>
</tr>
<tr>
<td>5b. Can be accomplished by kinking hoseline if no clamp is available</td>
<td></td>
</tr>
<tr>
<td>6. Open nozzle</td>
<td>6a. Being careful not to drop nozzle</td>
</tr>
<tr>
<td>7. Disconnect nozzle</td>
<td>9a. To new hoseline</td>
</tr>
<tr>
<td>8. Attach second hoseline</td>
<td>10a. Carefully</td>
</tr>
<tr>
<td>8b. Notifying nozzle operator</td>
<td>b. Notifying nozzle operator</td>
</tr>
<tr>
<td>9. Connect nozzle</td>
<td>11a. Removing kinks as necessary</td>
</tr>
<tr>
<td>10. Remove clamp</td>
<td></td>
</tr>
<tr>
<td>11. Check hoseline</td>
<td></td>
</tr>
<tr>
<td>12. Continue extinguishing the fire</td>
<td></td>
</tr>
<tr>
<td>13. Repeat Operations 4-12</td>
<td>13a. For third section of hoseline</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPLICATION:
The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:
The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:
Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
**TOPIC:** CHARACTERISTICS AND FUNCTIONS OF MOBILE ATTACK OPERATIONS

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the characteristics and functions of mobile attack operations by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Fundamentals of Wildland Fire Fighting*, IFSTA, Third Edition, Chapter 6

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- *Principles of Forest Fire Management*, C. Raymond Clar and Leonard R. Chatten

**PREPARATION:** Mobile attack is a fast and efficient method of extinguishing wildland fires. The very nature of this attack requires that the fire fighter be well trained, properly equipped, and safety conscious at all times.

Although mobile attack is a basic tactic, many variations exist due to differing conditions and variable fire behavior. A fire fighter must be able to assess these conditions and extinguish the fire in the safest possible manner.
I. MOBILE ATTACK

A. A method of wildland fire suppression where the engine moves in concert with the nozzle person
   1. Nozzle person may be to the front and to one side of engine, or
   2. If more than one nozzle is used, nozzle persons may be in different positions
   3. Normally direct attack
   4. Water is the primary extinguishing agent

B. Advantages
   1. Fast
   2. Protection from hoseline stream immediately available
   3. All equipment is readily available
   4. Command and control of crew is enhanced
   5. Less labor intensive than other methods
   6. Safer
      a) Working directly on line or in burn
      b) Less chance of getting trapped by sudden shift or buildup of fire
      c) Engine available as a refuge in overrun situation
   7. Usually a short length of hoseline
      a) 40 feet or less

II. TYPES OF MOBILE ATTACK

A. Pincer
   1. Direct attack around a fire in opposite directions by two or more engines from an anchor point
B. **Tandem**
   1. Direct attack along a part of the fire perimeter by engines following each other

C. **Envelopment**
   1. Simultaneously striking key or critical segments around the fire perimeter

III. **PERSONNEL**

A. **Nozzle person**
   1. The key to effective mobile attack
   2. All fire fighters must be capable of performing this task
   3. Receives instructions from crew leader
      a) Hoseline type
      b) Nozzle type
      c) Position and distance in relation to engine
   4. Checks to see if hoseline is charged by opening nozzle until continuous flow of water is discharged
      a) Checks pressure
      b) Checks nozzle pattern
      c) Checks that air is exhausted from the system

Where should extinguishment begin?

5. Approaches fire and begins extinguishment from an anchor point
6. Travels parallel to the fire line with one foot in the burn
7. Knocks down hot spots prior to approaching them
8. Progresses at a deliberate speed that allows complete extinguishment
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Slows or stops if fire behavior or visibility problems occur</td>
<td></td>
</tr>
<tr>
<td>10. Informs supervisor of his or her location, condition, and problems</td>
<td></td>
</tr>
<tr>
<td>B. Backup personnel</td>
<td></td>
</tr>
<tr>
<td>1. Receive instructions from crew leader</td>
<td></td>
</tr>
<tr>
<td>2. Equipment</td>
<td>What kind of equipment should the backup crew have?</td>
</tr>
<tr>
<td>a) Hand tools</td>
<td></td>
</tr>
<tr>
<td>b) Another hoseline off same engine</td>
<td></td>
</tr>
<tr>
<td>c) Back pump</td>
<td></td>
</tr>
<tr>
<td>3. Fire fighters assigned backup are responsible for</td>
<td></td>
</tr>
<tr>
<td>a) Extinguishing flare-ups and missed sections of line, etc.</td>
<td></td>
</tr>
<tr>
<td>b) Patrolling line</td>
<td></td>
</tr>
<tr>
<td>c) Helping with hoseline</td>
<td></td>
</tr>
<tr>
<td>4. Backup fire fighters' duties are just as important in mobile attack as the duties of the nozzle person and engine operator</td>
<td></td>
</tr>
<tr>
<td>5. Mobile attack is a team effort</td>
<td></td>
</tr>
</tbody>
</table>

IV. SAFETY CONSIDERATIONS

A. Nozzle and hoseline

1. The nozzle person's lifeline

2. Hoseline must be charged before approaching a fire

What are some safety concerns specific to mobile attack?
### PRESENTATION

- **a)** You must know you have water and adequate pressure to fight the fire before you attack it

- **3.** Use the correct nozzle and nozzle pattern for existing and predicted fire conditions

- **4.** Cool down hot spots prior to approaching them

- **5.** If you encounter bad visibility or breathing problems, slow down or stop
  - **a)** Remain in engine operator's sight at all times
  - **b)** Use nozzle to help clear away smoke
  - **c)** Remain low
  - **d)** Place mouth close to nozzle

- **6.** If you cannot see the engine operator, due to bad visibility, apply water to the windshield
  - **a)** This is the universal sign to stop the engine

### APPLICATON

**B. Properly wear appropriate wildland PPE**

1. Nomex shirt and pants
2. Hardhats
3. Goggles
4. Hood or shroud
5. Gloves
6. Fire shelter

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How does the fire fighter let the engine operator know they cannot be seen?

What appropriate wildland PPE should be worn during a mobile attack?
C. Do Not Run!
   1. Running along a fire line trying to extinguish a hot fire in difficult breathing conditions will leave you completely exhausted
      a) The mobile attack is no longer effective
      b) You are a prime candidate for an injury

D. Extinguish all fire
   1. Any fire that you leave behind, may build and spread
      a) At best it means your work was done in vain
      b) At worst it may overrun your position

E. Work on, or near, the fire line
   1. Move completely into the burned area if safety considerations dictate

F. Watch for obstacles
   1. Brush stubs and rocks may trip you or catch your hoseline pulling you off balance
   2. Fences
   3. Ditches, holes, logs, etc.
   4. An obstacle not dangerous to you may cause damage to the engine
   5. Notice any power lines
      a) Is one down?
   6. Inform crew leader immediately of any problems!

What obstacles might a fire fighter encounter while performing mobile attack?

What should you do if you notice a hazard?
7. Flag and clear the area

G. Privately operated equipment may be extremely hazardous
   1. The operator may not be aware of fire line safety procedures

H. Backup personnel
   1. Use tool or equipment correctly
   2. Extinguish smoldering material near the line
   3. Check back on portion already extinguished
   4. Stay in contact with other crewmembers and the engine operator
   5. Advise others of all hazards encountered
**SUMMARY:**

Terrain permitting mobile attack is a fast and efficient method of extinguishing wildland fires. The very nature of this attack requires that the fire fighters be well trained, properly equipped, and safety conscious.

Although mobile attack is a basic tactic, variations exist due to differing conditions and fire behavior. A fire fighter must be able to assess the conditions and extinguish the fire in the safest possible manner.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

Review your notes and read *Fundamentals of Wildland Fire Fighting*, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** HOW TO PERFORM A MOBILE ATTACK

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A fire engine, combination nozzle, hoseline, appropriate wildland personal protective equipment, and a simulated fire area
- **Behavior:** The student will perform a mobile attack
- **Standard:** Completing all operations within ________ according to the job breakdown

**MATERIALS NEEDED:**
- Job breakdown
- Engine (capable of mobile pumping)
- 1½” combination nozzle
- 25-foot length of 1½” hoseline
- Appropriate wildland personal protective equipment
- Simulated fire area

**REFERENCES:**
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6
- Principles of Forest Fire Management, C. Raymond Clar and Leonard R. Chatten

**PREPARATION:** When done properly, mobile attack can be the safest, fastest, and most efficient method of controlling a vegetation fire. If there is sufficient water supply, this method is often preferable. Good coordination between nozzle operator and driver is essential for effective safe operations.
<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>KEY POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Extend hoseline</td>
<td>1a. From engine</td>
</tr>
<tr>
<td></td>
<td>b. May be preconnected</td>
</tr>
<tr>
<td>2. Attach nozzle</td>
<td>2a. Hand tight</td>
</tr>
<tr>
<td>3. Open discharge</td>
<td>3a. Fully</td>
</tr>
<tr>
<td></td>
<td>b. Checking for leaks</td>
</tr>
<tr>
<td>4. Open nozzle</td>
<td>4a. Checking water pattern</td>
</tr>
<tr>
<td></td>
<td>b. Checking water pressure</td>
</tr>
<tr>
<td></td>
<td>c. Bleeding off air</td>
</tr>
<tr>
<td>5. Select anchor point</td>
<td>5a. Natural fire barrier</td>
</tr>
<tr>
<td></td>
<td>b. Constructed fire barrier</td>
</tr>
<tr>
<td>6. Start mobile attack</td>
<td>6a. At anchor point</td>
</tr>
<tr>
<td>7. Knock down simulated hot spot or flare-up</td>
<td>7a. Stopping</td>
</tr>
<tr>
<td></td>
<td>b. Adjusting nozzle</td>
</tr>
<tr>
<td></td>
<td>c. Straightening stream for added reach</td>
</tr>
<tr>
<td>8. Resume mobile attack</td>
<td>8a. Readjusting nozzle</td>
</tr>
<tr>
<td></td>
<td>b. Narrowing fog stream</td>
</tr>
<tr>
<td></td>
<td>c. Continuous wet line for 100 feet</td>
</tr>
<tr>
<td>9. Remain alert</td>
<td>9a. For hazards to engine and crew</td>
</tr>
<tr>
<td></td>
<td>b. Watching for rocks, ditches, brush, stumps, logs, power lines, etc.</td>
</tr>
</tbody>
</table>
APPLICATION:

The student will practice performing the operations in the job breakdown while under supervision.

EVALUATION:

The student will complete a manipulative performance test at a time determined by the instructor.

ASSIGNMENT:

Practice this job in order to prepare yourself for the upcoming performance test. Study for our next session.
TOPIC: CHARACTERISTICS AND FUNCTIONS OF MOP-UP AND PATROL

TIME FRAME: 0:45

LEVEL of INSTRUCTION: Level I

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the characteristics and functions of mop-up and patrol by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6

PREPARATION: The mop-up and patrol stages of fire fighting are extremely important and must be taken seriously. Spot fires, flare-ups, and slopovers can occur in these stages just as in the attack stage. Keep in mind that initially a small ember or flame started the fire you may be assigned to mop-up and patrol. An escape or a rekindle can be just as dangerous and damaging as the original fire.
## I. MOP-UP

A. The act of making a fire safe after it has been confined
   1. May be the applicable stage for only a segment of the fire perimeter on a large fire
   2. May apply to the entire fire on a small fire

B. Operations
   1. Seeking out and taking action on spot fires as yet undiscovered
   2. Finally extinguishing all burning material along or near the control line
      a) May mop-up for a designated distance (e.g., 100 feet) from the line
      b) May mop-up the entire fire
      c) Extent of mop-up determined by
         1) Fuels involved
         2) Weather condition
         3) Topography
         4) Size of fire
         5) Resource availability

3. Felling snags or burning trees
   a) Do not fell snags or burning trees unless you are properly trained and qualified
   b) All within the control lines which could potentially spot across the line
   c) All which could potentially fall and roll across the line

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
</thead>
<tbody>
<tr>
<td>What is mop-up?</td>
<td>What considerations or treatment should be given to snags or burning trees?</td>
</tr>
</tbody>
</table>
d) All which could present a safety hazard to fire fighters or the general public if left standing

e) All which may be a receptive fuel bed for firebrands

f) Where conditions warrant
   1) Clear a bed to mineral soil prior to falling snag into the bed
      • Especially where burning snag will fall into the green
      • Across the control line
      • Into an island within the control line

**NOTE:** Emphasize that the fire fighter is not to be felling trees unless properly trained and qualified to do so.

4. Removing or repositioning heavy fuels inside control lines
   a) Place fuels with rolling potential where they will not cross control lines
      1) Long axis of the fuel parallel to the slope of the hill
      2) Push/move well back into the burn and let fuel burn itself out
   b) Scatter concentrated fuels
      1) To eliminate hot spots along the control line
      2) Minimize threat of spotting across the control line
      3) Prevents mutual heat exchange between concentrated burning fuels
4) In some conditions (e.g., winds, high humidities, nighttime), piling burning fuels may be desirable
   - To expedite the burning process
   - Cut down on total mop-up time

5. Trench

   a) Undercut or underslung line, if not already accomplished
      1) To prevent rolling burning material from carrying fire into the green
   b) Heavy fuels within the burn
      1) To prevent them from rolling nearer the control line and spotting across

6. Improve control lines
   a) Widen lines, if necessary
   b) Eliminate sharp bends in the line
      1) Where fire can more easily cross
   c) Clear canopy near the line
      1) Which may encourage fire extension
   d) Ensure that control lines are cleared to mineral soil
   e) Grub out and remove any burning roots
      1) Which may cross under the control line

7. Burn out intervening fuels between the fire and the control line when practical
### Presentations

<table>
<thead>
<tr>
<th>PRESENTATION</th>
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</tr>
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</table>

8. Reduce amount of unburned fuel near control lines
   a) Remove and scatter unburned fuels back into the green
   b) Pay particular attention to receptive fuel beds
      1) Flashy fuels
      2) Punky logs or stumps
      3) Other concentrations of dead or decomposing fuels
         - Susceptible to direct firebrand contact and radiant heating
   c) Particular care must be exercised with dozer piles
      1) May harbor burning fuel on the green side of the control line

C. Procedures

1. Be systematic
   a) Start with hottest areas and work toward coldest
   b) Plan a beginning and ending point
   c) Examine entire assigned area
   d) Make sure instructions are clear
   e) Establish a grid technique for large areas

2. Seek out hot spots
   
   a) Flames
   b) White ash areas
   c) Wisps of smoke
   d) Burned out stumps

What are indicators of hot areas?
### D. Safety considerations

1. Hazards in the general area

   a) Overhanging trees
   b) Snags
   c) Leaning trees (leaners)
   d) Branches, tree tops, loose tree bark

---

3. Use hand tools in conjunction with water

   a) Rake, scrape, and chop until hot spot is located
   b) Apply small amount of water directly to burning fuels
      1) Water conservation is important
      2) Use of water additives is very helpful
         - Class A Foam
         - "Wet water"
   c) Repeat above steps until fire is extinguished

4. To determine when fire is extinguished

   a) Feel out the hot spot by passing the back of the ungloved hand
      1) 12 inches above the smoldering fuel
      2) Then lower the hand until near the fuel surface

---

What would be some general safety considerations when mopping up?
2. Hazards associated with water use
   a) Blow back when applying water to
      1) Hot rocks
      2) White ash
      3) Fire pits
      4) Ground fire
      5) Rock and dirt patches

3. Protection
   a) Always wear appropriate wildland personal protective equipment
      1) Emphasis on eye protection
   b) Adjust nozzle stream to a spray
      1) Before applying water in the direction of other workers

II. PATROL
   A. The act of actively moving about all segments of the fire control line
      1. Seeking out hot spots
         a) Inside and outside the control line
         b) Extinguishing those hot spots before they become a greater problem
   B. Patrol guidelines
1. The number of resources assigned to patrol the fire depends upon
   a) Type of fire behavior experienced during control operations
      1) Significant spotting
      2) Clean burn versus sizeable islands
      3) Type of fuels
         • Flashy fuels = less resources
         • Heavy fuels = more resources
   b) In some instances there may be a vantage point from which the entire fire can be seen
      1) This may reduce the number of resources assigned patrol duty
      2) Must have communication with resources assigned to the fire
         • In order to direct them to the appropriate area
   c) Amount of control line to patrol
   d) Vehicular access to control line

2. Patrol fire as long as necessary
   a) To ensure there will be no slopover or rekindle

How many personnel should be assigned to patrol a given area?

How long are patrol operations carried out?
SUMMARY:

Mop-up and patrol are very important operations in the control of a fire. If either is done poorly, the possibility of a rekindle is significant. The rekindle has the potential to be larger, more costly, and more severe than the original fire.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: METHODS FOR SCOUTING AND COMMUNICATING SPOT FIRES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the methods for scouting and communicating spot fires by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 9

MATERIALS NEEDED:
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition

PREPARATION: Spot fires are a serious threat to any control effort on a fire and should be given top priority. Considerable line building effort has been wasted because insufficient thought was given to possible spot fires. In order to maximize the line construction effort, good communication skills and methods must be employed in order to inform supervisors of unusual situations such as spot fires.
# SPOT FIRES

## A. Fires started outside the main fire caused by wind blown embers, ash, and rolling materials

## B. Conditions contributing to spot fires

1. Extremely dry weather
2. Steep topography
3. Heavy fuel
4. Crown fires
5. Whirlwinds or dust devils
6. A torched-out lone tree
7. Wind across the fire line
8. Burning snags

## SEARCHING FOR SPOT FIRES

## A. Inspect the area adjacent to the fire

1. Size or depth of area determined by supervisor

## B. Select two reference points in that area

1. Trees
2. Rock outcroppings

## C. Search between the reference points

1. Parallel to the fire line
2. Systematically covering the area
How should a spot fire be marked?

D. Mark spot fires on the ground
   1. Flag area of spot fire
   2. Flag out to main fire line, if nearby
   3. Report all spot fires to supervisor

What are some communication methods?

III. COMMUNICATIONS

A. Communication methods
   1. Radios
   2. Hand signals
   3. Written messages
   4. Runners
   5. Mirrors
   6. Whistles or air horns

B. Forms of communication worked out in advance
   1. Type of communication to use
   2. How often to report in
   3. Type of information to report
   4. Type of signals to use if necessary
SUMMARY:

Spot fires are a serious threat to any control effort on a fire and should be given top priority. Considerable line building effort has been wasted because insufficient thought was given to possible spot fires. It is essential that good communication skills and methods be decided upon and used in order to inform supervisors of unusual situations such as spot fires.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read S-130 Instructor’s Guide, NWCG (NFES 1510), 1995 Edition, Unit 9 in order to prepare yourself for the upcoming test. Study for our next session.
**TOPIC:** USING A WILDLAND MAP

**TIME FRAME:** 1:00

**LEVEL OF INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of using a wildland map by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *S-130 Instructor's Guide*, NWCG (NFES 1510), 1995 Edition, Unit 8

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Local administrative maps depicting township, range, and section (1 for every 4 students)
- U.S. Geological Survey (USGS) topographic maps (1 for every 4 students)
- Fireline Handbook, NWCG (NFES 0065), 1998 Edition, Appendix A

**REFERENCES:**
- Be Expert with Map and Compass, Bjorn Kjellstrom, 1994 Edition

**PREPARATION:** When working in the wildland fire environment, it is imperative that you be able to locate and describe your position to others. The ability to recognize and interpret the features depicted on topographic maps help you avoid dangerous situations and pinpoint your position on the fire.
## I. MAPS

A. Similar to an aerial view of a portion of the earth

B. Types are specifically designed for the user

## II. TYPES OF MAPS

A. Highway map
   1. Shows towns and highway route numbers
   2. Has few other features

B. Aeronautical chart
   1. Has information needed by pilots
   2. Can usually be found in a local dispatch office
   3. Used for air space management

C. Military map
   1. Highly detailed
   2. Information is useful to military personnel
   3. May lack information needed by fire fighting agencies

D. USGS topographic map
   1. Most popular with fire agencies
   2. Shows most of the needed information

E. Local maps
   1. Geographical Information Maps (GIS)
   2. Other maps which have local use

**NOTE:** Provide students with a USGS topographic map and a commonly used administrative map.
III. MAP FEATURES

A. Direction
   1. North
      a) Normally toward top of map

B. Scale
   1. One unit on the map
   2. Represents a certain number of units on the ground
      a) For example, 1:24,000 reads as
         1) One inch on the map equals 24,000 inches on the ground or
         2) One inch equals 2,000 feet on the ground

NOTE: Map conversion factors and examples of display symbols used for fire mapping can be found in Fireline Handbook, NWCG (NFES 0065), 1998 Edition, Appendix A.

C. Chain
   1. A linear unit of measure
   2. Equal to 66 feet
   3. 24-32 paces for the average person

What are some of the features of maps?

How long is one chain?

Mark out 66 feet and have students pace that distance to see how many steps it takes each individual to walk a chain.
What do the various colors on maps mean?

D. Colors
1. Black
   a) Constructed features
2. Green
   a) Vegetation
   b) Government land
3. White
   a) Private land
4. Blue
   a) Water
5. Brown
   a) Relief features
      1) Such as contour lines

E. Map symbols
1. Show detail of landscape in the following areas
   a) Fabricated features
   b) Water features
   c) Vegetation features
   d) Elevation features

F. Contour lines

NOTE: Refer to USGS topographic map.
1. Actual lines on a map along which every point is at the same height above sea level
2. Contour interval of a map
   a) Vertical distance, or difference in elevation
      1) Between adjacent contour lines
3. To determine contour interval
   a) Distance between each contour is evenly divisible by 5
   b) Example
      1) If distance between two index contour lines is 200 feet
      • The contour interval between all contour lines is 40 feet

4. Common contour intervals used today
   a) 40, 80, and 200 feet
   b) Contour level found on the legend of the map

5. Index contour
   a) Accentuated (heavier) line than others
   b) Numbered with the elevation on the line

6. Properties of contours
   a) Each contour line
      1) Must close upon itself
      2) Cannot dead end
   b) When contour lines cross streams
      1) Lines form a "V"
      • "V" points upstream

   c) When contour lines cross ridges
      1) Lines form a "U"
      2) "U" points down the ridge
d) Contour lines cannot cross or meet
   1) Except in cases of waterfalls or overhanging cliffs

e) Closed contours
   1) Represent either a summit or a depression
   2) Inspection of the index will indicate which one

f) Contour lines tend to parallel streams
   1) Rivers generally have a flatter gradient than do streams
      • Contours will be nearly parallel along rivers than contours along intermittent streams
      • And they will run parallel for a longer distance

g) A contour cannot branch or wye into two contours of the same elevation

h) Contour lines form a "M" just above stream junctions

i) Contour lines perpendicular to the direction of the maximum slope

j) Uniformly spaced contours represent uniformly sloping ground

k) Irregularly spaced contour lines represent rough, rugged ground

l) Contour lines are not drawn through buildings or other significant construction objects

IV. LAND SURVEY SYSTEMS
   A. Metes and bounds system

How are land divisions and boundaries surveyed?
1. Most states east of the Mississippi are surveyed in metes and bounds
2. These are lengthy descriptions
   a) They are of little use to fire fighters
   b) In surveyors terminology
   c) Used primarily by surveyors

B. Public land survey system
1. Used by
   a) Surveyors
   b) Land management agencies
   c) People who use maps that need legal land descriptions
2. Includes methods to describe legal locations
   a) Township
   b) Range
   c) Section

C. Other methods to describe locations
1. Latitude and longitude
2. Local map grid system
   a) Run book
3. Military grid
4. Universal Transverse Mercator (UTM)
   a) 1 km grids
   b) Suited for GPS receivers

V. METHODS FOR IDENTIFYING AND DESCRIBING LOCATION ON MAPS
A. Descriptive method
1. Use
   a) Road names and numbers
   b) Geographic features
### How is latitude and longitude measured?

**B. Latitude and longitude**

1. **Measured in**
   - a) Degrees
   - b) Minutes
   - c) Seconds

2. **When giving a latitude/longitude**
   - a) Latitude is always given first

3. **Latitude/longitude lines are on the corners of most maps**

### Where is 0° latitude?

**C. Latitude lines (or parallels of latitude)**

1. **Imaginary lines that run**
   - a) East and west
   - b) Around the earth

2. **The equator is 0° latitude**

3. **Numbered in degrees to show how far north or south they are from the equator**

4. **Degrees alone are too large for a precise location**

5. **Subdivided into minutes and seconds**
   - 1) One degree of latitude equals 60 minutes or 69 miles
2) One minute of latitude equals 60 seconds or 1.15 miles
3) One second of latitude equals 100 feet

D. Longitude lines (or meridians)
   1. Imaginary lines that run north and south through the geographic poles
   2. Denote the distance in degrees
      a) East and west of the prime meridian
   3. Prime meridian runs through Greenwich, England
      a) Is 0° longitude
   4. All lines intersect at the poles, therefore
      a) Lines are not parallel
         1) Like the lines on a basketball
      b) Have no set distance value
      c) The farther north or south of the equator, the closer the lines of longitude become to each other
   5. Longitude (like latitude) is also measured in
      a) Degrees
      b) Minutes
      c) Seconds

Where is the prime meridian?
Give students locations on the administrative map.

Working in groups, have them identify locations in latitude/longitude.

E. Local grid system method
   1. Lines superimposed on maps by users such as
      a) Local agency GIS map with a grid for reference
         1) Run book maps
      b) Incident action plan map that has grid for fire planning purposes

NOTE: Provide a map from an incident action plan, if available.

F. Township and range
   1. Initial point
      a) Most states west of the Mississippi and north of the Ohio Rivers were surveyed after the 1796 Survey Law
      b) Thirty-five initial points were established by astronomical observations
   2. Baseline
      a) Extends east and west through each initial point
   3. Principle meridian
      a) Extends north and south through each initial point
   4. Township subdivision
      a) Land is divided by cardinal lines
         1) Running due north-south
            • Range lines
<table>
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<tr>
<th></th>
<th>PRESENTATION</th>
<th>APPLICATION</th>
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<tr>
<td>2)</td>
<td>Running due east-west</td>
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<td></td>
<td>• Township lines</td>
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<td>3)</td>
<td>The land area within a township is approximately 36 square miles</td>
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<td></td>
<td>• Township numbers at the sides of map identify east-west bands of land</td>
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<td></td>
<td>• Range numbers at top and bottom of map identify north-south bands of land</td>
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<td>4)</td>
<td>Townships are identified by their relationship north and south of the baseline</td>
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<td></td>
<td>• For example, T3N R36E</td>
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<td>5)</td>
<td>Ranges are identified by their relationship east or west of the principle meridian</td>
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<td>• For example, T2S R9W</td>
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<td>5.</td>
<td>Section</td>
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<td>a)</td>
<td>Townships are divided by cardinal lines into 36 numbered sections</td>
<td></td>
</tr>
<tr>
<td>1)</td>
<td>Each section is one square mile</td>
<td></td>
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<tr>
<td></td>
<td>• 640 acres</td>
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<td></td>
<td>• 80 chains on each side</td>
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<td>b)</td>
<td>Township and sections are often larger or smaller where survey corrections have been made</td>
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<td>6.</td>
<td>Section subdivision</td>
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<td>a)</td>
<td>Divided into quarter sections that equal 160 acres</td>
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<tr>
<td></td>
<td>• 40 chains on each side</td>
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<td>PRESENTATION</td>
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<tr>
<td>• Subdivisions are not shown on field maps</td>
<td>How do you describe your legal location?</td>
<td></td>
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<tr>
<td>2) Quarter section can be subdivided into quarter of a quarter section that equal 40 acres</td>
<td>Working in groups, have students pick locations on a map and identify them by township, range, and section. Subdivide the locations into quarter sections or further.</td>
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<tr>
<td>• 20 chains on each side</td>
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<tr>
<td>b) When describing a location give</td>
<td></td>
<td></td>
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<tr>
<td>1) The smallest increment first</td>
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<td>2) Conclude with the largest increment</td>
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<tr>
<td>• For example, NW one quarter of section 6, T3S, R12E</td>
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SUMMARY:

This lesson on map use, although not designed to make you experts, is imperative for you to know how to read a map and communicate information to another person. The ability to recognize and interpret the features depicted on topographic maps help you avoid dangerous situations and pinpoint your position on the fire.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read S-130 Instructor’s Guide, NWCG (NFES 1510), 1995 Edition, Unit 8 in order to prepare yourself for the upcoming test. Study for our next session.
FIRE FIGHTER I

**TOPIC:** USING A WILDLAND COMPASS

**TIME FRAME:** 1:00

**LEVEL of INSTRUCTION:** Level II

**AUTHORITY:** 1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test

- **Behavior:** The student will confirm a knowledge of the parts of a compass, the steps necessary to shoot a bearing (azimuth) off a compass, and the importance of knowing the proper declination of an area by completing the written test

- **Standard:** With a minimum 80% accuracy according to the information contained in the S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 8 and Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 1

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- Local administrative maps (1 for every 4 students)
- USGS topographic maps (1 for every 4 students)
- Silva Ranger (or similar) compass (1 for every 4 students)

**REFERENCES:**
- Be Expert with Map and Compass, Bjorn Kjellstrom, 1994 Edition
- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 1

**PREPARATION:**

A working knowledge of compass use is a basic wildland fire fighter skill. In order to determine location of firelines and crews, the fire fighter must know how to use a compass in conjunction with a map and communicate that information to supervisors.
NOTE: The Silva Ranger compass is discussed in this lesson because it is the type most commonly used. Slight adaptations will have to be made if another type of compass is used.

Provide student groups with USGS and administrative maps, and a compass.

What are the parts of a compass?

I. PARTS OF A COMPASS

A. Revolving compass housing
   1. Upper rim marked with four "cardinal points"
      a) North, east, south, and west

B. Lower rim is divided into degree lines
   1. Each mark represents two degrees
   2. Every twentieth degree is marked with a number from 20-360

C. Orienting arrow (red arrow)
   1. Located on the inside bottom of the compass housing
   2. Points directly to the 360° North marking on the compass housing
      a) Points to degree of declination when adjusted

D. Magnetic needle
   1. Suspended on a needle sharp point around which it swings freely
   2. North end is painted red
      a) Some models are marked with a luminous band

E. Transparent base plate
   1. Direction of travel arrowhead
2. **Direction line or index pointer**
   a) **Reference point**
      1) **At rim of housing**
         - Indicates what degree number housing is at
         - Runs from housing rim to direction of travel arrowhead
   
3. **Side edges of the base plate are parallel to the direction of travel**

### II. THE AZIMUTH CIRCLE

**A. Definition**

1. **A precise location**

**B. Cardinal directions**

1. **Consists of four basic directions on housing rim**
   a) **North, east, south, and west**
      1) **Between the cardinal directions are**
         - NE, SE, SW, NW

2. **Knowledge of these directions is useful**
   a) Insufficient for describing or finding exact location

3. **When describing a precise location or direction**
   a) **Use the 360° marks**
      1) On the housing rim
      2) 0° and 360° are the same

**NOTE:** Demonstrate how cardinal directions fit into the azimuth scale.

What is an azimuth?
C. Orienting the map
   1. Place the compass on the map
      a) With edge along a longitude line
   2. Rotate map and compass together
      a) Until red magnetic arrow points to north on the compass housing
      b) Map is now oriented to north
         1) East is right
         2) West is left
         3) South is toward the bottom of the map

D. Shooting an azimuth on the map
   1. Orient the map to north
   2. Place a compass edge or ruler between two points on the map
      a) For example, your location and a prominent feature or desired destination
      b) Draw a line between
         1) Connecting those two points
      c) Place compass edge along that line
         1) Turn the compass dial
            • Until north on the dial is facing north on the map
      d) Read the bearing at the index pointer
         1) To obtain the azimuth (direction of travel)
**III. DECLINATION**

A. Also called variation

B. The difference between true north pole and magnetic north pole
   1. The red magnetic arrow points to the magnetic north pole
   2. Maps are laid out to true north (north pole)
      a) North arrow is visible on the map

C. Declination changes with geographic location

**NOTE:** Indicate declination in the legend on a local USGS topography map.

Indicate true north and magnetic north arrows on a local map.

**What is declination?**

**Why is declination important?**

D. Importance of declination in local areas
   1. Several degrees of declination would greatly affect line of travel over a distance

E. Mark declination on compass
   1. Silva ranger compass
      a) Adjust movable scale with adjustment screw
         1) To local declination correction
2. Compasses without a declination correction scale
   a) Permanent mark
      1) Scratch in a local declination mark
         • Fill scratch mark with red ink
   b) Temporary mark
      1) Allows adjustment of declination when moving from one geographical location to another
         • Transparent tape marked with a felt pen, covered with another layer of tape

**NOTE:** Adjust all class compasses with local declination.

F. After compass has been set for declination
   1. Use this declination point in reading compass
      a) Line up magnetic red (north) needle with the orienting arrow (declination arrow)
      b) Read compass at the index point

IV. **DETERMINING THE AZIMUTH**
   A. Adjust compass for declination
      1. Face object
      2. Rotate compass housing until red north arrow and orienting arrow are aligned in the same direction
      3. Read azimuth at the direction line mark (index pointer)

   B. Determining back azimuth
      1. Definition
         a) Opposite of azimuth
**PRESENTATION**

b) Retracing a route along an azimuth line would be back azimuth

2. Difference between azimuth and back azimuth  
   a) 180°  
      1) One half of a circle

3. To figure back azimuth  
   a) Read back azimuth at the pointer opposite the index pointer (direction mark)
   b) Alternative method to figure back azimuth  
      1) 180° or greater  
         • Subtract 180°  
      2) 180° or less  
         • Add 180° back

   Why is back azimuth important?

4. Always check back azimuth  
   a) To confirm and correct line of travel

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SUMMARY:

A working knowledge of compass use is a basic wildland fire fighter skill. In order to determine location of firelines and crews, the fire fighter must know how to use a compass in conjunction with a map. They must be able to communicate a description of that location effectively.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

**TOPIC:** INTRODUCTION TO INCIDENT BASE

**TIME FRAME:** 0:30

**LEVEL of INSTRUCTION:** Level I

**AUTHORITY:** 1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

- **Condition:** A written test
- **Behavior:** The student will confirm a knowledge of the incident base by completing the written test
- **Standard:** With a minimum 80% accuracy according to the information contained in the *Introduction to I-Zone Firefighting*, California Firefighter Joint Apprenticeship Committee, 1997 Edition, Chapter 3

**MATERIALS NEEDED:**
- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

**PREPARATION:**
Many fire fighters at some time during their career will respond to a large-scale incident as part of a strike team. They will be expected, at some point, to report to base camp in order to receive orders and rest. While there, they must maintain a level of professionalism and readiness. Fire fighters must understand their responsibilities and those of their strike team in order to perform their expected duties.
I. CHECK-IN
   A. On the line or in the field (immediate need)
      1. Dependent on needs of resources
      2. Dependent on development of the ICS structure
      3. May report at a rendezvous point to form up strike team
      4. May report to one of the following
         a) Division or group
         b) Staging
         c) Camp
         d) Helibase or helispot

II. FACILITIES
   A. Work area
   B. Feeding and sleeping
   C. Services and supplies
      1. Only the strike steam leader can get items from the supply unit

III. LEVEL OF READINESS
   A. Available
   B. Assigned
   C. Out-of-service

IV. RESPONSIBILITIES WHILE AT BASE
   A. Equipment
      1. Check all fluid levels
2. Safety check apparatus
3. Replace equipment lost or damaged

What are some personal needs that can be taken care of while at base?

B. Personnel needs
   1. Secure food and liquids for work period as assigned
      a) Engine company officer can delegate
   2. Secure supplies
      a) Strike team leader responsibility

Who can get supplies?

C. Come as a team, stay as a team
   1. Stay together as a strike team
   2. Eat together as a strike team
   3. Rest together as a strike team

What are some things to remember while in base camp?

D. Things to consider
   1. Be respectful and courteous
   2. Clean up after yourselves
   3. Dress appropriately
      a) No shorts
   4. No alcohol or drugs
   5. Know your responsibilities
   6. Identify showers and if there are restrictions on use
      a) Inmate crews
      b) Female or male
SUMMARY:

Every fire fighter must understand their roles and responsibilities while part of a strike team. This includes maintaining a professional attitude while in base camp and keeping supplied and rested. The fire fighter must perform their appropriate duties and maintain a state of readiness, even while out-of-service.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Introduction to I-Zone Firefighting, California Firefighter Joint Apprenticeship Committee, 1997 Edition, Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: WORKING WITH WILDLAND FIRE RESOURCES

TIME FRAME: 0:30

LEVEL of INSTRUCTION: Level II

AUTHORITY: SBFS

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of working with wildland fire resources by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fireline Handbook, NWCG (NFES 0065), 1998 Edition, Appendix A

PREPARATION:

There are many different resources available to fire fighters on the scene of a wildland incident. Would you know what the capabilities of a Type I Strike Team are? What is the difference between a tender and a tanker? When on the scene, knowing these capabilities and their differences is the key to having an effective suppression operation or causing the operation to take longer than it should.
I. ENGINE CREWS
   A. Used to pump water on mobile attack and extended hose lays
   B. Use a combination of hand tools and water to fight fire
   C. FIRESCOPE engine crew classifications
      1. Type 1
         a) 1,000 gpm
         b) 400 gallon tank capacity
         c) 4 crewmembers minimum
      2. Type 2
         a) 500 gpm
         b) 400 gallon tank capacity
         c) 3 crewmembers minimum
      3. Type 3
         a) 120 gpm
         b) 300 gallon tank capacity
         c) 3 crewmembers minimum
      4. Type 4
         a) 50 gpm
         b) 200 gallon tank capacity
         c) 3 crewmembers minimum

II. DOZER CREWS
   A. Used to construct fire lines and support other ground forces
   B. Will have a helper (swamper)
C. FIRESCOPE dozer crew classifications

1. Type 1
   a) Heavy dozer
   b) Minimum 200 HP
      1) D-7 and up

2. Type 2
   a) Medium dozer
   b) Minimum 100 HP
      1) D-5 or D-6

3. Type 3
   a) Light dozer
   b) Minimum 50 HP
      1) D-4

III. HELITACK CREWS

A. Used for initial attack on small remote fires

B. Manage the helicopter that transports ground crews to remote fires

C. NFES helitack crew classifications

1. Type 1
   a) 16 seats
   b) Bell 214
   c) Sikorsky S-61
   d) Manager only

2. Type 2
   a) 10 seats
   b) Bell 205
   c) Bell 212

What is a helitack crew and what are their capabilities?
<table>
<thead>
<tr>
<th><strong>PRESENTATION</strong></th>
<th><strong>APPLICATION</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>d) Manager</td>
<td></td>
</tr>
<tr>
<td>e) 3 crewmembers</td>
<td></td>
</tr>
<tr>
<td>3. Type 3</td>
<td></td>
</tr>
<tr>
<td>a) 5 seats</td>
<td></td>
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<tr>
<td>b) Bell 206</td>
<td></td>
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<tr>
<td>c) Hughes 500D, 500E</td>
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<tr>
<td>d) Hiller 12E</td>
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<tr>
<td>e) Manager</td>
<td></td>
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<tr>
<td>f) 2 crewmembers</td>
<td></td>
</tr>
<tr>
<td>4. Type 4</td>
<td></td>
</tr>
<tr>
<td>a) 3 seats</td>
<td></td>
</tr>
<tr>
<td>b) Manager</td>
<td></td>
</tr>
<tr>
<td>c) 2 crewmembers</td>
<td></td>
</tr>
</tbody>
</table>

**IV. INMATE/WARD CREWS**

A. Always under direct supervision of a Fire Captain and possibly accompanied by a custodial officer

B. Fire line exposure
   1. Handline construction
   2. Hose lay support
   3. Mop-up and patrol

C. Base camp exposure

---

What are some of the diversities that may innately exist?

1. Areas of cultural differences
   - a) Food or dietary needs of any ethnic group
   - b) Housing
   - c) Dress
   - d) Religion
2. Social and ethnic considerations
   a) Language barriers
   b) Rivalries may exist between ethnic groups
   c) Mixed personnel crews may require separate facilities

3. Common problems when using various crews
   a) Safety practices and attitudes
   b) Lack of training and experience in various areas of fire line work
   c) Off-shift showering
   d) Tools and equipment left on the fire line
   e) Trash left on the fire line
   f) Fatigue factors
   g) Crew morale
   h) Security
   i) Alcohol and drugs
   j) Physical stamina of some members
   k) Need for close supervision
   l) High accident rates
   m) Inter-crew communications
### Fire Fighter Attributes

1. **Suppress personal prejudice**
2. **Develop and maintain a positive attitude regardless of assignment**
3. **Motive with leadership**
   - Lead without allowing inmates to go unsupervised
   - Demonstrate your professionalism
4. **Be consistent**
   - Don't run hot and cold
   - Maintain even disposition

#### Apply the three "Fs"

1. **Fair**
   - Stay impartial (no favoritism)
2. **Firm**
   - Enforce all rules uniformly
3. **Friendly**
   - Open communications with respect

**What are the three "Fs"?**

**What are some of the attributes that fire fighters should observe when working with hand crews?**

- Don't become a buddy
- Avoid nicknames
- Keep relationship on a professional level
## MISCELLANEOUS CREWS

A. Firing crews

B. Felling crews

## ENGINE DESIGN

**A. Apparatus characteristics**
1. Highly maneuverable
2. Two-wheel or four-wheel drive
3. Pump and roll capabilities

**What are some characteristics of apparatus?**

**B. Types of pump drives**
1. Mid-ship
2. Power take-off (PTO)
3. Hydrostatic

**What are the two primary types of pumps used in the fire service?**

**C. Types of pumps**
1. Centrifugal
2. Positive displacement
   a) Typically used for priming
   b) Also used for high pressure/low volume pumps (bean pumps)

**D. Vehicle weight**
1. Bridge load limits
2. Type of terrain

**E. Water tanks**
1. Baffled for stability
2. Mounted for low center of gravity
### PRESENTATION

#### F. Vehicle identification
1. Identification lettering on top of roof
2. Minimum 2 feet high

#### G. Protective equipment
1. Roll bar
2. Seat belts
3. Fire blanket

#### H. Exhaust system protection
1. Insulated mufflers and exhaust pipes

#### I. Anti-slip tread plates

### APPLICATION

What are some types of protective equipment on vehicles?

### VII. AIRCRAFT

#### A. Fixed-wing (air tankers)

1. Drop fire retardant for direct or indirect attack
2. Light aircraft
   a) Used for spotting fires
   b) Direct air tanker operations
   c) Serve as aerial fire command
3. Classifications
   a) Type 1
      1) 3,000 gallon capacity
      2) C-130
      3) P-3
      4) DC-7

What are some of the uses of fixed-wing aircraft?
b) Type 2
   1) 1,800 gallon capacity
   2) DC-4
   3) SP2H
   4) P2V
c) Type 3
   1) 600 gallon capacity
   2) S-2
d) Type 4
   1) 100 gallon capacity
   2) Thrush

B. Rotary wing (see helitack crews)

VIII. WATER TENDERS

A. Type 1
   1. 300 gpm pump
   2. 500 gallon capacity

B. Type 2
   1. 200 gpm pump
   2. 2,500 gallon capacity

C. Type 3
   1. 200 gpm pump
   2. 1,000 gallon capacity
**SUMMARY:**

As a fire fighter in the wildland environment, it is important to know the resources available. Requests for resources must be specific to the needs of the operation in order to use them most effectively. The fire fighter must be aware of the capabilities of each resource and how they can best be used.

You may be required to work with varying types of equipment and crews, particularly inmate and ward crews on projects and emergency incidents. Your actions must conform to the rules established by the respective custodial agencies. Failure to conform to these rules may unnecessarily place you or the inmate in a difficult or unsafe position.

**EVALUATION:**

The student will complete the written test at a time determined by the instructor.

**ASSIGNMENT:**

**TOPIC:**  INTRODUCTION TO I–ZONE

**TIME FRAME:**  0:15

**LEVEL of INSTRUCTION:**  Level II

**AUTHORITY:**  1997 NFPA 1001 3-3.18

**BEHAVIORAL OBJECTIVE:**

**Condition:**  A written test

**Behavior:**  The student will confirm a knowledge of what is meant by I-Zone and its associated hazards by completing the written test

**Standard:**  With a minimum 80% accuracy according to the information contained in the S-130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 11, Lesson D

**MATERIALS NEEDED:**

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

**REFERENCES:**

- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 7

**PREPARATION:**

More people than ever before are moving into wildland areas. The threat of fires and financial loss in these areas, therefore, is also increasing. With the subsequent increase in fire fighting activities in the urban interface, wildland fire fighters must become aware of a new fire environment in which they will be increasingly involved.
I. **I–ZONE**
   A. The area where people, structures, and wildlands meet or interface
   B. Many disastrous fires have occurred in the interface
      1. Loss of life
      2. Extreme loss of property
      3. Deforestation of large areas

II. **TYPES OF INTERFACES**
    
    A. Mixed interface
       1. Occurs when structures are scattered over a large wildland area
          a) Isolated cabins surrounded by large blocks of industrial or public wildland
       2. Large fires in these areas may endanger only very few structures

    B. Occluded interface
       1. Isolated areas of wildland within an urban area
          a) New York’s Central Park
       2. Many structures at risk
       3. Potential for severe wildland fire behavior is low due to small total wildland area

    C. Classic interface
       1. Where many structures on small lots border wildlands on a broad front
2. Inter-mix of vegetation and structures can put many structures at risk
3. Greatest potential for loss of life and property

III. TYPICAL ASSIGNMENTS

A. Structural protection
B. Patrolling
C. Holding along a road
D. Less common assignments
   1. Deploying hoselines
   2. Rescue/evacuation
   3. Mop-up perimeter
   4. Staging
SUMMARY:

Fire fighters working in the interface areas must be able to recognize the challenges unique to these kinds of fires. Understanding the hazards involved in the I–Zone will dictate tactics and contribute to safer suppression efforts.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read S–130 Instructor's Guide, NWCG (NFES 1510), 1995 Edition, Unit 11, Lesson D in order to prepare yourself for the upcoming test. Study for our next session.
TOPIC: I-ZONE SAFETY CONSIDERATIONS

TIME FRAME: 1:00

LEVEL of INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of I-Zone safety considerations by completing the written test


MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials

REFERENCES:

- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapters 7 and 8

PREPARATION:

With the increase of building construction in the wildland urban-interface, fire fighters will increasingly be exposed to the problems associated with fires in those areas. Due to the issues of rescue and property conservation, fire fighters may find themselves taking more risks, with potentially deadly consequences. It is imperative that any fire fighter working in the I-Zone be aware of the safety considerations unique to this environment.
### I. GENERAL SAFETY GUIDELINE

- A. Keep engine headlights on
- B. Keep all windows rolled up
- C. Keep SCBAs in the cab
- D. Maintain a hoseline for engine protection
- E. Save at least 100 gallons of water for engine protection
- F. Stay aware of safety zone locations
- G. Scout ahead on unfamiliar roads for terrain and turnarounds
- H. Back in when deploying at a structure and choose a safe parking area

**What specific areas or dangers should be avoided?**

1. Avoid overhead wires, LPG tanks, combustibles
2. Avoid saddles, chutes, or other dangerous topographic locations
3. Park on the side opposite the fire
4. Leave room for other vehicles
5. Be prepared to take refuge or deploy shelters
6. Always wear appropriate wildland personal protective equipment

### II. I-ZONE WATCH-OUTS

- A. Wooden construction and shake roofs
- B. Poor road access and narrow/one-way road
- C. Inadequate water supply
- D. Natural fuels 30 feet or closer to structures

**What are some watch-outs unique to I-Zone?**
E. Extreme fire behavior

F. Strong winds
   1. Greater than 25 mph

G. Evacuation of the public

H. Structures located in chimneys, box canyons, and midslope

I. Bridge load limits

III. USING STRUCTURES AS A REFUGE

A. Crew preparation
   1. Stay together
      a) Keep close account of all crewmembers
      b) Avoid having to look for "strays"
   2. Follow directions of crew leader

   What should the IC be told?

   3. Inform others
      a) Contact IC
      b) Explain situation
      c) Give detailed description of location, access, and resources needed

   4. Re-evaluate your situation
      a) Possible escape routes
      b) Safer structures available
      c) Weigh risks of staying versus using escape routes
      d) Consider all options

   What you can do to prepare for having to take refuge?

B. Self-preparation
   1. Keep calm
### PRESENTATION

2. Think clearly  
3. Secure appropriate wildland personal protective equipment and tools  
   a) Sleeves down, cuffs secured, shrouds down, collars up, face protection on (no dry bandanas)  
   b) Goggles, gloves, chin strap  
   c) Flashlight, radio, pack canteen  
      1) Hosepacks can be used as a barrier  
      2) Place all combustible or flammable items well away from crew area (e.g., fuses, gas cans)

### APPLICATION

What are some safety precautions you can take inside a structure during refuge?

C. Take refuge  
   1. Stay in rooms opposite fire side  
   2. Maintain exits and be prepared to evacuate  
   3. Place bedding, sheets, or towels around doors and windows  
   4. Be aware of layout of structure in case relocation is necessary  
   5. Avoid upper floors  
   6. Use furniture as barriers  
   7. Take SCBAs with you

What should you do after the danger has passed?

D. After danger has passed  
   1. Exit structure when safe  
   2. Check crew for injuries and treat if needed
### PRESENTATION

3. Inform supervisor of status
4. Continue extinguishments or evacuate as appropriate

### IV. USING VEHICLES AS REFUGE

**A. Available vehicle**
1. Engines
2. Transports
3. Crew vehicles
4. Pick-ups
5. Sedans

**B. Close all windows**

**C. Call for assistance**
1. Inform IC
2. Give situation and detailed location

**D. Position vehicle**
1. Park in safest area possible
   a) Low fuel loading
   b) Level terrain
   c) Behind embankment, structure, etc.
   d) Away from chimneys, saddles, or other dangerous topographical features
   e) Be aware of overhead hazards such as trees or power lines
   f) Minimize exposure to radiant heat
2. Prepare vehicle
   a) Fire out around vehicle
   b) Leave motor running at high rpm
   c) Leave auxiliary pump running at high engine pressure
      1) Do not bring hoseline into cab
   d) Set spring brake to avoid movement if bumped into gear
   e) Keep cab sealed up
      1) Do not lock doors
      2) Cover open areas and windows with open fire shelters

What can the crew do to prepare when taking refuge in a vehicle?

3. Crew preparation
   a) Get everyone into cab
   b) Be encouraging
   c) Cover up with turnouts, if available
   d) Breathe shallowly
   e) Open an SCBA cylinder slightly to pressurize the cab and reduce smoke

4. After fire passes
   a) Account for all personnel
   b) Treat injuries as needed
   c) Extinguish all fires on vehicle
   d) Let IC and supervisor know status
   e) Check vehicle for mechanical condition
SUMMARY:

Quick thinking has saved many lives in firefighting. Part of LCES is always being aware of safety zones and escape routes. In rare occasions, the only options may be to take refuge in a structure or vehicle. Knowing a few simple things about preparing for this event will enhance your ability to survive this dangerous situation.

In addition to those safety considerations already learned regarding wildland fire fighting, such as the 18 situations that shout "Watch Out" and the 10 Standard Fire Orders, there are also some specific safety considerations that are unique to fighting fire in the I-Zone. These are included in the I-Zone watch out situations. In addition, there might some day be a time when a fire fighter may have to seek refuge in a vehicle or a structure during a blow-up.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

TOPIC: I-ZONE STRUCTURE PROTECTION PROCEDURES

TIME FRAME: 2:00

LEVEL OF INSTRUCTION: Level II

AUTHORITY: 1997 NFPA 1001 3-3.18

BEHAVIORAL OBJECTIVE:

Condition: A written test

Behavior: The student will confirm a knowledge of the procedures for protecting structures during I-Zone fires by completing the written test

Standard: With a minimum 80% accuracy according to the information contained in the S-205 Instructor's Guide, NWCG (NFES 2170), 1991 Edition, Unit 6

MATERIALS NEEDED:

- Writing board with markers/erasers
- Appropriate audiovisual equipment
- Appropriate audiovisual materials
- "Fire Behavior In The Wildland/Urban Interface" video, NWCG (NFES 2132), 1990 Edition

REFERENCES:

- Fundamentals of Wildland Fire Fighting, IFSTA, Third Edition, Chapter 7
- I-Zone Firefighting, CDF, 2001 Edition

PREPARATION:

Due to rapid population growth in California and the extensive construction of homes in wildland areas, thousands of homes are exposed to wildland fires. From small initial attack fires to those involving hundreds of structures, well-trained, knowledgeable fire personnel often make the difference between structural survival and disaster. Seldom will the need for effective public relations be greater than during and after an I-Zone fire.
I. **STRUCTURE TRIAGE**
   A. A decision-making process (prioritizing) that determines which structures will be protected
   B. Goal
      1. To protect and save as many structures as possible with the available fire fighting resources

II. **ON-SCENE ASSESSMENT**
   A. Fire situation
      1. Rate of spread
         a) Prearrival
         b) Current
         c) Predicted
      2. Resistance to control
         a) Difficulties already encountered
         b) Potential problems
      3. Direction of fire spread
         a) How it relates to exposed property
      4. Fuel
         a) Concentration
         b) Configuration
         c) Continuity
      5. Weather
         a) Past
         b) Current
         c) Expected
6. Topography  
   a) Slopes  
   b) Chutes and chimneys  
   c) Canyons  

B. Physical features and improvements  
1. Roads  
   a) Paved or dirt  
   b) Widths  
   c) Gates and locks  
   d) Traffic patterns  
   e) Traffic control  
2. Fuel breaks  
   a) Natural  
   b) Fabricated  
      1) Roads  
      2) Ditches  
      3) Reservoirs  
      4) Golf courses, etc.  
   c) Location, type, and size  

3. Structures  
   a) Number  

With structure location in mind, what are some topographical concerns?  
What are some examples of fabricated fuel breaks?  
What are some considerations on arrival at a structure?
b) Type (construction)
c) Location
d) Address system
e) Access
f) Contents
g) Value
h) Fire defense improvements

4. Water sources
a) Distance from assigned location
b) Access
   1) Is it limited?
c) Type
   1) Draft or pressure?
d) Volume
   1) Gpm, total source capability
e) Turnaround times for engines, water tenders, etc.

C. Communications
1. Tactical net
   a) Name
   b) Channel
   c) Frequency

2. Command net
   a) Name
   b) Channel
   c) Frequency

3. Air support request
   a) Contact supervisor versus go direct
   b) Name


II. TACTICS

D. Organizational structure

1. Your position
2. Your subordinate
3. Your supervisor
4. Adjoining forces/supervisors
5. Organization of other operations
   a) Air operations
   b) Staging and location
   c) Support and location

III. STRATEGY

A. Offensive mode

1. Control the wildland fire before it reaches the structures
2. This is usually the first and most desirable option

3. Ask three questions
   a) Is there a place to attack?
      1) Consider access, fuel breaks, roads, fuel changes, or modifications
   b) Are there enough resources to accomplish the tasks?

What are three questions you should ask to determine strategies?
c) Is there time?
   1) Can the work be completed in time?
   2) Can the line be fired out in time?
   3) Can the line be held?

4. Accomplishes both objectives
   a) Protects life and property
   b) Always look for opportunities to go on the offensive

B. Defensive mode
   1. Protecting structures as fire moves through
   2. No direct control effort on the fire
      a) Lack of time
      b) Lack of resources
      c) Extreme fire behavior
   3. May be only option, last choice

   Why do forces tend to get stuck in the defensive mode?

4. Tendency to become stuck in defensive mode
   a) Tunnel vision takes away flexibility
   b) We miss opportunities to go on the offensive
   c) Fire passes on to threaten other property or resources

C. Combine mode (defensive/offensive)
   1. Offensive
      a) Control fire when possible
   2. Defensive
      a) Direct structure protection when necessary
3. Close coordination required
   a) Resources must know entire plan
   b) Resources must know which mode they are in
   c) Actions must complement each other
   d) All resources adjacent to the firing operation must know of the Firing Plan

4. Firing operations
   a) Must take into consideration what will be accomplished and what will be at risk as a result of this action

5. If direct control effort fails, rapid change to defensive mode may be necessary

IV. TRIAGE AND PROTECTION DECISIONS
A. "Eliminate the hopeless, ignore the unnecessary, deal with the rest"

B. Indefensible
   1. Features which may cause a structure to be written off as "unsavable"
      a) Poor construction features
         1) Shake or shingle roof
            • Brands will fly into and lodge between the shakes
      b) Wood siding
      c) Large square footage of window area, especially if facing side of expected fire front

What should happen when direct control efforts fail?

What factors render a structure indefensible?
d) Many vents and openings in roof, attic, and subfloor, especially if unscreened

2. Poor location
   a) Midslope
      1) Do not expect that fire will back towards the structure
   b) Top of slope
      1) Expect rapid fire run
   c) Top of chimney
      1) Intense fire funneled at structure
   d) Isolated from other structures
      1) Resources unable to protect more than one at a time
   e) Long distance from water source
   f) Hidden from view

3. Poor access
   a) Narrow, long, slow drive
      1) Difficult to see in smoke
   b) Heavy fuels along access
      1) Heat generated precludes access or egress while burning
   c) Access crosses chimney
   d) Access has snags and/or power lines near it
      1) Snags and/or power lines may fall across and block escape routes
   e) Washouts, dips, and bumps could cause high centering, etc
4. Poor clearance
   a) Fuels right up to side of structure
   b) Brush within 30 feet of structure or within 100 feet on steep slope
   c) Trees overhanging or near structure
      1) Especially when fire has been spreading vertically or is crowning
   d) Vertical continuity of fuels is sufficient to expect fire spread into the crown fuels
   e) Woodpile, hay, or other concentrated flammables near structure with no time to move or adequately cover them

5. Structure has already caught fire and has substantial involvement
   a) Write this structure off unless this is the only structure that needs to be saved
   b) Don't waste time on it if other structures are threatened

C. Defensible
   1. Features which may allow a structure to survive
   2. Fire-resistive construction
      a) Composition shingles
      b) Tile or metal roof
      c) Stucco, brick, or metal siding
### PRESENTATION

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<tr>
<td>d)</td>
<td>Enclosed decks, no decks, or overhangs</td>
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<tr>
<td></td>
<td>1) Fire has no access underneath the structure</td>
</tr>
<tr>
<td>e)</td>
<td>Screen on vents of roof, attic, and sub floor with few openings</td>
</tr>
<tr>
<td>f)</td>
<td>Minimal glass on side of approaching flame front</td>
</tr>
</tbody>
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3. **Good location**

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<tbody>
<tr>
<td>a)</td>
<td>Flat terrain</td>
</tr>
<tr>
<td>b)</td>
<td>Backside of ridge</td>
</tr>
<tr>
<td>c)</td>
<td>No chimneys</td>
</tr>
<tr>
<td>d)</td>
<td>Water source nearby</td>
</tr>
<tr>
<td>e)</td>
<td>Clustered with other defensible structures</td>
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<tr>
<td>f)</td>
<td>Separated from defensible structures</td>
</tr>
<tr>
<td></td>
<td>1) Extra distance needed if the indefensible structure is upwind or is constructed with wood shakes or shingles</td>
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<td>g)</td>
<td>Visible from street</td>
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4. **Good access**

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<table>
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<tbody>
<tr>
<td>a)</td>
<td>Short, wide drive with room to turn around</td>
</tr>
<tr>
<td>b)</td>
<td>Light fuels along access</td>
</tr>
<tr>
<td>c)</td>
<td>Fire not funneled across access route</td>
</tr>
<tr>
<td></td>
<td>1) No chimneys</td>
</tr>
<tr>
<td>d)</td>
<td>No snags or power lines that would fall across access</td>
</tr>
<tr>
<td></td>
<td>1) Essentially, escape route is secured</td>
</tr>
<tr>
<td>e)</td>
<td>More than one route of ingress or egress</td>
</tr>
<tr>
<td>f)</td>
<td>Egress safe even while fire is burning</td>
</tr>
</tbody>
</table>
## PRESENTATION

### 5. Good clearance
- a) All flammable vegetation at least 30 feet away from structure
- b) On slopes, brush, and trees cut back at 100 feet away
- c) Woodpiles and other flammable materials away from structure
  1) Flammable material may be moved or covered if there is time
- d) No ladder fuels
- e) Fire resistant vegetation

---

## APPLICATION

What are some factors that would indicate a structure has good clearances?

What are some ways in which we can identify which structures are worth protecting?

---

### D. Identifying indefensible and defensible

1. Flagging system
   - a) Red flagging
     1) Indefensible
   - b) White flagging
     1) Defensible
   - c) No flagging
     1) Unknown

2. Placed on street near access route

3. Other systems may be employed as long as all resources are informed
4. A system should be used to designate when a structure is being protected
   a) Long drives
   b) Structure not visible from road

E. When to protect indefensible structures
   1. Never protect a structure if it is unsafe to do so, even if extra resources are available
   2. When all threatened defensible structures are protected, resources are available, and there is still time
   3. Enough resources are available to safely overcome deficits
      a) Shuttling water
      b) Clearing brush
   4. Fire behavior and/or weather changes reduce control problems
      a) Fire intensity
      b) Rate of spread
      c) Flame lengths
   5. Direction of fire approach changes
      a) Backing fire versus active flame front
   6. Contents dictate attempt to protect
      a) Example
         1) A water treatment plant containing 70,000 lbs. of hazardous materials may need to have extra resources assigned or a large employer (factory) of a small community
F. When not to protect a defensible structures
   1. Doesn't need protection
      a) Will survive on its own
   2. Change in fire behavior or direction causes a
defensible structure to become an indefensible
   structures
   3. Not enough resources to protect all the
defensible structures

V. PREPARING THE STRUCTURE
   A. Exterior preparation
      1. Ladder the roof
         a) With homeowner's, if available
         b) At the corners
         c) Away from power drop
         d) Away from fire front
      2. Clean out roof and gutters
      3. Cover swamp cooler
      4. Cover roof, attic, and subfloor vents
         a) Pile dirt in front of subfloor vents
      5. Pretreat with Class A foam, if available
      6. Cut limbs overhanging roof
      7. Close windows and doors, but leave unlocked
      8. Remove/cover flammable items
         What are some
         common flammable
         items that should be
         removed or covered?
      9. Remove vehicle or place in garage
         a) Facing out

Have students cite other examples.
b) Windows up
c) Key in ignition
d) Unlocked
e) Out of the way of fire apparatus

10. Place flammable items such as lawn chairs inside the structure

11. Remove vegetation
   a) 10 feet around LPG tanks
   b) Use fire crews or dozers, if available
   c) Scatter brush on uphill and side of structure
      1) DO NOT PILE BRUSH

12. Remove wooden fences near structure

13. Consider removing or modifying decks, overhangs, etc.

14. Shut-off gas service

15. Leave electricity on, but know where panel is
   a) Electricity may be needed
      1) Outside lights make it easier to find the structure in smoke or nighttime
      2) To run well pumps for 'improvised' water supply
      3) Turn off electricity, if structure becomes involved

16. Have large-wheeled vehicles or equipment moved to a safe location
   a) May have to be towed to refuge area

17. Cover flammable roofs of small out buildings with layer of dirt

Why do we leave electricity on?
18. Preconnect garden hoses and lay out for easier deployment

B. Interior preparation, if protocol allows
   1. Become familiar with the floor plan or have occupant show you
   2. Know access to attic
      a) Ladder beforehand, if necessary
   3. Remove light curtains but close heavy drapes from windows and doors
   4. Put pets and valuables in car or least exposed room

C. Evacuate the occupants

   1. Legal responsibility for evacuation lies with law enforcement
      a) Evacuation may be carried out by fire suppression crews
   2. Advise occupant(s) to leave
      a) Advise them they are complicating the effort to protect their structure
      b) It is voluntary, we cannot force them to leave
      c) Call for law enforcement if you believe they must leave
      d) Advise them what to leave
      e) Advise of established refuge areas

NOTE: React if students ask about legal removal of occupants.

   f) Advise about possible time of return

Can we legally remove occupants from their residences?

Discuss with students possible locations of evacuation shelters.
g) Get occupants out before egress is threatened or they get in the way of fire control activities

3. If occupants stay
   a) ADVISE THEM OF THE SIGNAL TO EVACUATE!
   b) Make sure they have separate transportation
   c) Advise them to stay in the structure when the fire hits
   d) Instruct them on how to patrol from inside and how to contact you
   e) Report remaining occupants' location to law enforcement for later accountability

VI. APPARATUS PLACEMENT
   A. Golden rule of structure protection
      1. Stay mobile
   B. Do not block roadways or access, if possible
      1. Stage extra vehicles on roadway
      2. Keep hoseline off drive
   C. Back in and be ready to drive out in poor conditions
   D. Mark long drive to show protection is in place
      1. Multiple ribbons at end of drive
      2. Ribbon across drive
      3. Sign
      4. Other predetermined signal
   E. Park in a cleared area
   F. Protect engine using structure as shield

VII. HOSELINE DEPLOYMENT
   A. Use 100-200 feet preconnected 1½" hoseline
      1. Minimize hoseline deployment
2. The more hoseline on the ground, the more "anchored" you are

B. Set up handlines directly from hydrants but avoid long hose lays

C. Use portable pump in pool, pond, etc.
   1. Saving booster water

D. Deployed hoseline should be able to reach completely around structure

E. Apparatus preparation
   1. Hose bed covered
   2. Compartment doors closed
   3. Windows rolled up
   4. Emergency lights and head lights on
   5. Charged 20-30 feet coiled protection hoseline on top of engine

F. If using multiple engines, consider having each deploy one hoseline
   1. Backup in case one pump fails

G. Charge and bleed hoselines as fire gets near

H. Place garden hose in tank
   1. Top off booster tank
   2. Turn on when pumping

I. Establish escape routes and safety zones making sure everyone, including occupants, knows them

J. Try to keep in visual contact with all personnel

K. Establish "cut and run" signal

L. Rest and hydrate personnel whenever possible

**VIII. FIGHTING THE FIRE**

A. Burn out from control lines, if possible
   1. Reduces impact of main fire
   2. Increases width of control line
### PRESENTATION

<table>
<thead>
<tr>
<th>3. Reduces length of time committed</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Coordinate with supervisor and adjoining forces</td>
</tr>
<tr>
<td>b) Consider wind direction, slope, and fuel continuity</td>
</tr>
<tr>
<td>c) Control lines should surround entire structure</td>
</tr>
<tr>
<td>d) Burning out should not threaten other operations</td>
</tr>
<tr>
<td>e) Time firing</td>
</tr>
<tr>
<td>1) It looks bad if the main fire never gets there</td>
</tr>
</tbody>
</table>

### APPLICATION

<table>
<thead>
<tr>
<th>3. Reduces length of time committed</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Coordinate with supervisor and adjoining forces</td>
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<tr>
<td>e) Time firing</td>
</tr>
<tr>
<td>1) It looks bad if the main fire never gets there</td>
</tr>
</tbody>
</table>

### Backfire small area ahead of the fire front

1. Used to reduce intensity of main front
2. Takes advantage of main fire draft
3. Timing is critical

### Fighting the wildland fire

1. Conserve water
2. Fight fire in lighter fuels only
3. Knock down fire in ladder fuels
4. Get behind objects to protect yourself

5. Watch for reburns, particularly in crowns
   a) Fire burning through an area a second or third time consuming unburned fuels

### Fighting the structure fire

1. Treat it like you would any structure fire
2. Direct application of water to burning surfaces
   a) Do not prewet fuels
   b) No water curtains (ineffective and wasteful)

---

What is a reburn?
3. Roof fire
   a) Consider a 1½" or 2½" blitz attack
   b) Sometimes it's better to give it all you have than to conserve to the point of failure

4. Avoid water on glass doors and windows

5. If it is too far involved, write it off and move on to the next structure

6. Save 100 gallons in booster tank for self-protection

7. Request assistance, if needed

8. Use garden hose for mop-up

IX. LEAVING THE SITE
   A. Rapid pull out required
      1. Consider cutting hoseline
      2. Bleed pressure from hoseline
         a) Secure on the back of the engine
            1) Partially bleed hoseline
            2) Pick up with over-the-shoulder or watermelon (figure-eight) method
            3) Gather in the middle and hang with strap or seat belt
         b) Coil hoseline loosely on top of engine
      3. Keep vehicle protection hoseline in-place and charged
      4. If occupant is present, advise that you are leaving
         a) In life threatening situations when occupants are present, encourage them to leave immediately and in their own vehicles if possible
<table>
<thead>
<tr>
<th>PRESENTATION</th>
<th>APPLICATION</th>
</tr>
</thead>
</table>

5. Advise supervisor of crew and occupant status, water supply, and get next assignment

6. Remove marker(s) at end of drive

**B. Pullout not critical**

1. Do a complete and thorough check for extension
   a) Roof
   b) Attic
   c) Ventilation system
   d) Interior
   e) Sub floor

**C. Limit mop-up to structural threats**

1. Burning trees
2. Rolling material
3. Debris piles
4. Others

**D. Top off tank before leaving**

**E. Remove marker(s) at end of drive**

**X. PUBLIC RELATIONS**

**A. Always try to minimize damage caused by control methods**

**B. Document any damage caused by suppression efforts**

**C. Follow good salvage operation practices**

**D. Consult your local authorities for policies and regulations regarding entry into structures**

**E. Be prepared to answer questions, but follow incident guidelines regarding release of public information**

**F. Be professional, this is someone’s home**
XI. GENERAL SAFETY CONSIDERATIONS

A. Always wear and use appropriate wildland PPE
B. Protect your engine as well as the structure
C. When moving around on the fire line in smoky conditions, slow down, keep your headlights and emergency lights on
D. Always have escape routes
E. Be aware of intense radiant heat and convective heat moving uphill ahead of the fire
F. Park your engine in a safe area, headed out towards the escape route
G. Back in and don't block the roadway
   1. If backing in is not practical, drive-in, then immediately take the time necessary to turn around so the apparatus is facing out
H. Avoid excessive idling with lights and radios on
   1. Ensure enough rpm to keep batteries charged
I. Never leave your engine unattended unless it is parked in a safe area
J. Stay in contact with all personnel
SUMMARY:

Protecting structures during a wildland fire can be a complex, stressful, and dangerous fire fighting operation. Decisions you make not only affect the lives and property of the public, but also your safety. Because of the increasing frequency with which these situations occur, it is extremely important that you be well prepared to make the tough decisions that are required in these situations.

EVALUATION:

The student will complete the written test at a time determined by the instructor.

ASSIGNMENT:

Long Term Assignments

Many times firefighter may be asked to be on a fireline for an extended period of time. For many that can extend into days or even weeks. In order to be well prepared, a firefighter must have supplies and personal items to keep them comfortable and meet their individual needs. While your local jurisdiction may require some items, below is a suggested list. These items are in addition to your wildland and structural gear, which should be carried with you at all times.

<table>
<thead>
<tr>
<th>Clothing</th>
<th>Entertainment Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform pants</td>
<td>Small Transistor Radio</td>
</tr>
<tr>
<td>Uniform t-shirts</td>
<td>Cards</td>
</tr>
<tr>
<td>Sweatshirt and pants</td>
<td>Book</td>
</tr>
<tr>
<td>Uniform shorts (in-camp only)</td>
<td>Other</td>
</tr>
<tr>
<td>Jacket</td>
<td></td>
</tr>
<tr>
<td>Underwear</td>
<td></td>
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<tr>
<td>Socks – both wool for on the line</td>
<td></td>
</tr>
<tr>
<td>for in camp</td>
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<tr>
<td>Tennis shoes</td>
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<tr>
<td>Shower thongs</td>
<td></td>
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<tr>
<td>Bandannas</td>
<td></td>
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<tr>
<td>Hygiene items</td>
<td>Miscellaneous</td>
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<td>-----------------------------------</td>
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</tr>
<tr>
<td>Sunscreen</td>
<td>Ear Plus</td>
</tr>
<tr>
<td>Chapstick</td>
<td>Sunglasses</td>
</tr>
<tr>
<td>Hand lotion</td>
<td>Sleeping Bag</td>
</tr>
<tr>
<td>Prescription drugs</td>
<td>Sleeping Pad</td>
</tr>
<tr>
<td>Aspirin</td>
<td>Space Blanket</td>
</tr>
<tr>
<td>Sanitary napkins</td>
<td>Money</td>
</tr>
<tr>
<td>Soap</td>
<td>Credit Card</td>
</tr>
<tr>
<td>Washcloth</td>
<td>Cell Phone</td>
</tr>
<tr>
<td>Shampoo</td>
<td>Can Opener</td>
</tr>
<tr>
<td>Toothbrush/Toothpaste</td>
<td>Spoon</td>
</tr>
<tr>
<td>Razor</td>
<td>Metal Cup</td>
</tr>
<tr>
<td>Foot Powder</td>
<td>Extra Rations</td>
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<tr>
<td>Antacids</td>
<td></td>
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<tr>
<td>Toilet Paper</td>
<td></td>
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<tr>
<td>Hand wipes</td>
<td></td>
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</tbody>
</table>
INFORMATION SHEET TEST

Directions: Write the answer to each question in the space provided for the question. Additional paper may be used, if necessary.

1. What is the best way of determining what actions and important steps are necessary to perform a job? What are the instructional terms used to denote "action" and the "important steps"?

2. What is the purpose of a Job Breakdown?

3. What type of lesson plan best utilizes the Job Breakdown format for instructional purposes? Which step of instruction best fits the Job Breakdown?

4. What are the seven (7) questions one should ask himself when preparing a Job Breakdown, under the Key Points section? What question or important step is the most often overlooked or forgotten by the instructor when preparing a Job Breakdown?
<table>
<thead>
<tr>
<th>UNIT A</th>
<th>FIRE SERVICE ORGANIZATION AND RESPONSIBILITY</th>
<th>18:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Relationship of fire department with other local agencies</td>
<td>0:30</td>
</tr>
<tr>
<td>2.</td>
<td>National, federal, and state fire service organizations</td>
<td>1:00</td>
</tr>
<tr>
<td>3.</td>
<td>Community organizations having an interest/relationship to public fire protection</td>
<td>0:15</td>
</tr>
<tr>
<td>4.</td>
<td>Fire department functions</td>
<td>0:30</td>
</tr>
<tr>
<td>5.</td>
<td>Fire department plans</td>
<td>0:30</td>
</tr>
<tr>
<td>6.</td>
<td>Principles of the standardized emergency management system (SEMS)</td>
<td>1:00</td>
</tr>
<tr>
<td>7.</td>
<td>The fire prevention function</td>
<td>0:30</td>
</tr>
<tr>
<td>8.</td>
<td>Fire service resources</td>
<td>1:00</td>
</tr>
<tr>
<td>9.</td>
<td>Duties of fire service ranks and positions</td>
<td>1:00</td>
</tr>
<tr>
<td>10.</td>
<td>Fire service agency rules and regulations</td>
<td>0:30</td>
</tr>
<tr>
<td>11.</td>
<td>Discipline in the fire service</td>
<td>0:15</td>
</tr>
<tr>
<td>12.</td>
<td>Fire fighter safety and physical fitness</td>
<td>0:45</td>
</tr>
<tr>
<td>13.</td>
<td>Fire service labor organizations</td>
<td>0:30</td>
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<tr>
<td>14.</td>
<td>Work site health and safety legislation</td>
<td>0:15</td>
</tr>
<tr>
<td>15.</td>
<td>California Joint Apprenticeship Program</td>
<td>0:30</td>
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<tr>
<td>16.</td>
<td>Sexual harassment recognition and prevention</td>
<td>2:00</td>
</tr>
<tr>
<td>17.</td>
<td>Cultural diversity, part 1</td>
<td>2:00</td>
</tr>
<tr>
<td>18.</td>
<td>Cultural diversity, part 2</td>
<td>2:00</td>
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<tr>
<td>19.</td>
<td>Training and education programs</td>
<td>0:30</td>
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<tr>
<td>20.</td>
<td>Why we plan for mutual aid</td>
<td>0:30</td>
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<tr>
<td>21.</td>
<td>CA fire service and rescue emergency mutual aid plan</td>
<td>2:00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT B</th>
<th>MISCELLANEOUS EQUIPMENT AND TOOLS</th>
<th>11:30</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Characteristics and functions of fire service hand tools</td>
<td>2:00</td>
</tr>
<tr>
<td>2.</td>
<td>Inspection and maintenance of fire service hand tools</td>
<td>0:30</td>
</tr>
<tr>
<td>3.</td>
<td>Characteristics and functions of fire service power tools</td>
<td>1:00</td>
</tr>
<tr>
<td>4.</td>
<td>Inspection and maintenance of fire service power tools</td>
<td>0:30</td>
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<tr>
<td>5.</td>
<td>Record management systems for hand and power tools</td>
<td>0:15</td>
</tr>
<tr>
<td>6.</td>
<td>How to operate a chain saw</td>
<td>1:00</td>
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<tr>
<td>7.</td>
<td>How to operate a rotary (circular) saw</td>
<td>0:30</td>
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<tr>
<td>8.</td>
<td>Characteristics and functions of pneumatic air chisels</td>
<td>0:30</td>
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<tr>
<td>9.</td>
<td>Inspection and maintenance of pneumatic air chisels</td>
<td>0:30</td>
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<tr>
<td>10.</td>
<td>Characteristics and functions of fire service lighting equipment</td>
<td>0:30</td>
</tr>
<tr>
<td>11.</td>
<td>Inspection and maintenance of fire service lighting equipment</td>
<td>1:00</td>
</tr>
<tr>
<td>12.</td>
<td>How to set up portable lights</td>
<td>0:30</td>
</tr>
<tr>
<td>13.</td>
<td>Characteristics and functions of headlamps</td>
<td>0:15</td>
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<tr>
<td>14.</td>
<td>Characteristics and functions of fire service jacks</td>
<td>1:30</td>
</tr>
<tr>
<td>15.</td>
<td>How to ignite and extinguish road flares or fusees</td>
<td>0:15</td>
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<tr>
<td>16.</td>
<td>Characteristics and functions of thermal imaging devices</td>
<td>0:15</td>
</tr>
<tr>
<td>17.</td>
<td>Safety concerns for utility interruptions</td>
<td>0:30</td>
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<tr>
<td>18.</td>
<td>Navigational tools for the fire service</td>
<td>0:15</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT C</th>
<th>FIRE BEHAVIOR AND EXTINGUISHMENT THEORY</th>
<th>16:30</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction to building construction</td>
<td>1:00</td>
</tr>
<tr>
<td>2.</td>
<td>Building components</td>
<td>2:00</td>
</tr>
<tr>
<td>NAME:</td>
<td>TOPIC</td>
<td>TIME</td>
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<tr>
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<tr>
<td></td>
<td>3. Purpose of fire resistive ratings for walls and buildings</td>
<td>1:00</td>
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<tr>
<td></td>
<td>4. Basic roof construction and safety considerations</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>5. Indications of potential building collapse</td>
<td>1:00</td>
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<tr>
<td></td>
<td>6. Types of heat measurement</td>
<td>1:00</td>
</tr>
<tr>
<td></td>
<td>7. Sources of heat energy</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>8. Theory and fundamentals of heat transfer</td>
<td>0:30</td>
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<tr>
<td></td>
<td>9. Terms related to the fundamentals of combustion</td>
<td>0:30</td>
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<tr>
<td></td>
<td>10. Elements of the combustion process</td>
<td>0:30</td>
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<tr>
<td></td>
<td>11. Products of combustion</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>12. Physical properties of common combustion gases</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>13. Phases of fire</td>
<td>1:00</td>
</tr>
<tr>
<td></td>
<td>14. Characteristics of pyrolysis, rollover, flashover, and backdraft</td>
<td>2:00</td>
</tr>
<tr>
<td></td>
<td>15. Types and causes of explosions</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>16. Characteristics and functions of extinguishing agents</td>
<td>2:30</td>
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<tr>
<td></td>
<td>17. Properties of water as they relate to fire fighting</td>
<td>1:00</td>
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<tr>
<td></td>
<td><strong>UNIT D  FIRE FIGHTER SAFETY</strong></td>
<td><strong>10:15</strong></td>
</tr>
<tr>
<td></td>
<td>1. General safety precautions for all emergency situations</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>2. Personal protective equipment for the fire service</td>
<td>1:00</td>
</tr>
<tr>
<td></td>
<td>3. Reasons why personal protective equipment can fail</td>
<td>0:30</td>
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<tr>
<td></td>
<td>4. Characteristics and functions of personal alarm devices</td>
<td>0:15</td>
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<tr>
<td></td>
<td>5. How to don structural PPE within one minute, doff, and prepare for reuse</td>
<td>0:30</td>
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<td></td>
<td>6. Traffic control considerations and procedures</td>
<td>1:00</td>
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<tr>
<td></td>
<td>7. Safety considerations for energized electrical equipment</td>
<td>0:45</td>
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<tr>
<td></td>
<td>8. Procedures for responding on apparatus</td>
<td>0:30</td>
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<tr>
<td></td>
<td>9. How to mount and dismount a fire apparatus</td>
<td>0:15</td>
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<tr>
<td></td>
<td>10. Fire fighter injuries and fatalities</td>
<td>2:00</td>
</tr>
<tr>
<td></td>
<td>11. Procedures for using rapid intervention crews</td>
<td>1:00</td>
</tr>
<tr>
<td></td>
<td>12. Performing an assessment on a downed fire fighter</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>13. Personnel accountability reports</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td><strong>UNIT E  SELF-CONTAINED BREATHING APPARATUS</strong></td>
<td><strong>8:15</strong></td>
</tr>
<tr>
<td></td>
<td>1. Conditions requiring respiratory protection</td>
<td>1:00</td>
</tr>
<tr>
<td></td>
<td>2. Types of self-contained breathing apparatus</td>
<td>0:15</td>
</tr>
<tr>
<td></td>
<td>3. SCBA components and accessories</td>
<td>0:30</td>
</tr>
<tr>
<td></td>
<td>4. Factors affecting reduced air supply duration of SCBA</td>
<td>1:00</td>
</tr>
<tr>
<td></td>
<td>5. Safe use of SCBA</td>
<td>0:30</td>
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<tr>
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<td>6. Emergency procedures when using SCBA</td>
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<tr>
<td>14. Principles of automatic wet chemical systems</td>
<td>0:15</td>
<td></td>
</tr>
<tr>
<td>15. Principles of Halon systems</td>
<td>0:30</td>
<td></td>
</tr>
<tr>
<td>16. Characteristics and functions of clean agent and Halon replacement systems</td>
<td>0:15</td>
<td></td>
</tr>
<tr>
<td>17. Characteristics and functions of automatic foam systems</td>
<td>0:30</td>
<td></td>
</tr>
<tr>
<td>18. Characteristics and functions of automatic carbon dioxide systems</td>
<td>0:30</td>
<td></td>
</tr>
<tr>
<td>19. Characteristics and functions of ultra high-speed explosion detection systems</td>
<td>0:30</td>
<td></td>
</tr>
<tr>
<td>20. Characteristics and functions of water mist systems</td>
<td>0:15</td>
<td></td>
</tr>
<tr>
<td>21. Characteristics and functions of automatic alarm initiating devices</td>
<td>1:00</td>
<td></td>
</tr>
<tr>
<td>22. Installation practices for residential smoke detectors</td>
<td>0:30</td>
<td></td>
</tr>
</tbody>
</table>

**UNIT Q FIRE PREVENTION AND INVESTIGATION 4:00**

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic techniques for public education</td>
<td>3:00</td>
</tr>
<tr>
<td>2. Role of the first responder in fire investigations</td>
<td>1:00</td>
</tr>
</tbody>
</table>

**UNIT R COMMUNICATIONS 4:45**

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fire department emergency communication systems</td>
<td>1:00</td>
</tr>
<tr>
<td>2. Characteristics and functions of a fire department radio</td>
<td>1:00</td>
</tr>
<tr>
<td>3. How to operate a fire department radio</td>
<td>0:30</td>
</tr>
<tr>
<td>4. Clear radio text and common terminology</td>
<td>1:00</td>
</tr>
<tr>
<td>5. Methods of receiving fire alarms</td>
<td>0:30</td>
</tr>
<tr>
<td>6. Telephone and communication procedures</td>
<td>0:30</td>
</tr>
<tr>
<td>7. Characteristics and functions of traffic pre-emption devices</td>
<td>0:15</td>
</tr>
</tbody>
</table>

**UNIT S VEHICLE EXTRICATION 17:30**

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction to the principles of vehicle extrication</td>
<td>1:00</td>
</tr>
<tr>
<td>2. Vehicle anatomy</td>
<td>0:30</td>
</tr>
<tr>
<td>3. New vehicle safety systems</td>
<td>0:15</td>
</tr>
<tr>
<td>4. Vehicle accident size-up</td>
<td>1:00</td>
</tr>
<tr>
<td>5. Principles of victim disentanglement</td>
<td>1:00</td>
</tr>
<tr>
<td>6. How to stabilize a vehicle on its wheels</td>
<td>0:30</td>
</tr>
<tr>
<td>7. How to stabilize a vehicle on its side</td>
<td>0:30</td>
</tr>
<tr>
<td>8. How to stabilize a vehicle on its roof</td>
<td>0:15</td>
</tr>
<tr>
<td>9. How to remove an adhesive mounted vehicle windshield, two-person method</td>
<td>0:30</td>
</tr>
<tr>
<td>10. How to remove a channel mounted vehicle windshield, two-person method</td>
<td>0:30</td>
</tr>
<tr>
<td>11. How to open a vehicle roof using an air chisel</td>
<td>1:00</td>
</tr>
<tr>
<td>12. Characteristics and functions of light rescue hand tools</td>
<td>2:00</td>
</tr>
<tr>
<td>13. How to displace vehicle seats using a come-along and chains</td>
<td>0:30</td>
</tr>
<tr>
<td>14. How to displace a steering wheel/column using a come-along</td>
<td>0:30</td>
</tr>
<tr>
<td>15. How to open a vehicle door using panel cutters and a pry bar</td>
<td>0:30</td>
</tr>
<tr>
<td>16. Characteristics and functions of hydraulic rescue tools</td>
<td>2:30</td>
</tr>
<tr>
<td>17. Inspection and maintenance of hydraulic rescue tools</td>
<td>0:30</td>
</tr>
<tr>
<td>18. How to remove a vehicle roof using powered hydraulic shears</td>
<td>0:30</td>
</tr>
<tr>
<td>NAME:</td>
<td>TOPIC</td>
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<tr>
<td>19.</td>
<td>How to displace a vehicle seat using a hydraulic jack and ram extension</td>
</tr>
<tr>
<td>20.</td>
<td>How to displace a vehicle seat using a powered hydraulic tool</td>
</tr>
<tr>
<td>21.</td>
<td>How to remove a vehicle front door using a powered hydraulic tool</td>
</tr>
<tr>
<td>22.</td>
<td>How to displace a steering wheel/column using a powered hydraulic tool and chains</td>
</tr>
<tr>
<td>23.</td>
<td>How to displace a dashboard using a powered hydraulic ram</td>
</tr>
<tr>
<td>24.</td>
<td>How to displace a dashboard using a powered hydraulic spreader</td>
</tr>
<tr>
<td>25.</td>
<td>Characteristics and functions of air bags as a rescue tool</td>
</tr>
<tr>
<td>26.</td>
<td>Considerations for preparing, packaging, and removing a victim from a vehicle</td>
</tr>
<tr>
<td>UNIT T WILDLAND FIRE FIGHTING</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Wildland fire behavior</td>
</tr>
<tr>
<td>2.</td>
<td>Fire weather</td>
</tr>
<tr>
<td>3.</td>
<td>Wildland fire fighter preparedness and personal protective equipment</td>
</tr>
<tr>
<td>4.</td>
<td>Wildland fire fighting safety</td>
</tr>
<tr>
<td>5.</td>
<td>Lookouts, communications, escape routes, and safety zones (LCES)</td>
</tr>
<tr>
<td>6.</td>
<td>Safety considerations when working around dozers</td>
</tr>
<tr>
<td>7.</td>
<td>Safety considerations when working near aircraft</td>
</tr>
<tr>
<td>8.</td>
<td>Characteristics and functions of fire shelters</td>
</tr>
<tr>
<td>9.</td>
<td>How to deploy a fire shelter, standing method</td>
</tr>
<tr>
<td>10.</td>
<td>How to deploy a fire shelter, lying-down method</td>
</tr>
<tr>
<td>11.</td>
<td>Parts of a wildland fire</td>
</tr>
<tr>
<td>12.</td>
<td>Wildland fire strategy</td>
</tr>
<tr>
<td>13.</td>
<td>Handline construction</td>
</tr>
<tr>
<td>14.</td>
<td>Characteristics and functions of wildland hand tools</td>
</tr>
<tr>
<td>15.</td>
<td>Inspection and maintenance of wildland hand tools</td>
</tr>
<tr>
<td>16.</td>
<td>Characteristics and functions of back pumps</td>
</tr>
<tr>
<td>17.</td>
<td>Characteristics and functions of fusees as a firing tool</td>
</tr>
<tr>
<td>18.</td>
<td>Characteristics and functions of a drip torch</td>
</tr>
<tr>
<td>19.</td>
<td>How to use a drip torch</td>
</tr>
<tr>
<td>20.</td>
<td>Characteristics and functions of wildland hose lays</td>
</tr>
<tr>
<td>21.</td>
<td>Using water on wildland fires</td>
</tr>
<tr>
<td>22.</td>
<td>How to construct progressive hose lays</td>
</tr>
<tr>
<td>23.</td>
<td>Characteristics and functions of mobile attack operations</td>
</tr>
<tr>
<td>24.</td>
<td>How to perform a mobile attack</td>
</tr>
<tr>
<td>25.</td>
<td>Characteristics and functions of mop-up and patrol</td>
</tr>
<tr>
<td>26.</td>
<td>Methods for scouting and communicating spot fires</td>
</tr>
<tr>
<td>27.</td>
<td>Using a wildland map</td>
</tr>
<tr>
<td>28.</td>
<td>Using a wildland compass</td>
</tr>
<tr>
<td>29.</td>
<td>Introduction to incident base</td>
</tr>
<tr>
<td>30.</td>
<td>Working with wildland fire resources</td>
</tr>
<tr>
<td>31.</td>
<td>Introduction to I-Zone</td>
</tr>
<tr>
<td>32.</td>
<td>I-Zone safety considerations</td>
</tr>
<tr>
<td>33.</td>
<td>I-Zone structure protection procedures</td>
</tr>
<tr>
<td>UNIT U EMERGENCY CARE</td>
<td></td>
</tr>
<tr>
<td>Complete, at a minimum, an Emergency Care of the Sick and Injured course</td>
<td>40:00</td>
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<tr>
<td>UNIT</td>
<td>TOPIC</td>
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<tr>
<td>V</td>
<td>INCIDENT COMMAND SYSTEM</td>
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<tr>
<td></td>
<td>Complete an ICS-200 (Introduction to ICS) course</td>
</tr>
<tr>
<td>W</td>
<td>CONFINED SPACE RESCUE</td>
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<tr>
<td></td>
<td>Complete a Confined Space Rescue Awareness course</td>
</tr>
<tr>
<td>X</td>
<td>HAZARDOUS MATERIALS</td>
</tr>
<tr>
<td></td>
<td>Complete an OSFM recognized Hazardous Materials First Responder Operations course</td>
</tr>
</tbody>
</table>

**HOURS:** 348:00  
Plus manipulative performance lab and testing
Folding a Gnass Pack

1. Hose is rolled on a Gnass pack roller
   
   -OR-

2. Hose is rolled into a 45” or 36” roll (inside diameter).

3. Roll is then pinched together and secured with a strap
4. Roll is folded in half around pinch point

5. Place folded roll in holder -OR-

6. Secure folded roll with parachute or other cord.
7. Completed roll can be placed in a Gnass pack holder or other style of hose holder.

VERY IMPORTANT!!!!!

When deploying, do not flake out hose.

To deploy:
1. Remove hose from holder
2. Unfold to resemble step #3 above
3. Remove securing strap and shape hose into an open circle
4. Attach fittings and charge while still in a circle.
5. Flaking out hose will result in kinks and twists.