CONFINED SPACE RESCUE TECHNICIAN

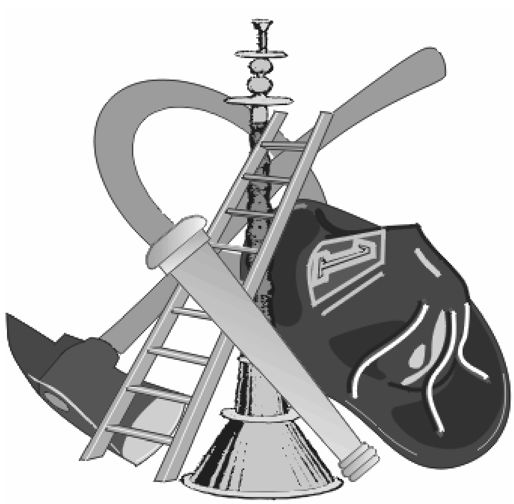
Instructor Guide

January 2008

CDF/State Fire Marshal State Fire Training

CONFINED SPACE RESCUE TECHNICIAN

INSTRUCTOR GUIDE



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State Fire Training

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.

California Fire Service Training and Education System

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 Certification Training Standards, 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.

Fire Service Training and Education Program

The Fire Service Training and Education Program (FSTEP) were established to provide specific training needs of local fire agencies in California. State Fire Training coordinates the delivery of this training through the use of approved curricula and registered instructors.

The FSTEP series is designed to provide both the volunteer and career fire fighter with hands-on training in specialized areas such as fire fighting, extrication, rescue, and pump operations. All courses are delivered through registered instructors and can be tailored by the instructor to meet your department’s specific need.

Upon successful completion of an approved FSTEP course, participants will receive an Office of State Fire Marshal course completion certificate.

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.

Ruben Grijalva Director of CDF	**Henry Renteria** Director of OES
Kate Dargan State Fire Marshal	**Kim Zagaris** State Fire Chief
Mike Richwine Chief, State Fire Training	**Charles Hurley** Deputy Chief, OES Fire & Rescue

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The Governor's Office of Homeland Security

The Governor's Office of Emergency Services

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.

Rodney Slaughter Deputy State Fire Marshal

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 these individuals who served as principal developers for this document.

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Stan Klopfenstein Santa Fe Springs Fire Department
John Mc Kently CMC Rescue
Don Shellhammer Vista Fire Department
Lou Steslicki Upland Fire Department

"We gratefully acknowledge the hard work and accomplishments of those before us who built the solid foundation on which this program continues to grow."

Introduction to the Instructor Guide

This publication is intended to serve as an instructor guide and includes lesson plans, a slide index, student activities, and tests. 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, lesson content, and endnotes. Suggested application methods have been identified throughout the lessons for you to use during your presentation.

- **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. The corresponding pages in the student supplement are also listed here.
- **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.

Technical Lesson Plans	
<u>Presentation</u> Everything you say or display Content Notes	<u>Application</u> Everything the student participates in Questions Activities Audiovisual Cues

Protecting the Homeland on the Homefront

While military personnel combat terrorism overseas, the role of local public safety agencies, law enforcement, emergency medical, and fire personnel has expanded to protect our citizens from the threat of terrorism here at home.

The expansion of the fire service mission; to save lives and protect property, has gone from fighting fires to areas of specialization that include; EMS mass casualty responses, hazardous material responses and a growing trend for specialized rescue missions.

The need for qualified rescue personnel has grown exponentially over the years. Not only will this class prepare you for the routine rescue missions in your home jurisdiction, but challenge your skills and abilities in larger regional operations brought on by natural disaster such as: floods, earthquakes, tsunamis, landslides, tornados, typhoons and hurricanes. This would seem like enough of a challenge when you look at the history of natural disasters in the last three decades. But to this list of challenges we now include the challenges that terrorism brings to our doorstep.

There are no skills more important in the response to a terrorist event than those of a trained and qualified rescuer. The ability to brace and shore unstable structures, to move and lift heavy objects without further injuring trapped victims and to skillfully tie ropes and knots into sophisticated harnesses and lifting or lowering systems are all the specialized craft of a professional rescuer.

Historically, explosives have been the weapon of choice for many terrorists. The World Trade Center bombing in 1993, the Alfred P. Murrah Federal Building in 1995, and the infamous strike on the World Trade Center in 2001 all relate to explosive events in one way or another, and all herald the call for emergency responders to be prepared for the next catastrophic event.

When explosive events like these are combined with chemical, biological, radioactive and/or nuclear or explosive (CBRNE) weapons a new dimension is added to the rescue scenario—rescuers now face the possibility that they themselves can become potential victims if not properly trained and prepared to handle the extra measure of personal protective equipment that may be required performing a rescue successfully.

California fire fighters have been expected to answer the call to many of the regional rescue events outside the state. We are also expected to, and have, work cooperatively with other federal and state resources to save lives. The California firefighter, knowledgeable in the incident command organizational structure and the National Incident Management System, is a valuable asset to Federal and local urban search and rescue operations.

Your fire fighting career has helped prepare you physically and mentally for this new role as a rescuer. With the successful completion of this class you will join the ranks of a select group of highly trained and motivated specialist prepared to handle a wide range of natural and human caused emergencies. That training continues today with this program!

Terminal Learning Objectives

The terminal learning objectives of the Confined Space Rescue Technician Course are to:

a) Provide fire service personnel with information on the regulations and standards which regulate entry into confined spaces

b) Provide fire service personnel with information to identify confined spaces and permit required confined spaces

c) Provide fire service personnel with the ability to identify the hazards associated with confined spaces

d) Provide fire service personnel with the knowledge, skills, and abilities to perform confined space rescue as it relates to incidents involving terrorism and/or weapons of mass destruction (WMD)

e) Provide fire service personnel with the ability to select and use atmospheric monitoring equipment

f) Provide fire service personnel with the ability to select and use the equipment necessary to control hazards in confined spaces

g) Provide fire service personnel with the ability to identify, select, and use personal protective equipment

h) Provide fire service personnel with the ability to use various types of victim removal and packaging systems

i) Provide fire service personnel with the ability to construct rope rescue systems for confined space rescue

j) Provide fire service personnel with the information necessary to plan, organize, operate, and command at confined space rescue incidents

k) Provide fire service personnel with the opportunity to apply the principles of confined space rescue through directed rescue scenarios

Course Content 40 Hours

Orientation Module	Time
Course Introduction	0:15
Confined Space Identification	1:30
CAL-OSHA Regulations	1:00
Federal Regulation-CFR 1910. 146	0:00
Confined Space Hazards	1:30
Atmospheric Monitoring	1:00
Hazard Control	1:00
Personal Protective Equipment	0:45
Phases of Confined Space Rescue	0:30
Rescue Rope and Related Equipment	1:00
High Point Anchor Systems	0:30
Communications	0:30
Permitting Confined Spaces	0:30

Skills Module	Time
Knots	1:30
Anchor Systems	0:50
RPM	1:15
Belay Systems	0:30
Raising Systems	1:15
Rescuer and Victim Packaging	2:00
Respiratory Protection	1:00
Communication Systems	1:00
Hazard Control	1:10
Atmospheric Monitoring	1:00
High Point Anchor Systems	2:30
Scenarios	16:00

Texts and References

- Confined Space Entry & Rescue Manual, CMC Rescue Inc. 2007
- Worker Deaths in Confined Spaces, (NIOSH) January 1994
- CCR Title 8, 5156, 5157, 5158, Confined Space Regulations, Last amended 2001
- CCR Title 8, 5155, Airborne Contaminants, Last amended 2001
- CCR Title 8, 5194, Hazard Communications, Last amended 1999
- CCR Title 8, 1669-1675, Fall Protection, Last amended 2002 (certain sections)
- CCR Title 8, 3409, Respiratory Protection, Last amended 1999
- CCR Title 8, 3314 Cleaning, Repairing, Servicing and Adjusting Prime Movers, Machinery and Equipment, Lock-out/ Tag-out, Last amended 1994
- CCR TITLE 8, 5144 Respiratory Protection, Last Amended 2005
- Complete Confined Spaces Handbook, John F. Rekus, 1994
- NFPA 1006, Standard for Rescue Technician Professional Qualifications, 2003
- NFPA 1670, Standards on Operations & Training for Technical Search & Rescue Incidents, 2003
- NFPA 1983, Standard on Life Safety Rope and Equipment for Emergency Services, 2006

TOPIC:	0: Introduction
TIME FRAME:	0:15
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a written test
Terminal Learning Objective:	The student will confirm their knowledge of the structure and goals of the class.
Enabling Learning Objective:	Identify the instructors, facilities, mission, objectives and course requirements for the Confined Space Rescue Technician course
Standard:	With a minimum 80% accuracy according to the information contained in
MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc.
PREPARATION:	Welcome to Confined Space Rescue!

PRESENTATION	APPLICATION
	PPT 0-1
I. CONFINED SPACE RESCUE	PPT 0-2
II. FUNDING	
A. Funding for this new curriculum was provided by the Federal Department of Homeland Security and the California Governor's Office of Homeland Security and the CDF –State Fire Marshal	PPT 0-3
III. COMMITTEE	
A. Kent Freeman, Project leader, Roseville F.D.	
B. Mike Bilheimer, San Bernardino City F.D.	
C. Wayne Chapman, Orange County Fire Authority	
D. Stan Klopfenstein, Santa Fe Springs F.D.	
E. Don Shellhammer, Vista F.D.	
F. Lou Steslicki, Upland F.D.	
G. John Mc Kently, CMC Rescue, Inc.	
IV. INSTRUCTOR INTRODUCTION	
A. Cite Background	
1. Fire department experience	
2. Education	
3. Training	
4. Teaching history	
5. Contact information	PPT 0-4
	CLASS ACTIVITY Students are to introduce themselves.
B. Student Introductions	
1. Name	
2. Fire Department	
3. Rank	

PRESENTATION	APPLICATION
4. Years of experience 5. Current Assignment 6. Reason for taking the Confined Space Rescue class?	
V. FACILITIES ORIENTATION A. Classroom location(s) B. Restrooms C. Food locations D. Smoking E. Breaks F. Telephones G. Parking	PPT 0-5
VI. MISSION A. Our mission during the course of this class is “To prepare students to safely and effectively perform confined space rescue”	PPT 0-6
VII. COURSE OBJECTIVES: A. Provide fire service personnel with the knowledge, skills, and abilities to perform confined space rescue as it relates to incidents involving terrorism and/or weapons of mass destruction (WMD) B. Provide fire service personnel with the opportunity to apply the principles of confined space rescue through directed rescue scenarios	PPT 0-7
VIII. COURSE DESCRIPTION A. 40-hour class B. Considerable work C. Numerous activities	PPT 0-8

PRESENTATION	APPLICATION

IX. COURSE REQUIREMENTS

A. Activities
   1. Classroom activities
   2. Outside activities

B. Attendance
   1. Excused absence of 10% is permitted with prior approval

C. Required text
   1. Confined Space Entry and Rescue Manual, 2^{nd} ed (2007), CMC Rescue Inc.

Note: CSR class is based on the October 2004 edition of Title 8, CCR, GISO, §5156-5158. Revisions and updates to that document will require the instructor to update affected sections of this course

SUMMARY:

We have a lot of material to cover in this class, you have a lot of work to do, but this will be one of the most rewarding classes you will have ever taken. Safety will be the watch word through out the class. When we all leave here, not only will you have learned what you need to know about confined space rescue but your confidence will improve as well.

TOPIC:	1: Confined Space Identification
TIME FRAME:	1:30
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter individuals will list the regulations affecting confined space rescue operations, determine what a confined space and permit required space is, and discuss the reason for changes in the regulations
Enabling Learning Objective:	1. List the industries exempted from (Title 8 §5157) permit required confined space entry procedures 2. Define a confined space 3. Define a permit required confined space 4. Describe examples of permit required confined spaces 5. Describe other regulations and standards affecting confined space rescue operations 6. List the causes of fatalities in confined space operations
Standard:	With a minimum 80% accuracy according to the information contained in • <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 1

MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of Instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36
REFERENCES:	• <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 1

PREPARATION:

Fire service responsibility is ever widening. In the past, we would not have considered confined space rescue our responsibility, or if we did, we may have considered it just as we would any other technical rescue operation.

Research has shown that we cannot deal with confined space incidents like routine technical rescues, and regulations will not permit us to. Changes to Federal and State regulations have caused many employers to re-evaluate their Confined Space program. In an attempt to comply with these regulations, many employers are relying on outside rescue services such as the local fire department. Requests for our services will undoubtedly increase, thus we must be well versed in confined space operations. Only with our understanding of what constitutes a confined space, the dangers they pose, and the regulations that apply to our operations, can we complete a safe and successful rescue in these hazardous environments.

PRESENTATION	APPLICATION
	PPT 1-1
I. REGULATIONS AFFECTING PERMIT REQUIRED CONFINED SPACE RESCUE OPERATIONS	
	PPT 1-2
A. February 1994 CAL-OSHA enacted their final rule for confined space regulations	
1. Title 8, California Code of Regulations (C.C.R.) General Industry Safety Orders (G.I.S.O.), §5156, §5157, and §5158	
B. Outside California FED-OSHA has a near identical document	
C. American National Standards Institute (A.N.S.I.) and National Institute for Occupational Safety and Health (N.I.O.S.H.) guidelines are also used	
D. Other CAL-OSHA standards	
1. Respiratory protection	
2. Lock-out/Tag-out/Block-out	
3. Fall protection	
4. Trench	
5. Other applicable regulations	
II. FATALITY STATISTICS	
	PPT 1-3
A. Original NIOSH study revealed that every year approximately 67 preventable deaths occurred in confined spaces	
1. Current studies show an average of 92 fatalities per year	
B. As many as 60% of the deaths occur to would be rescuers	
C. Research reveals interesting facts regarding the causes of deaths in confined spaces	
	PPT 1-4
1. 65% hazardous atmospheres	
2. 13% engulfment	
3. 7% struck by falling objects	

PRESENTATION	APPLICATION

4. 6% heat stress/exposure
5. 4% other causes

Note: Changes in the confined space regulations also provide the mechanism for satisfying required Injury and Illness Prevention Program (I.I.P.P.) elements with respect to confined space safety.

III. INJURY AND ILLNESS PREVENTION PROGRAM

A. Safety responsibility
B. Compliance/recognition
C. Employee-employer communication
D. Workplace inspections/evaluations
E. Correction of hazards
F. Injury/illness investigation
G. Training
H. Recordkeeping

IV. RAMIFICATIONS OF THE REGULATIONS

A. Regulations require organizations that perform confined space entry to have access to rescue team
   1. This can be in-house or contract with an outside agency
B. Industry will be asking for rescue teams from fire departments
C. Fire departments that do confined space rescue have to follow the regulations and have a written program and provide yearly refresher training
D. Failure to comply with the regulation could result in citations and severe fines

V. DEFINITIONS OF CONFINED SPACES

A. Confined spaces are divided in two groups

PPT 1-5

   1. Confined spaces
      a) Is large enough and so configured that an employee can bodily enter and perform

PRESENTATION	APPLICATION
assigned work: and	
b) Has limited or restricted means for entry or exit; and	
c) It is not designated for continuous employee occupancy	
2. Permit required confined spaces	
Note: The space must meet the definition of confined space plus one or more of the following	
	PPT 1-6
a) Contains or has the potential to contain a hazardous atmosphere	
b) Contains a material that has the potential for engulfing an entrant	
	PPT 1-7
c) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downwards and tapers to a smaller cross section; or	
d) Contains any other recognized serious safety or health hazard	
VI. EXAMPLES OF PERMIT REQUIRED SPACES	
A. Pressure vessel	
	PPT 1-8
1. This space is obviously a permit required space as it meets the criteria of a confined space with the addition of the possibility of a hazardous atmosphere	
B. Manhole under construction	
	PPT 1-9
1. For those in the construction industry entering for the purpose of new construction this would be classified as an “other confined space” and regulated by Section 5158	
2. For rescuers it would be a permit required space and regulated by Section 5157	
C. Telecommunications vault	

PRESENTATION	APPLICATION
1. For those in the telecommunications industry entering for that purpose this vault would not be permit required, as section 8616 would prevail 2. If entered for the purpose of rescue Section 5157 would prevail	PPT 1-10
D. Railroad tank car	
1. This space meets the definition of a permit required confined space 2. There are no known exemptions of section 5157 for this entry	PPT 1-11
E. Industrial Facility	
1. Entry into the vessels in this facility would meet the three criteria of a confined space and all four of the criteria of a permit required confined space	PPT 1-12
F. Open Top Wastewater Basin	
1. While this space may not appear “confined” it clearly meets the definition of a permit required confined space	PPT 1-13
G. Inside Telecommunications Vault	
1. For telecommunication workers entering for the purpose of telecommunication, this space would be considered an “other confined space” and entered by Section 8616 requirements 2. Entry for the purpose of rescue would be deemed “permit required” and entered by section 5157 requirements	PPT 1-14
VII. TYPICAL PERMIT REQUIRED CONFINED SPACES	
A. Storage tanks	
B. Pump wet wells	

PRESENTATION	APPLICATION

C. Degreasers
D. Digesters
E. Sewers
F. Person holes
G. Tunnels
H. Underground vaults
I. Boilers
J. Silos
K. Vessels
L. Grain elevators
M. Mixers
N. Open topped water tanks
O. Enclosures with bottom access
P. Rail cars

VIII. OTHER SPACES

A. There are other spaces that don't meet the exact definitions of the regulation
B. Many of these spaces can have the same hazards and require protective equipment
C. Examples include
    1. Empty swimming pools
    2. Below grade loading docks
    3. Parking garages
    4. Open top spaces greater than 5' deep

SUMMARY:

Confined spaces are quite common throughout any jurisdiction. Whether these spaces are pipelines, underground vaults, tanks, grain silos or any other configuration is not important. The critical fact is that we as rescuers can identify them as confined spaces and that we understand what makes them so dangerous. Only through training can we be confident that we will respond to these incidents with the information to be successful without placing ourselves in jeopardy.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 1 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC: 2: CAL-OSHA Regulations

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY:

- TITLE 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a written test

Terminal Learning Objective: At the conclusion of this chapter individuals will demonstrate their knowledge of the regulations affecting permit-required confined space entry in California.

Enabling Learning Objective:

1. List the regulations that pertain to confined space and permit-required confined space operations
2. List the elements of the permit-required confined space entry program
3. List the items necessary on an entry permit
4. Describe the duties of an authorized entrant, attendant, and entry supervisor
5. Discuss training requirements for permit-required confined space entry personnel
6. Describe the requirements for rescue and emergency services

Standard: With a minimum 80% accuracy according to the information contained in

- <u>Confined Space Entry and Rescue</u>, 2nd ed. CMC Rescue Inc., Chapter 2, (2007)

MATERIALS NEEDED:

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

Practical Exercise: None

Method of Instruction: Facilitated format in a classroom environment

Instructor/Student Ratio: 1:36

REFERENCES:

- <u>Confined Space Entry and Rescue Manual, CMC Rescue Inc.,</u> 2007 Edition
- <u>Worker Deaths in Confined Spaces National Institute for</u>

Occupational Safety and Health (NIOSH), January 1994

PREPARATION:

To properly and safely perform Confined Space Rescue, you must first have a working knowledge of the governing regulations. Industry must conform to the letter of the regulation enforced in their state. Some states simply enforce the federal regulations. Other states make their own which must be at least as restrictive as the federal regulations. For many years some industries chose not to comply with certain regulations. They considered OSHA fines a cost of doing business. With the increased fine structure that has been enacted, this is no longer cost efficient. In some states, fire departments are allowed to conform to the intent of the regulations, mainly safe entry and rescue. Following the regulations as closely as possible may be good enough. Cal/OSHA has served notice in California that fire department's will conform to the letter of the law in Title 8 General Industry Safety Orders. Five citations were issued to a fire department that did not comply with the regulations during a confined space rescue. A number of fire fighters were hospitalized as a result of this rescue.

Some other states are also requiring strict compliance. In Indiana, a fire department agreed to provide confined space rescue services for city workers without equipping and training their fire fighters. IOSHA issued a seventeen-page listing of "serious" violations. The cover letter stated "Generally, governmental entities are not assessed monetary penalties, as IOSHA does for private sector employers. However, there is nothing in the state statutes that prohibits IOSHA from assessing penalties to public sector entities. If your agency was a private sector employer, you would have been assessed $41,600.00 in penalties for violating safe workplace standards. We do insist that all safety and health hazards be abated.

It is important to check with your local regulatory agency to determine which regulations apply and at what level of compliance. No entry or rescue can be started until all the points in the regulation have been addressed.

PRESENTATION	APPLICATION
	PPT 2-1
I. TITLE 8, §5156	
A. Scope	PPT 2-2
1. Prescribes minimum standards for employees working in confined spaces	
2. Gives examples of what can be considered a confined space	
B. Application and definitions	
1. §5157 shall apply to all operations and industries not defined in subsection (b)(2)	
2. Confined space definition along with other definitions and requirements of §5158 shall apply to:	
a) Construction operations regulated by §1502	
b) Agriculture operations defined by §3437	
c) Marine terminal operations defined in §3460	
d) Shipyard operations defined by §3355	
e) Telecommunication manholes and unvented vaults regulated by §8616	
f) Grain handling facilities regulated by §5178	
g) Natural gas utility operations within distribution and transmission facility vaults defined in Title 49 CFR 191, 192 and 193	
h) Electrical underground vaults	
II. TITLE 8, §5157	
A. Scope and application	PPT 2-3
1. Explains that practices and procedures are to protect employees	
2. Applies to all industries not specified in §5156(b)(2)	

PRESENTATION	APPLICATION
B. Definitions	
1. gives definitions and terms in the standard	
2. relevant definitions include	
a) permit required confined space	
b) non-permit required confined space	
c) entry	
d) entry permit	
C. General requirements	
1. Employer must conduct survey of business	
a) Determines if permit-required confined space exists	
2. If the workplace contains permit required confined spaces	
a) Employer shall inform employees of existence and location by posting signs	
	PPT 2-4
3. If employees will not enter permit spaces	
a) Employer shall take effective measures to prevent employees from entering	
1) Warning signs may qualify	
2) Permanent barriers safest way	
4. If employees will enter confined spaces	
a) Employer must develop and implement a written program	
b) Written program must be available for inspection by employees	
5. Employer may use alternate procedures set forth in subsection (c)(5)(B)	
a) Entry into permit space need not comply with subsections (d)-(f) and (h)-(k) providing that:	
	PPT 2-5
1) Employer can demonstrate only hazard is atmosphere related	
2) Continuous ventilation keeps the	

space safe for entry

3) Employer develops data that supports both the above

4) Entry necessary to obtain the above data is regular permit-required

5) Determinations and supporting data are documented and made available to employees

6. Entry into permit space in accordance with (c)(5)(B)

   a) Any condition that makes it unsafe to remove an entrance cover shall be eliminated prior to removing the cover

   b) Openings with covers removed shall be guarded to protect the entrants from foreign objects

   c) Atmosphere shall be tested for:

      1) Oxygen

      2) Flammable gases

      3) Potential toxic air contaminates

   d) No hazardous atmosphere is allowed when an employee occupies the space

   e) Continuous forced air ventilation shall be used

      1) To eliminate any hazardous atmosphere prior to an employee entering

      2) Ventilate the immediate area where the employee is or will be present

      3) Ventilation shall be from a clean source

   f) Periodically test the atmosphere

      1) To check the effectiveness of ventilation

   g) If a hazardous atmosphere is detected during entry

      1) Employee shall leave the space

PRESENTATION	APPLICATION

2) Evaluate the space to determine how hazard developed
3) Implement procedures to protect employees from hazardous atmosphere prior to additional entry

h) Employer shall verify in writing that the space is safe and (c)(5)(B) measures have been taken

7. Reevaluate and reclassify space if configuration changes and increases the hazards
8. If independent contractor enters permit spaces the host employer must inform the contractor of
   a) Permit program requirements
   b) Permit space hazards
   c) Safety procedures that have been implemented by the employer
   d) Employer must coordinate activity between employees and contractor
   e) Contractor must be debriefed after entry operations

D. Permit-required Confined Space program
1. Implement measures that prevent unauthorized entry
2. Identify and evaluate hazards before entry
3. develop procedures for safe entry
   a) Identify acceptable entry conditions
   b) Isolate the permit space
   c) Procedures to eliminate or control atmospheric hazards
   d) Verifying conditions are acceptable for the duration of the entry
4. Provide to employees at no cost
   a) Testing and monitoring equipment
   b) Ventilation equipment
   c) Communication equipment

PRESENTATION	APPLICATION

- d) Personal protective equipment
- e) Lighting equipment
- f) Barriers and shields
- g) Ingress and egress equipment
- h) Any other equipment needed for safe entry

5. Evaluate permit space conditions when entry operations are conducted
   - a) Before entry is authorized
   - b) Test or monitor to determine acceptable entry conditions
     - 1) Oxygen
     - 2) Flammable gases or vapors
     - 3) Toxic gases or vapors
6. Provide at least one attendant outside space during entry
   - a) May monitor more than one space
   - b) May be stationed at any location outside space as long as they can perform the duties
7. Provide means for an attendant to respond to an emergency at more than one entry if multiple entries are being watched
8. Designate personnel duties and provide training
9. Develop and implement rescue and emergency plans
10. Develop permit system
11. Develop procedures to coordinate employees from more than one employer
12. Develop procedures for conducting entry operations
13. Review and revise permit space program as necessary
    - a) Unauthorized entry into permit space
    - b) Detection of hazards not covered by the

permit

c) Occurrences of injury or near-miss

d) Change in use or configuration of permit space

e) Complaints of program effectiveness

14. Review effectiveness of permit program using cancelled permits within one year after each entry

E. Permit System

1. Before making entry into a “permit required“ confined space it is necessary to document that all necessary measures to make the space safe have been completed

2. This documentation is made on a “permit”

3. The permit is signed by the “Entry Supervisor” and posted at the entry portal or otherwise made available for entrants to see

4. The duration of the permit must not exceed the time required to complete the job

5. The permit shall be cancelled by the Supervisor when

   a) The entry operations have been completed

   b) A condition not covered by permit occurs

6. Permits must be retained for at least one year to facilitate the review of the permit space program

7. Any problems encountered during an entry operation shall be noted on the permit

F. Entry Permit

1. There is no established format for a permit, but a permit must contain the following minimum information

   a) The space to be entered

   b) The purpose of entry

   c) Date and duration of the permit

PRESENTATION	APPLICATION

- d) Names of authorized persons involved
  - 1) Entrants
  - 2) Attendants
  - 3) Entry Supervisor
- e) List of hazards and acceptable entry conditions
- f) List of hazard controls necessary before entry
- g) Special protective equipment and tools required
- h) Atmospheric test readings
- i) Who the rescue service is and how to contact them
- j) Communication procedures to be used
- k) Any other pertinent information specific to entry
- l) Other permits necessary for the authorized work
  - 1) Hot work
  - 2) Safe work permits

G. Training

1. Employer must provide training necessary for employees to safely perform their duties
2. Each affected employee must attend
   - a) Before assigned to perform confined space entry
   - b) Before there is a change in assigned duties
   - c) Whenever the operation changes and the employee is not trained in the new procedures
   - d) Whenever the employer believes that the permit space program is not being followed or that the employee is not adequately trained
3. Specific training is not listed, but training must

PRESENTATION	APPLICATION
establish proficiency	
4. Employer must certify that the training has been accomplished	
a) Employees name	
b) Signature or initials of the trainer	
c) Date of training	
H. Duties of Authorized Entrants	PPT 2-6
1. You become an entrant whenever any part of your body breaks the plane of the opening of a permit required confined space	
2. The OSHA regulations list what an entrant must know and do	
a) Know all the hazards within the space	
b) Know the signs, symptoms and consequence of exposure to the hazard	
c) Know how to properly use every piece of personal protective equipment	
d) Entrant must keep in contact with the attendant	
e) Alert the attendant whenever a hazard or condition arises that is not on the entry permit	
f) Obey any order to evacuate the space	
I. Attendants	PPT 2-7
1. Duties of attendants are as follows	
a) Know the hazards within the space	
b) Know the signs and symptoms of exposure to the hazards	
c) Monitor the entrants behavior for signs of exposure	
d) Keep track of the number of entrants and that they are all authorized entrants	
e) Maintain constant communications	
f) Protect entrants form external hazards	

PRESENTATION	APPLICATION
g) Do not leave unless relieved by another qualified attendant	
h) Do not enter the space to perform a rescue	
i) Summons the rescue team if an emergency exists	
J. Duties of Entry Supervisors	PPT 2-8
1. Know the hazards in the space	
a) Mode of exposure	
b) Signs and symptoms of exposure	
c) Consequence of exposure	
2. Verify entries on the permit, the acceptable entry conditions exist and the necessary equipment is available	
3. Terminate entry as required	
4. Verify rescue service is available and the means to summon them is operable	
5. Remove unauthorized individuals who enter or try to enter the permit space during operations	
6. Determine that operations remain consistent with the permit	
K. Rescue and Emergency Services	PPT 2-9
1. The employer shall ensure that at least one stand-by person is trained and immediately available to perform rescue	
2. Employers who have employees perform rescue services must ensure that	
a) Each member is equipped and trained to use the necessary personal protective and rescue equipment	
b) Each member is trained to perform rescues and shall be trained as an authorized entrant	
c) Each member must practice making	

permit space rescues at least once every 12 months

d) Each member of the rescue service shall have training in basic first aid and CPR

3. Employer may provide an off-site rescue service.
4. If an off-site rescue service is contracted then the employer shall provide
   a) Information on the hazards they may confront while performing permit space rescue
   b) Provide the rescue service with access to all permit spaces
5. Retrieval systems shall be used during entry into permit spaces
   a) Unless the retrieval equipment would increase the overall risk and not contribute to rescue
6. Each entrant shall use chest of full body harness, with a retrieval line attached to a suitable point
   a) System should provide the entrant with the smallest possible profile
   b) Wristlets may be used
      1) Must demonstrate that chest or full body harness is infeasible or creates greater hazard
7. Other end of the retrieval line shall be attached to a mechanical device or fixed point outside the space
   a) Rescue can begin as soon as the rescuer becomes aware it is necessary
   b) Mechanical device shall be available to retrieve personnel from permit spaces greater than 5 feet deep
   c) MSDS or written information shall be made available to the medical facility treating an exposed employee

PRESENTATION	APPLICATION
L. Appendices 1. Appendices A through E a) Provide information and non-mandatory guidelines	
	PPT 2-10
III. TITLE 8, §5158 OTHER CONFINED SPACE OPERATIONS A. For industries and operations specified in each section 5156(b)(2) this section prescribes minimum standards for preventing employee exposure to dangerous air contamination and/or oxygen deficiency in confined spaces B. Followed by specific industries, not the fire service for confined space entry C. Some definitions and limits are different than §5157 1. Confined space 2. Dangerous air contamination a) 20% LEL for flammability b) 20% of the minimum explosive concentration for particulates D. Refer to the sections that regulate the specific industries because some have more restrictive requirements E. Not covered in detail as our operations are covered in §5157	

SUMMARY:

In California incidents involving confined spaces are regulated by Title 8, Sections 5156 and 5157. The regulation itself tells you what needs to be done to operate in these spaces, but not specifically how to do the operations. Remember, that in the fire service we need to follow the letter of the regulation. Failure to follow the regulation can lead to fines or citations.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue, 2nd ed. CMC Rescue Inc., Chapter 2, (2007) in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	3: FEDERAL REGULATION – CFR 1910.146
TIME FRAME:	0:00
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• CFR 1910. 146

BEHAVIORAL OBJECTIVE:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter individuals will demonstrate their knowledge of Federal Regulations affecting confined space entry and rescue.
Enabling Learning Objective:	1. List the regulations that pertain to confined space operations 2. List the elements of a permit-required space entry program 3. List the items necessary on an entry permit 4. Describe the duties of an authorized entrant, attendant and entry supervisor 5. Discuss the training requirements for permit-required confined space entry personnel 6. Describe the requirements for rescue and emergency services
Standard:	With a minimum 80% accuracy according to the information contained in • Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 3

MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
PRACTICAL EXERCISES:	None
METHOD OF INSTRUCTION:	Facilitated format in a classroom environment

Instructor/Student Ratio: 1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 3
- CFR 1910. 146

PREPARATION:

To properly perform a confined space rescue, you must first have a working knowledge of the regulations governing such rescues. Industry must conform to the letter of the regulation. CFR 1910.146 is a federal document and is considered the law of the land. States that have their own OSHA programs must write programs that are at least as restrictive as the Federal Law. CFR 1910.146 is enforced in all non-state plan states and on federal reservations in State plan states.

PRESENTATION	APPLICATION

I. SCOPE

A. Regulation to protect employees working in confined spaces

B. Excludes specific industries covered by other regulations, (known as vertical standards)

1. Agriculture (Part 1928)
2. Construction (Part 1926)
3. Shipyards (Part 1915)

II. DEFINITIONS

A. Confined Space

B. Permit-required confined space

C. Entry

D. Hazardous atmosphere

E. Retrieval system

III. GENERAL REQUIREMENTS

A. Employer must conduct a survey of business

1. To determine if any spaces are permit-required

B. If the workplace contains permit-required confined spaces

1. Employer must inform employees of existence, location and danger posed by permit space
2. Danger posed can be stated in broad terms (atmospheric, engulfment, etc.)

C. If employer decides employees will not enter permit spaces

1. Employer must take effective measures to prevent employees from entering
   a) Warning signs
   b) Permanent barriers

D. If employer decides that employees will enter permit spaces

1. Employer must develop and implement a written program
2. Written program must be available for inspection by the employees and their

PRESENTATION	APPLICATION

authorized representatives

E. The employer may use the alternate procedures specified in paragraph (c)(5)(ii)

F. Entry into these types of spaces need not comply with subsection (d)-(f) and (h)-(k) providing that
   1. The permit space in question has only a hazardous atmosphere that can be controlled with continuous forced air ventilation
   2. Employer must develop data that supports the data stated
   3. If entry is necessary to obtain the above data a permit would be required

G. Guidelines for alternate entry procedures
   1. Condition that makes it unsafe to remove an entrance cover shall be eliminated prior to removing the cover
   2. Openings with covers removed shall be guarded to prevent accidental falls through the opening and to protect entrants working in the space from foreign objects entering the space
   3. Internal atmospheres shall be tested with a calibrated direct reading instrument in the following order
      a) Oxygen
      b) Flammable gases and vapors
      c) Potential toxic air contaminates
   4. There may be no hazardous atmosphere while an employee is in the space
   5. Continuous forced air ventilation shall be used
      a) Employee may not enter until ventilation has eliminated any hazardous atmosphere
      b) Ventilation to be directed into the area the employee is or will be working
      c) Ventilation shall be from a clean source
      d) Ventilation shall not increase the hazards in the space

6. Periodically test the atmosphere
   a) To insure that the forced air ventilation is preventing the accumulation of a hazardous atmosphere
7. If a hazardous atmosphere is detected during entry
   a) All employees shall exit the space immediately
   b) Evaluate the space to determine how the hazardous atmosphere developed
   c) Implement measures to protect the employees from the hazardous atmosphere before re-entry
8. Employer shall verify in writing that the space is safe and that the pre-entry measures required by subsection (c) (5) (ii) have been taken

H. Re-evaluate and, if necessary, reclassify non-permit spaces to permit-required if configuration and/or hazards warrant

I. If an independent contractor is hired to perform work in host employers permit spaces, host employer must inform the contractor
1. That the worksite contains permit spaces
2. That entry is allowed only through compliance with a written program
3. Of any identified hazards
4. Of any safety procedures that have been implemented by the host employer
5. That there may be other contract employees working in the space

J. Host employer is required to debrief the contractor at the conclusion of entry operations
1. Hazards found
2. Hazards created

IV. PERMIT REQUIRED CONFINED SPACE PROGRAM

A. Under the permit space program the employer shall

PRESENTATION	APPLICATION

1. Implement measures to prevent unauthorized entry into permit spaces
2. Identify and evaluate specific hazards prior to entry
3. Develop and implement the means, procedures and practices for safe entry, including but not limited to
   a) Identification of acceptable entry conditions
   b) Isolation of permit space
   c) Procedures used to eliminate or control atmospheric hazards
   d) Barriers for the protection of entrants
   e) Verify that conditions in the space remain acceptable for the duration of the entry
4. Provide the following equipment at no cost to employees
   a) Testing and monitoring equipment
   b) Ventilation equipment
   c) Communications equipment
   d) Personal protective equipment
   e) Lighting equipment
   f) Barriers and shields
   g) Ingress/egress equipment
   h) Rescue and emergency equipment
   i) Any other equipment needed for safe entry
5. Evaluate permit space conditions when entry operations are conducted
   a) Prior to authorizing entry
   b) Atmospheric hazards to be tested in the following order
      1) Oxygen
      2) Flammable gases or vapors
      3) Toxic gases or vapors

   c) Provide employee or their representative opportunity to observe testing procedures

6. Provide at least one attendant outside permit space during entry operations
   a) May monitor more than one space
   b) May be stationed at any location outside the permit space as long as they can perform assigned duties
7. Designate personnel who will have active roles
   a) Entrant
   b) Attendant
   c) Entry supervisor
   d) Air monitoring
   e) Rigging
8. Develop and implement procedures for
   a) Summoning rescue services
   b) Rescuing entrants from permit spaces
   c) Providing the necessary emergency services to the rescued entrants
   d) Preventing unauthorized personnel from attempting a rescue
9. Develop and implement a system for the preparation, issuance, use and cancellation of entry permits
10. Review permit space program
11. Revision to program may be required if the following conditions occur
    a) Unauthorized entry into permit space
    b) Detection of hazard not covered by the permit
    c) Occurrence of an injury or near-miss injury
    d) Change in the use or configuration of a permit space
    e) Employee complaints of program effectiveness

12. Review permit space program within one year of each entry
    a) Using the cancelled permits

V. PERMIT SYSTEM

A. Before entry is authorized to begin, employer shall document completion of all necessary measures

B. This documentation is entered on a permit

C. Prior to entry the completed permit must be signed by the entry supervisor

D. The duration of the permit must not exceed the time required to do the job

E. The permit shall be cancelled by the entry supervisor when
   1. The entry operations are complete
   2. A condition not covered by the permit occurs

F. Permits must be retained by the employer for at least one year to facilitate the annual review of permit space program

G. Any problems encountered during an entry shall be noted on the permit so that appropriate revisions can be made

H. Acceptable entry conditions

I. A place to document initial and subsequent atmospheric testing
   1. Name or initial of tester
   2. When the test was performed

J. Who the rescue team is and how to contact them

K. The communication procedure to be used

L. A list of the PPE and related equipment used for entry

M. Any other pertinent information specific to the entry

N. Any additional permits
   1. Hot work
   2. Safe work permit

VI. TRAINING

A. Employer must provide the necessary training

B. Each employee must acquire the understanding, knowledge and skills necessary for the safe performance of their duties

C. Training shall be provided to each affected employee

   1. Before they are assigned to perform confined space entry
   2. Before there is a change is assigned duties
   3. Whenever the operation changes and the employee is not trained in the new procedures
   4. Whenever the employer believes that the permit space program is not being followed or that the employee is not adequately trained

D. Specific training in terms of content or hours is not listed, but the training must establish employee proficiency

E. Employer shall certify that the training has been accomplished

F. Certification shall contain

   1. Employee name
   2. Signature of trainer
   3. Date(s) of training

VII. DUTIES OF AUTHORIZED ENTRANTS

A. Know all hazards involved with entry

   1. Mode
   2. Signs and symptoms
   3. Consequence of exposure

B. Properly use all equipment

C. Communicate with the attendant

D. Alert the attendant whenever

   1. Entrant recognizes a warning sign of exposure
   2. Entrant detects a prohibited condition

E. Obey any order given to evacuate

NOTE: Remind students what constitutes entry and that you must be trained to perform entry

PRESENTATION	APPLICATION

VIII. DUTIES OF ATTENDANTS

A. Knows all hazards involved with the entry
   1. Mode
   2. Signs and symptoms
   3. Consequences of exposures

B. Is aware of possible behavioral effects in entrants

C. Maintains an accurate count of authorized entrants

D. Remains outside the permit space until relieved by another trained attendant

E. Communications, as necessary, with authorized entrants

F. Monitors activities inside and outside the space

G. Relays, to entrants, the need to evacuate when
   1. Attendant detects a prohibited condition
   2. Attendant detects behavioral effects of hazard exposure in entrants
   3. Attendant detects a situation outside the space that could endanger the entrants
   4. Attendants cannot perform all duties required of the position

H. Summons rescue personnel as soon as it is deemed necessary

I. Performs non-entry rescue

IX. DUTIES OF ENTRY SUPERVISORS

A. Knows all hazards involved with the entry
   1. Mode
   2. Signs and Symptoms
   3. Consequence of exposure

B. Verify all tests required for the entry have been conducted

C. Verify that the rescue service is available and the means to summon them is operable

D. Remove unauthorized individuals who enter or attempt to enter permit space

E. Ensure acceptable entry conditions are maintained

PRESENTATION	APPLICATION

X. RESCUE AND EMERGENCY SERVICES

A. Employer is required to evaluate prospective rescuers ability to respond to a rescue summons in a timely manner

B. Employer is required to evaluate the prospective rescue teams ability for
   1. Proficiency with equipment
   2. Proficiency with rescue related tasks

C. Employer must select a rescue team or service that
   1. Has the capability to perform the entry involved
   2. Is equipped for the rescue needs
   3. Is proficient in performing rescue

D. Employer must inform each rescue team of the hazards they may confront

E. Employer must provide access to all permit spaces from which rescue may be necessary
   1. For planning purposes
   2. To practice rescue

F. Employer must provide and train employees to properly use all required PPE

G. All rescue team members shall be trained as an authorized entrant

H. Rescue team members must be trained in basic first aid and CPR
   1. At least one member must hold current certification

I. Rescue team members shall practice making permit-space rescues at least once every 12 months

J. Training can be in actual or representative permit-spaces

K. Representative spaces shall simulate the types of spaces from which rescue may be performed
   1. Opening size
   2. Internal Configuration
   3. Accessibility

L. Retrieval systems must be in place to facilitate non-

PRESENTATION	APPLICATION

entry rescue

M. Retrieval systems consists of

4. Chest or full body harness
5. Retrieval line attached so that entrant maintains the smallest possible profile

N. Wristlets may be used if employer can demonstrate they are the safest and most effective alternative

O. If injured entrant is exposed to substance, ensure that MSDS information is made available to the medical facility

XI. EMPLOYEE PARTICIPATION

A. Employer shall consult with affected employees on development and implementation of permit space program

XII. APPENDICES

A. Provide non-mandatory guidelines to assist employers in compliance

B. Appendices are lettered A-F

SUMMARY:

In California on a Federal installation, incidents involving confined spaces are regulated by Code of Federal Regulations Section 29, CFR 1910.146. The regulation itself tells you what needs to be done to operate in these spaces, but not specifically how to do the operations. Remember, that in the fire service we need to follow the letter of the regulation. Failure to follow the regulation can lead to fines or citations.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2^{nd} ed (2007), CMC Rescue Inc., Chapter 3 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	4: Confined Space Hazards
TIME FRAME:	1:30
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter individuals will be able to identify and describe the common hazards that they might encounter at a confined space rescue incident.
Enabling Learning Objective:	1. List the four classes of hazards in a confined space 2. List the common reasons for oxygen deficiency in confined spaces 3. Describe the common causes of flammable atmospheric conditions in confined spaces 4. List the most common toxic chemicals found in confined spaces 5. List physical, mechanical and environmental hazards commonly found in confined spaces 6. Describe the signs and symptoms of claustrophobia
Standard:	With a minimum 80% accuracy according to the information contained in • Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 4

MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of Instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 4

PREPARATION:

What makes confined spaces so dangerous are the potential hazards involved. These hazards usually fall into four basic categories: atmospheric hazards which account for 90% of all confined space deaths and injuries, physical hazards, environmental hazards and psychological hazards. By knowing the types of hazards that exist in confined spaces we can better protect ourselves from them.

The threat of weapons of mass destruction, chemical, biological, radiological and nuclear will heighten our awareness of these potential hazards during a confined space rescue operation.

PRESENTATION	APPLICATION
	PPT 4-1
I. CONFINED SPACE HAZARDS	
A. There are a large number of hazards associated with confined spaces	
	PPT 4-2
B. Confined space hazards can be divided into four categories: 1. Atmospherics hazards 2. Physical/mechanical hazards 3. Environmental hazards 4. Psychological hazards	
II. ATMOSPHERIC HAZARDS	
A. Atmospheric hazards account for 90% of all confined space injuries and deaths	
	PPT 4-3
B. A hazardous atmosphere is one that exposes employees to a risk of death, incapacitation, injury or acute illness from one or more of the following causes:	
	PPT 4-4
1. Oxygen concentration below 19.5% or above 23.5% 2. Flammable gas or vapor in excess of 10% of the Lower Explosive Limit (LEL) 3. Airborne dust concentration that obscures vision at 5 feet or less a) Explosion Hazard b) Respiratory Hazard 4. Radiation and/or radioactivity is also considered an atmospheric hazard 5. Any other immediately dangerous to life and/or health (IDLH) atmosphere defined as an atmosphere with sufficient toxic, corrosive or asphyxiant substances to; a) Cause an immediate threat to life b) Cause irreversible/immediate adverse health effects	

PRESENTATION	APPLICATION

c) Interfere with the worker's ability to escape/self rescue

Note: Compare with NIOSH definition

C. Atmospheric hazards can be divided into three general categories
   1. Oxygen deficiency/enrichment
   2. Flammable or combustible atmospheres
   3. Toxic atmospheres

III. OXYGEN DEFICIENCY

A. The leading cause of confined space deaths

B. An atmosphere is considered oxygen deficient if the oxygen level drops below 19.5% by volume

C. This deficiency can be caused by
   1. Consumption
      a) Combustion-welding operations or cutting torches
      b) Decomposition of organic matter rotting foods, plant life and fermentation
      c) Oxidation of rusting metals
   2. Absorption
      a) The vessel itself or the product stored in the vessel; (i.e., damp activated carbon)
   3. Displacement
      a) Intentional purging with inert gases
         1) Nitrogen
         2) CO2
         3) Helium
         4) Steam
      b) Unintentional purging by inert gases that don't support life
         1) Engine exhaust
         2) Industrial processes

IV. FLAMMABLE ATMOSPHERES

A. Oxygen enrichment

PRESENTATION	APPLICATION

1. Oxygen level above 23.5%
2. Flammable materials will burn very rapidly
3. Common causes include unattended or leaking oxygen lines or cylinders

B. For combustible gases to ignite and burn three components must be present

1. Fuel
2. Oxygen
3. Ignition source

C. Fuel and oxygen must be present in the proper range. The critical point, known as the flammable range, is between the lower explosive limit (LEL) and the upper explosive limit (UEL)

1. Concentrations below the LEL are too lean to burn
2. Concentrations above the UEL are too rich to burn

D. A concentration of greater than 10% of the LEL is considered a hazardous atmosphere

V. TOXIC ATMOSPHERES

A. Contaminants may be present from previously stored material

B. Decomposing organic matter can displace or consume oxygen and can produce gases like methane (CH_4) Carbon Monoxide (CO), Carbon Dioxide (CO_2), Hydrogen Sulfide (H_2S), Sulfur Dioxide (SO_2)

C. Toxic gases can also enter the space due to improper isolation procedures

1. Leaks
2. Improper Lock out/Tag out

D. Routes or entries into the body

1. Inhalation
2. Absorption
3. Ingestion
4. Injection

Note: Some toxic materials are also flammable and may be

PRESENTATION	APPLICATION

toxic at concentrations below their lower explosive limit, such as Hydrogen Sulfide (H2S) and Toluene

E. Toxic limit shall be any limit with a numerical value exceeding the permissible exposure limit (PEL)
    1. Cal-OSHA has developed PEL's for many toxic contaminates
    2. If Cal-OSHA does not have PEL, check other sources
        a) NIOSH pocket guide

VI. COMMON TOXIC GASES

PPT 4-5

A. Five common toxic gases that may be found in confined spaces
    1. Methane
    2. Carbon Monoxide
    3. Carbon Dioxide
    4. Hydrogen Sulfide
    5. Sulfur Dioxide

VII. METHANE (CH4)

A. Used for cooking, lighting and in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, and formaldehyde. Also caused by decomposition of organic material
B. Colorless, odorless, tasteless gas which may be a liquid under pressure
C. Simple asphyxiant
D. Explosive range 5-15%
E. Vapor density – 0.55
    1. lighter than air
F. Inhalation hazard
G. Signs and symptoms of exposure
    1. Dizziness
    2. Difficulty breathing
    3. Cyanosis
    4. Loss of consciousness

H. PEL = none established

I. IDLH = none established

VIII. CARBON MONOXIDE

A. Colorless, odorless, tasteless flammable and extremely toxic gas

B. Widely encountered in almost every industry

C. Asphyxiant

1. Displaces oxygen

D. Has 200-300 times the affinity for Hemoglobin that oxygen has

E. Explosive range 12.5% – 74%

F. Vapor density – 0.968

1. slightly lighter than air

G. Inhalation hazard

H. Signs and Symptoms of Carbon Monoxide poisoning

1. Headache
2. Nausea
3. Shortness of breath
4. Irritability, confusion, loss of judgment
5. Dizziness
6. Increased heart and respiratory rate
7. Faintness
8. Lethargy and stupor
9. Seizures

I. Skin color initially pale to cyanotic and then cherry red

J. Coma, convulsions and death

K. PEL = 25 PPM

L. IDLH = 1200 PPM

M. Inhalation hazard

IX. CARBON DIOXIDE

A. Colorless, odorless–nonflammable gas

1. Displaces oxygen, increases respirations and raises the acid level in the blood

B. Vapor density - 1.527

1. Heavier than air

C. Inhalation hazard

1. Asphyxiant

D. Signs and symptoms of exposure

1. Headache
2. Dizziness
3. Restlessness
4. Increased heart rate
5. Convulsions at high concentrations

E. PEL - 5,000 PPM

F. IDLH - 40,000 PPM

X. HYDROGEN SULFIDE (H2S)

A. Colorless, toxic, combustible gas with characteristic odor of rotten eggs

B. Formed by the decomposition of organic plants and animal life and deterioration of concrete

1. Also found in oil and gas production and refining, sewers, pulp mills, and a variety of industrial processes

C. Flammable range 4.5% - 45.5%

D. Vapor density – 1.19

1. Heavier than air

E. Collects in the bloodstream then paralyzes the nerves in the brain that control breathing

F. Inhalation hazard and readily absorbed by the skin

1. Liquid can cause freezing burns
2. Irritant to mucous membranes

G. Signs and symptoms of exposure

1. Headache
2. Loss of appetite
3. Dizziness
4. Muscle fatigue and cramps
5. Low blood pressure
6. Loss of consciousness

7. Respiratory paralysis and death

H. Diminishes your sensitivity to smell leading individuals to believe the gas is no longer present, when it may still be at hazardous levels

I. PEL - 10 PPM

J. IDLH - 100 PPM

XI. SULFUR DIOXIDE (SO2)

A. Colorless, non flammable gas with characteristic irritating pungent odor, extremely toxic

B. Irritant to eyes, nose, throat

1. Can cause reflex bronchoconstriction, skin burns, and edema of the lungs and glottis

2. Corrosive irritant to eyes, skin, and mucous membranes

C. 1-10 PPM exposure causes respiratory and pulse rate increases and decreases in depth of respiration

D. Vapor density = Heavier than air

E. PEL = 2 PPM

F. IDLH = 100 PPM

XII. EXPLOSIVE ATMOSPHERIC CLASSIFICATIONS

A. Characterized by the type and form of hazardous materials present

B. National Electrical Code divides atmospheres into classes, groups, and divisions

1. Classes – types of atmospheric hazard

a) Class I – flammable vapors and gases

b) Class II – combustible dusts

c) Class III – ignitable fibers

2. Group – classes are further divided into groups based on similar flammable characteristics

a) A through D – fall under Class I

b) E through G – fall under Class II

3. Division – occurrence of release of the explosive material

a) Division 1- material is present in the air

PRESENTATION	APPLICATION
b) Division 2- material is confined in containers	
XIII. PHYSICAL/MECHANICAL HAZARDS	PPT 4-6
A. Physical hazards	OH – What materials do you think provide a potential for engulfing an entrant?
1. Engulfment – hoppers, silos, vessels a) Grain b) Sand c) Gravel d) Cement e) Clay f) Sawdust g) Liquids	
2. Causes of engulfment incidents a) Bridging: walking on unstable materials with void spaces below b) Improper or lack of safety or retrieval lines c) Overhead flow of particulate matter or liquids inadvertently activated	
B. Other physical hazards 1. Falls 2. Electrical shock 3. Chemical/corrosive 4. Temperature 5. Biological 6. Falling debris	
C. Mechanical hazards 1. Weirs 2. Agitators	

PRESENTATION	APPLICATION
3. Mixers	
4. Paddles	
5. Augers	
D. Trenches and excavations	
Note: The following information regarding trenches and excavations needs to be considered	
1. Recognizing the need for trench and excavation rescues	
2. Resources necessary for trench and excavation operations	
3. General hazards in trench and excavation incidents	
4. Procedures and equipment needed to mitigate hazards	
5. Collapse patterns	
6. Why trenches and excavations collapse/secondary collapse	
7. Soil characteristics	
8. Specialized training required	
XIV. ENVIRONMENTAL HAZARDS	
	PPT 4-7
A. Heat	
B. Cold	
C. Insects	
D. Vermin	
E. Snakes/reptiles	
F. Mold/fungus	
XV. PSYCHOLOGICAL HAZARDS	
	PPT 4-8
A. Claustrophobia	
1. Abnormal fear of a closed or confined space	
2. Types of responses	
a) Anxiety	
1) Physical or emotional response to	

PRESENTATION	APPLICATION

any kind of situation

- b) Phobia
  - 1) Persistent fear of an object or situation in which the actual danger is modified
- c) Panic
  - 1) Sudden terror or an unreasonable infectious and uncontrollable fear

3. Physical symptoms
   - a) Elevated pulse
   - b) Increased respirations
   - c) Sweating
   - d) Cold clammy palms

B. Fatigue

C. High noise levels

SUMMARY:

Atmospheric conditions are the number one killer in confined space incidents. Only by properly identifying the atmosphere within space, can we safely enter the space with the appropriate protection in place. It is imperative that we have a knowledge of target gases found in confined spaces and the effects they may have on our rescuers (entrants).

Physical and engulfment hazards are the second leading cause of personnel in confined spaces. If for no other reason than this, these hazards demand our utmost attention.

Facilities relying on outside rescue services (i.e. fire department) are required by Cal-OSHA to provide those rescue services access and opportunity for rescue pre-planning. It is to our advantage to capitalize on this opportunity so we can fully understand our potential rescue problem. By pre-planning the industries in our jurisdiction and researching the hazards, we can help reduce our risk in a potentially dangerous environment.

EVALUATION:

The student will complete a written exam with an 80% accuracy at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 4 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	5: Atmospheric Monitoring
TIME FRAME:	1:00
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

Behavioral Objective:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter, individuals will describe different atmospheric monitoring instruments, selection and use of instruments, monitoring strategies and locations in/around confined space rescue incidents.
Enabling Learning Objective:	1. Describe the purpose of performing atmospheric monitoring, and what may be determined based upon instrument readings. 2. Describe three different types of atmospheric monitoring instruments, and the reason(s) for monitoring for specific atmospheric hazards in sequence. 3. Describe four different atmospheric monitoring strategies and locations to be monitored when working in/around a confined space. 4. Describe stratification of atmospheres within a confined space, and the importance of monitoring at different levels within the space.
Standard:	With a minimum 80% accuracy according to the information contained in • Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5

MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of Instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5

PREPARATION:

The CAL-OSHA standard requires that atmospheres in confined spaces be monitored prior to entry. There are several types of monitoring instruments available that can be used to test for oxygen, flammable and toxic atmospheres. An understanding of various monitoring strategies to be used is essential when developing a confined space entry plan.

PRESENTATION	APPLICATION
	PPT 5-1

I. ATMOSPHERIC MONITORING

Note: This lesson plan should also emphasize the agency's selected monitors. Use that agency's type of monitoring-equipment whenever possible.

A. Prior to entry, all atmospheres shall be tested for hazards

B. The information gathered through testing will aid in

1. Selecting personal protective equipment
2. Determining areas where protection is needed
3. Assessing the potential health affects of exposure
4. Determining the need for specific medical monitoring

II. GAS MONITORING INSTRUMENTS

PPT 5-2

A. There are a variety of atmospheric monitors available

1. A "real time" direct read-out instrument is required by Cal-OSHA

B. Single gas monitors

1. Monitors only the presence of one gas

C. Multiple gas monitors

1. Capable of monitoring more than one gas simultaneously

D. To be useful in the field, these instruments should be

1. Portable
2. Reliable with little or no need to extrapolate, integrate or compile large amounts of data
3. Sensitive and have selective results
   a) Have the ability to analyze very low contaminate levels
   b) Selectivity establishes what contaminates elicit a response and which interferences produce similar response
4. Intrinsically safe

a) Will not introduce an ignition source into the atmosphere

5. Atmospheres should be tested for
   a) Oxygen level (first)
   b) Flammable or combustible levels (second)
   c) Toxic (third)
6. Monitors are calibrated to, or have sensors for, certain hazards
7. Monitors can be damaged by exposing the sensors to certain products

III. MONITOR GUIDELINES

A. Monitors should be operated and inspected by qualified individuals

B. Calibrate instruments according to manufacturers' instructions before and after use

C. Instrument readings have limited value where contaminates are unknown

D. Instrument reading will not be precise when using in atmosphere other than what the instrument has been calibrated to

E. Instrument should be Radio Frequency (RF) shielded

F. Reading of zero should be reported as "no instrument response" rather than "clean"

G. When monitoring unknown atmospheres, utilize several different detection systems

IV. MONITOR START-UP PROCEDURES

A. Turn instrument on and let it warm-up
   1. In a clean, uncontaminated atmosphere

B. Check battery level

C. Zero monitor if necessary

D. Clear the peaks

E. Test monitor
   1. Gently breath into sensor or sample tube
   2. Oxygen level should drop below 19.5 %

PRESENTATION	APPLICATION

3. Alarm should sound

F. Clear the peaks

G. Begin monitoring

V. MONITORING FOR OXYGEN

A. First monitoring priority

B. Used to detect the percent of oxygen in the atmosphere

C. Most instruments are calibrated for concentrations between 0% - 25%

D. 19.5% - 23.5% acceptable range for entry unless respiratory protection is used

E. Detection occurs in an electrochemical cell

F. Advantages

1. Quick response time
2. Portable
3. Single or combination monitors available

G. Disadvantages

1. Must calibrate at temperature, humidity and elevation of use
2. Monitors are adversely affected by certain gases and vapors

VI. MONITORING FOR FLAMMABLE ATMOSPHERES

A. Second monitoring priority

1. Check oxygen level first since oxygen is required to burn the combustible gas
2. Most instruments will not give an accurate reading in atmospheres of less than 10% oxygen

B. Accomplished by using an instrument capable of measuring flammable/combustible atmospheres

C. Three different scales used on different models

1. Percent of the Lower Explosive Limit (LEL)
   a) Most common scale
   b) Measure 0% - 100% of vapor in the air
2. Parts per million

PRESENTATION	APPLICATION

a) Detects the parts per million of a gas or vapor in the atmosphere

3. Percent of a specific gas

a) Detects the percentage of a specific gas or vapor in the atmosphere

D. Readings are relative to the calibrated gas

1. Different gases require a response curve

E. On a combustible gas indicator, combustible gases are heated and burned inside the sensor

1. This combustion heats a filament which changes the resistance and causes an imbalance in the Wheatstone Bridge
2. This resistance change is translated into an atmospheric monitoring reading

F. Broad range instruments

1. Sensing technology uses metal oxide semi conductors (MOS)
2. Senses a wider range of flammable materials
3. Detects at a lower oxygen level than catalytic filaments
4. Less prone to being poisoned by lead and silicon contaminated materials
5. Preferred instrument to test unknown atmospheres

G. Advantages

1. Fast response
2. Simple operation
3. Audible and visual alarms available
4. Portable
5. Choice of active or passive sampling

H. Disadvantages of combustible gas indicator

1. Reaction temperature dependent
2. Calibrated to a single calibration gas
3. Various compounds may damage the element
4. False readings in atmospheres less than 10%

PRESENTATION	APPLICATION

oxygen

VII. MONITORING FOR TOXICS

A. Third priority for atmospheric monitoring

B. Accomplished by using a variety of monitors and devices

1. Toxic gas Monitors

    a) Contains an electro chemical coil designed to give an accurate response to specific gases

    b) Variety of detectors available for different toxic substances

2. Colorimetric detector tubes

    a) Glass tube filled with chemical reagent

    b) Specific volume of air is drawn through the tube

    c) Concentration of the contaminate is determined by observing the length of stain in the reagent

    d) Useful for measuring the concentration of a known gas or vapor

    e) Color indicator must be appropriate for tested gas

3. Other monitors include photoionization detectors and flame ionization detectors

    a) May be available and require additional training

C. Limits for safe entry are determined by the Permissible Exposure Limit (PEL) for the toxic involved

VIII. APPLICATION OF DETECTION DEVICES

A. No one Atmospheric Monitor can detect all hazards

B. Monitors must be calibrated, maintained and operated by qualified persons

C. Factors that directly affect readings

1. Proper equipment operation
2. Proper calibration
3. Equipment detection range

PRESENTATION	APPLICATION

4. Device relative response
5. Response time
6. Inherently safe
7. Nature of the hazard
8. Environmental conditions

D. Key points on monitor use

1. Calibrate or zero monitor prior to use
2. Use the appropriate instrument
3. Never assume only one hazard
4. Use one instrument to confirm another
5. Monitor continuously
6. Establish action levels
7. Use conservative judgment in interpreting atmospheric monitor readings

IX. SELECTION OF DETECTION DEVICES

A. Recommend to use only one approved instrument

1. Underwriters Laboratory (UL)
2. Factory Mutual (FM)
3. Use equipment only in the atmosphere they have been certified for
4. If monitoring an unknown atmosphere use equipment certified for use in most hazardous locations
   a) Class I, Division I, Groups A-D
5. Instruments used in a methane environment should be approved by the Mine Safety and Health Administration

X. MONITORING STRATEGIES

PPT 5-3

A. Select monitors and PPE based on the initial site characterization

B. Four categories of monitoring

1. General site monitoring
2. Perimeter monitoring

PRESENTATION	APPLICATION
3. Confined space monitoring	
4. Personal monitoring	
C. Regulation requires monitoring in the following order	PPT 5-4
1. Oxygen	
2. LEL	
3. Toxicity	
D. Record monitoring results	
1. Location	
2. Time	
3. Testing results	
4. Name of person monitoring	
5. Time, testing results and name of person monitoring are all Cal-OSHA requirements	
E. Immediately dangerous to life and/or health (IDLH)	
1. May cause immediate collapse	
2. May have immediate transient effects with sudden collapse 12-72 hours later	
F. General site monitoring	
1. All areas around confined space	
2. Start upwind	
3. Wear PPE for any suspected hazards	
a) Utilize appropriate PPE with respiratory protection in unknown atmospheres	
G. Perimeter monitoring	
1. Area around operation	
a) Measures contaminant migration from within space	
H. Confined space monitoring	
1. Starts outside the space	
2. Identify source of possible contaminant generation	
3. Atmospheric monitoring must be performed prior to entry	

a) If possible perform atmospheric monitoring prior to ventilation

4. Sample around opening

5. Sample inside opening

   a) If possible, perform atmospheric monitoring without opening

   b) Use probe or hose through “pick” holes or cracks

   c) If necessary to open

      1) Protect against possible escape of contaminants

   d) Test all areas within space

      1) Vertical spaces

         - Top, bottom, middle
         - Remember response delays caused by hose

           - Typically one to two second per foot of hose

      2) Horizontal spaces

         - Tape hose and probe (pipe, pike pole, etc) to reach into space

   e) If entry is necessary to perform atmospheric monitoring it must be conducted as permit required entry

      1) Entry is defined as any part of the body breaking the plane of the opening

I. Personal Monitoring

   1. First entrant into confined space

   2. Entrant furthest into confined space

XI. OXYGEN DEFICIENCY/DISPLACEMENT

A. In oxygen deficient atmospheres, atmospheric monitors may not operate properly

   1. Acceptable oxygen readings must be determined prior to monitoring for all other

PRESENTATION	APPLICATION
atmospheres	PPT 5-5

XII. STRATIFICATION OF ATMOSPHERES

A. Atmospheres are made up of a combination of gases

B. Each gas has its own weight (vapor density)

C. Vapor density

   1. A vapor density of less than one is lighter than air

   2. A vapor density of more than one is heavier than air

D. Gases will tend to seek their own level within a space or “Stratify” based upon vapor density

E. Relying heavily on a suspected gas to be “lighter” or “heavier” than air to determine its location within a space can be a fatal mistake

   1. Gases can be found at any location within a confined space

SUMMARY:

Atmospheric monitoring is one of the most important functions performed at a confined space incident. Initially it will give you an indication of the level of hazards that you are dealing with. From this, you can make an informed decision on the level of protection and hazard control needed.

There are a variety of monitors on the market today. Generally, a three or four gas atmospheric monitor that measures for oxygen level, flammable or combustible vapors, and toxics is sufficient. Remember though, monitors have sensors for certain hazards and exposing them to other chemicals or hazards can damage them. Sensors also have a certain service life and need to be periodically replaced.

When monitoring a space, remember to check all the levels of the space and the area where work is being done.

EVALUATION:

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

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	6: Hazard Control
TIME FRAME:	1:00
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., §5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this module, individuals will demonstrate the most common methods used to control hazards in confined spaces. These methods include the use of ventilation techniques and isolation techniques.
Enabling Learning Objective:	1. Describe the equipment used to ventilate confined spaces 2. Describe the method used to ventilate a confined space with one portal 3. Describe the method used to ventilate a confined space with more than one portal 4. Describe how vapor density affects a ventilation plan 5. Describe common ventilation problems and ways to avoid these problems 6. Describe common ways to lockout/tagout/blockout electrical equipment 7. Describe common ways to lockout/tagout/blockout plumbing or piping systems 8. Describe the methods used to prevent ignition within a confined space 9. Describe claustrophobia and the methods used to control its affects 10. Describe the signs and symptoms of the three types of heat illnesses
Standard:	With a minimum 80% accuracy according to the information contained in • Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

MATERIALS NEEDED:	• Writing board/pad with markers/erasers

- Appropriate audiovisual equipment
- Appropriate audiovisual materials

Practical Exercise: None

Method of Instruction: Facilitated format in a classroom environment

Instructor/Student Ratio: 1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION:

Once you have determined what hazards exist in a confined space, the next step is to control or eliminate these hazards. Controlling or mitigating confined space hazards is essential to ensure as safe an entry as possible into a confined space for work or rescue.

The two primary ways to control hazards is by ventilation and a lock out/tag out program. Ventilation controls atmospheric hazards while a lock out/tag out program eliminates physical hazards.

PRESENTATION	APPLICATION

PPT 6-1

I. VENTILATION

A. The most effective method to control/eliminate atmospheric hazards

PPT 6-2

B. Ventilation can produce the following results
   1. Increase oxygen in oxygen deficient atmospheres
   2. Reduce the risk of explosion
   3. Increase victim survival profile
   4. Reduce/eliminate toxic substances in the space
   5. Positive pressure ventilator cools space

C. Type of ventilation used is determined by the
   1. Configuration of the space
   2. Type of product you are dealing with
   3. The number and type of ventilators you have

D. Types of ventilation
   1. Natural ventilation
      a) Slow process
      b) Not generally useful in rescue situations
   2. Mechanical
      a) Positive pressure ventilation (supply ventilation)
         1) Air forced in diffuses contaminates
         2) Increases oxygen in space
         3) Can create new hazards by agitating contaminates in the space or by bringing a flammable atmosphere into its explosive range
      b) Exhaust ventilation
         1) Draws contaminates out of the space
         2) Can control the direction of the exhaust

PRESENTATION	APPLICATION

3) Can draw more contaminates into the space from other connecting areas
4) Can contaminate ventilation equipment
5) Use caution where contamination is exhausted

c) Combination ventilation

1) One blower to supply air and one to exhaust it
2) Increased efficiency

3. Local exhaust

a) Ventilation placed close to the source of contamination
b) Pulls contaminates out before they spread
c) Useful in diffusing flammables from a fixed source

PPT 6-3

II. TYPES OF VENTILATION DEVICES

A. Ventilators come in many different configurations

B. Three basic types

1. Centrifugal flow

a) Draws air in parallel to the shaft
b) Discharge perpendicular to the shaft

2. Axial Flow

a) Air intake and discharge is along the path of the shaft

3. Air or steam powered ejector

a) Work well in hot or explosive environment and environments with heavy contaminates
b) Requires large amounts of air or stream
c) Oil needs to be filtered out if used for supply ventilation
d) Can be a source of static electricity

PRESENTATION	APPLICATION

III. DUCT WORK

A. Flexible, noncollapsible hose
   1. Can be used on either side of the fan

B. Collapsible hose
   1. Can only be used on the discharge side of the fan

C. Keep duct work as short and straight as possible
   1. Longer hose or multiple bends will result in a lower CFM

D. Saddle vents
   1. Maximizes entry space with minimal flow restriction

IV. VENTILATION CONSIDERATIONS

A. Volume of air to be moved
   1. Ventilators are rated by how many cubic feet of air per minute they discharge

PPT 6-4

   2. Calculate the size of the space to be ventilated and the time needed to ventilate
      a) Width X Height X Depth = Cubic Feet
      b) Divide the size of the space by the CFM of the ventilator to determine how long it will take to complete one air exchange
         1) Round up the volume of the space
         2) Round down on the CFM of the ventilator
         3) Round up the time to ventilate
            - To give a buffer zone
         4) Recommend 7 complete air exchanges before retesting atmosphere

B. Type of atmosphere
   1. Flammable
   2. Toxic

PRESENTATION	APPLICATION

C. Access to the space

D. Power requirements

   1. Gasoline

      a) Not recommended because of carbon monoxide fumes from the exhaust

   2. Electric

      a) Consider Class I, Division I, Group B rated equipment

   3. Pneumatic

   4. Hydraulic

      a) Both hydraulic fluid and water powered

E. Shape of the space

   1. May need to consider use of ducting to adequately ventilate

F. Location of fresh air

   1. Governs amount of duct work needed

   2. Keep ventilator intake away from vehicle exhaust or other contaminates

G. Length of time ventilation is needed

   1. Duration of entry if hazardous atmosphere exists or potential to exist

V. DUCT VENTILATED TECHNIQUES

A. Problems

   1. Recirculation

      a) Recirculation of contaminated exhausted air back in to space

      b) Keep ventilator intake at least five feet away and upwind from confined space entry portal

   2. Short circuiting

      a) Air is exhausted prior to ventilating the entire space

      b) Extend duct work further into space

      c) Use alternate exhaust port

PRESENTATION	APPLICATION

3. Chimney effect
    a) Caused by duct work hanging vertically in the space
    b) Direct duct towards wall or corner of space

VI. SPECIFIC VENTILATION PROCEDURES

A. Oxygen deficiency
1. Openings at either end of a long space
    a) Supply/positive pressure ventilation at one end
    b) Recirculation not a problem since exhaust air is exiting through the other end
2. Spaces with one opening
    a) Placement of fan must allow for exhaust air
    b) Consider recirculation
        1) Use ducting if available
    c) Select a fan powerful enough to ventilate space
3. Deep confined space
    a) Make sure air is reaching all areas of the space
    b) Must have high velocity fan to reach deep spaces

B. Flammable or toxic contaminates
4. Exhaust ventilation preferred method for removing contaminates
    a) Make sure air is exhausted away from opening
    b) Make sure flammable vapors are not directed toward ignition source
5. Heavier than air
6. Lighter than air
7. Single point of origin

PRESENTATION	APPLICATION

a) Keep intake hose close to the source of contamination

b) Reduces likelihood of creating an atmosphere within explosive range of contaminate

c) Removes the contaminate before it is dispersed throughout the space

8. Spaces with unusual shapes and different proportions

a) May require a combination of supply and exhaust ventilation

9. Local supply ventilation

a) Provides fresh air immediately around the victim

C. Non duct ventilation techniques

1. Utilizes electric “Box” fans typically found in the fire service

2. Can be used for both supply and exhaust ventilation

3. If the space to be ventilated has a separate exhaust point, place the blower back far enough so cone of air seals the entire opening

a) Blowers can be used in tandem to increase velocity or cover a larger opening

4. With a single opening move blower close enough to partially cover the opening to allow for exhaust

5. To protect against recirculation place a second blower at 90 degree angle to push exhausted atmosphere away from the entrance

a) Keep the second blower far enough away that the cone of air will not disrupt the air flow from the first blower

D. Important safety considerations when ventilating

1. Fans are compatible with the environment

a) Intrinsically safe

PRESENTATION	APPLICATION

b) Explosion proof

2. Vehicles and generators positioned downwind away from opening
3. Begin ventilation far enough in advance to allow sufficient number of air exchanges
4. Only ventilate with air

   a) Never oxygen

5. Secure a second power supply to ensure continuous ventilation should the original power be lost
6. Continually monitor the atmosphere
7. Use "TELLTALE" to monitor air flow

Note: The term "TELLTALE" refers to an indicator flag that shows air movement.

   a) Especially in noisy environments

8. Place ventilator on surface free of debris

   a) Prevents foreign material from being pulled into ventilator

PPT 6-5

VII. HAZARDOUS ENERGY

A. FED-OSHA states that failure to control these hazards results in

   1. 10% of the serious industrial accidents
   2. 28,000 lost work days per year
   3. Approximately 120 deaths per year

B. Hazardous energy comes in many forms

   1. Electrical
   2. Pressure

      a) Pneumatic

      b) Hydraulic

      c) Steam

   3. Momentum/gravity
   4. Residual/stored

PRESENTATION	APPLICATION
	PPT 6-6

VIII. LOCK OUT/TAG OUT

A. The purpose of a lock out/tag out program is to place any electrical, mechanical or other hazardous energy system in a zero mechanical state

B. This is accomplished by turning off the equipment and locking out energy source with a special lock

C. Once the equipment is locked out a tag is placed on the equipment advising not to turn the system back on

  1. The key shall remain with person who locked it or their designee

D. A variety of locks and locking devices are found in a special lock out/tag out kit

E. If the equipment cannot be locked, a person should be stationed next to the switch to prevent unauthorized reenergization

  1. Dedicated position

F. In liquid or gas distribution systems, isolation is accomplished by

  1. Blanks/Blinds
  2. Double block and bleed

PPT 6-7

Note: No longer an industry standard due to valve failure.

G. Considerations

  1. Stored energy may still be present

IX. IGNITION PREVENTION

A. All equipment taken into a confined space should be considered a potential ignition source

B. Electrical devices are tested to standards developed by

  1. Underwriters Laboratory (UL)
  2. Factory Mutual (FM)
  3. American National Standards Institute (ANSI)
  4. National Fire Protection Association (NFPA)

C. Electrical devices certified under one of these agencies

PRESENTATION	APPLICATION

have permanently affixed plate showing

1. A location of the laboratory
2. Class, Division, and Group device was tested against

D. Device that is certified, used, maintained and serviced according to the manufacturer will not contribute to ignition

E. The device is certified for the specific atmosphere that it was tested

Note: Isolating confined spaces can be a complex process that must be performed by trained personnel. Offsite rescue teams should find a knowledgeable person to brief them on isolation procedures.

X. METHODS USED TO MAKE DEVICES SAFE

A. Explosive proof

1. Ignition source is encased in rigidly built container
2. Any arc or explosion is contained within the container
3. Any flames or hot gases are cooled prior to exiting the container

B. Intrinsically safe

1. Instrument's operational current and voltage is below the energy level for ignition for flammable atmospheres
2. Components are encased in a solid insulated material
3. Defined by National Electric Code as "incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignited concentration"
4. Indiscriminate release of energy may cause uncontrolled event
5. Address potential back-up systems

PRESENTATION	APPLICATION

C. Utilize facility experts to assist in lock out/tag out

PPT 6-8

XI. CLAUSTROPHOBIA

A. Signs of reacting to stress
   1. Elevated pulse
   2. Increased respirations
   3. Sweating
   4. Cold, clammy palms

B. There are ways to control the anxiety felt
   1. Expect, allow and accept that fear will rise
      a) Don't fight it
      b) Know it will be present and be prepared for it
   2. Methods for controlling claustrophobia
      a) Take one step at a time
      b) Create a goal
      c) Communicate with attendant
      d) Focus your attention on the rescue
         1) Focus on moving from point A to B and accomplishing the goal
      e) Label any fear response 1 – 10
         1) Monitor your fear level
      f) Learn to function with a level of fear and appreciate the achievement
         1) Controlled fear is self preserving
      g) Allow and accept that fear will reappear

XII. MEDICAL MONITORING

A. Important factor in preventing medical emergencies
   1. Often overlooked

B. Baseline should be established

C. Body temperature can affect the rescuers ability to be effective

D. Heat stress/fatigue

PRESENTATION	APPLICATION

1. Confusion – poor judgment
2. Chills
3. Weakness – loss of motor control
4. Temperature between 99.5°F – 101.3°F

E. Heat exhaustion
1. Decreased level of consciousness
2. Pale, cool sweaty skin
3. Nausea, vomiting
4. Weak rapid pulse
5. Temperature between 101°.3F – 105.0°

F. Heat stroke
1. True medical emergency
2. Rapid Pulse
3. Rapid, shallow breathing
4. May have hot dry skin
5. Temperatures greater than 105°F

XIII. STANDARD FOR MEDICAL MONITORING

A. Remove from work any person manifesting any of the following signs
1. Temperature greater than 100°F
2. Heart rate greater than 85% of maximum heart rate
   a) Maximum heart rate = 220 – age
3. Heart recovery rate = 1 minute rate – 3 minute rate
   a) Heart recovery rate is less than 10 beats
4. Congestion, wheezes or other respiratory difficulties

B. Person exhibiting any of these signs should not return to work unless cleared by a medically qualified authority

Note: Remember, avoidance only reinforces the phobia.

PRESENTATION	APPLICATION
Failure to confront your fear will increase to your stress level 10 fold at future events. Trust your team, equipment and yourself.	

SUMMARY:

Proper hazard control means placing equipment involved in an incident in a zero mechanical state. This is done through a lock out/tag out program. Electrical equipment is locked out using locks on the control boxes. On other devices, like piping or hydraulic and pneumatic systems, it can be more complex. Equipment operators or facility maintenance workers should be consulted for proper steps to take.

Another hazard control to consider is that of ventilation. Ventilation can provide the victim with additional clean air to breath, as well as reduce the temperature inside the space. This aids in reducing heat related problems. The type of space, nature of the hazard involved, and the type of ventilators available need to determine an effective ventilation plan. In general though, it is better to positive pressure ventilate a confined space than exhaust ventilate it.

EVALUATION:

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

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC: 7: Personal Protective Equipment

TIME FRAME: 0:45

LEVEL OF INSTRUCTION: Level I

AUTHORITY:

- Title 8 CCR, G.I.S.O., §5157 &NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a written test

Terminal Learning Objective: At the conclusion of this chapter, individuals will describe the personal protective equipment necessary to enter and safely work in confined spaces, the differences between self contained breathing apparatus and supplied air respiratory equipment, air purifying respirators and why they are generally not accepted for rescue work, and the different types of communication systems.

Enabling Learning Objective:

1. Describe the physical protection required to safely enter, work, and rescue a victim from a confined space
2. Describe the four levels of chemical protective equipment
3. Describe Self Contained Breathing Apparatus (SCBA) used for confined space entry and rescue
4. Describe Supplied Air Respirators (SAR), with Escape Cylinders, used for confined space entry and rescue
5. Describe Air Purifying Respirators (APR), their advantages and disadvantages when used for confined space rescue
6. Describe respiratory protection factors and how they are used to determine respiratory protection levels
7. Describe the elements of a respiratory protection program required by the California Code of Regulations, Title 8, Section 5144, Respiratory Protection

Standard: With a minimum 80% accuracy according to the information contained in

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7

MATERIALS NEEDED:

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

Practical Exercise: None

Method of Instruction: Facilitated format in a classroom environment

Instructor/Student Ratio: 1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7
- Title 8 CCR, G.I.S.O., §5144

PREPARATION: One of the most important aspects of entry into a confined space is the protection and survivability of the rescue team. The level of rescuer personal protection is dependent on the type of space being entered, the duration of the entry, hazardous products, and atmospheric conditions inside the space. Generally, structural fire fighting turnout clothing is too bulky and increases the risk of heat stress to the rescuer.

PRESENTATION	APPLICATION
	PPT 7-1
I. PERSONAL PROTECTIVE EQUIPMENT	
	PPT 7-2

A. Helmet
   1. Generally a small, durable helmet with a small brim, which meets ANSI specifications
   2. Structural fire fighting helmets are not recommended because of size and weight limitations, and the large brim

B. Flash protection
   1. Lightweight
   2. Flame resistant jumpsuit or brush gear
      a) Examples of flame resistant material
         1) Nomex, PBI, etc.

C. Hood
   1. Flame resistant for added flash protection of the head
      a) Examples of flame resistant materials
         1) Nomex, PBI, etc.

D. Boots
   1. Good pair of leather safety boots with a steel toe, steel shank and high ankle support

E. Gloves
   1. Lightweight leather or flame resistant

F. Ear and eye protection

G. Knee and elbow pads

PPT 7-3

H. Personal audible locator (PAL)
   1. For each person making entry, as required

I. Respiratory protection
   1. For each person making entry

J. Atmospheric monitoring instrument
   1. Consider minimum of one instrument for each entry team

PRESENTATION	APPLICATION
K. Lighting 1. Explosion proof or intrinsically safe and rated for the type of atmosphere being entered 2. Primary and back-up lighting equipment should be required for each rescuer a) Examples 1) Headlamp, flashlight, chemical light stick L. Communications system 1. Portable radios, hardwire, sound powered, or acoustic system 2. Explosion proof or intrinsically safe and rated for the type of atmosphere being entered	
II. LEVELS OF CHEMICAL PROTECTIVE CLOTHING A. Level “A” 1. Self-contained breathing apparatus (SCBA) 2. Fully-encapsulating, vapor proof chemical resistant suit 3. Inner chemically resistant gloves 4. Outer chemically resistant gloves 5. Chemically resistant boots with steel toe and shank 6. Two-way radio communication B. Level “B” 1. SCBA 2. Chemical resistant clothing 3. Inner chemically resistant gloves 4. Outer chemically resistant gloves 5. Chemically resistant boots with steel toe and shank 6. Two-way radio communication C. Level ”C” 1. Full face air purifying respirator (APR) 2. Chemical resistant clothing	PPT 7-4

PRESENTATION	APPLICATION
3. Inner chemically resistant gloves 4. Outer chemically resistant gloves 5. Chemically resistant boots with steel toe and shank D. Level "D" 1. Structural fire fighting turnout clothing 2. No respiratory protection 3. Should not be worn in areas where in areas where respiratory or skin hazards exist	
	PPT 7-5
III. RESPIRATORY PROTECTION A. Atmospheric hazards are responsible for 65 percent of the deaths that occur in confined spaces B. Identifying hazardous atmospheres and wearing appropriate respiratory protection allows rescuers to enter confined spaces safely C. Personnel who wear respiratory protection are required to comply with Title 8, California Code of Regulations, §5144, Respiratory Protection	
	PPT 7-6
IV. SELF CONTAINED BREATHING APPARATUS A. Typical air supply is 30 minutes to 60 minutes B. Big and bulky, presents a large rescuer profile that may restrict rescuer movement in a confined space C. Air cylinder on the back makes it difficult for the rescuer to enter through small diameter openings D. Rescuer operational time in the confined space needs to be monitored closely when using SCBA E. Some SCBA's connected to a supplied air system F. Positive pressure SCBA systems should always be used for rescue work	
	PPT 7-7
V. SUPPLIED AIR RESPIRATOR (SAR) WITH ESCAPE CYLINDER A. Respirator connected to a remote air source B. NIOSH requirements limit airline length to 300 feet from	

PRESENTATION	APPLICATION

regulated air source to rescuer

C. Typical air supply is 30 to 60 minutes per cylinder

D. Escape cylinders must be worn with SAR when entering an IDLH atmosphere

E. An Air Supply Officer supervisor must monitor the air supply and change cylinders when necessary to allow longer working times

F. Escape cylinders are available in a variety of sizes

1. Typically 5, 10 or 15 minutes

PPT 7-8

VI. AIR PURIFYING RESPIRATORS (APR)

A. Air is inhaled through filters or cartridges that filter chemical contaminant

B. Filters and cartridges are available for a variety of dusts, vapors and mists

1. The atmospheric hazard must be identified and the proper filter/cartridge selected

C. Cartridges have service life and must be replaced periodically

1. Cartridges can become saturated quickly in atmospheres with high contaminant concentrations

D. APR’s only filter contaminates from the atmosphere

1. Do not use APR’s in IDLH atmospheres
2. Do not use in atmospheres containing less than 19.5 percent oxygen

E. Hazardous atmospheres must be monitored continuously when using APR’s

F. Not recommended for use in confined space rescue work because of limitations

PPT 7-9

VII. RESPIRATOR PROTECTION FACTOR

A. Respirators are rated by the protection they provide

B. Protection factor number is the ratio of contamination concentration outside the face piece to the contamination concentration inside the face piece

PRESENTATION	APPLICATION
C. ANSI recommends that SCBA have a protection factor of 10,000	
D. Personnel who wear respiratory protective devices must be fit tested for the specific type of respiratory protection being used	
VIII. TITLE 8, CALIFORNIA CODE OF REGULATIONS (CCR), §5144, RESPIRATORY PROTECTION REQUIREMENTS	PPT 7-10
A. Employers are required to establish a written Respiratory Protection Program when employees are required to wear respiratory protection at work	
B. Required elements of a written Respiratory Protection Program	
1. Respirator selection	
2. Medical evaluation	
3. Fit testing	
4. Use of respirators	
5. Maintenance and care of respirators	
6. Breathing air quality (Grade D) must be used when SCBA's are used	
7. Training and information	
8. Program evaluation	
IX. SUMMARY	PPT 7-11

SUMMARY:

A confined space rescue operation is one of the most dangerous types of rescue situations firefighters may be called upon to mitigate. By having the proper equipment and training, fire-fighters are more likely to accomplish a confined space rescue safely and efficiently.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	8: Phases of Confined Space Rescue
TIME FRAME:	0:30
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter, the student will describe the order and phases of confined space rescue.
Enabling Learning Objective:	1. Describe Phase I, Preparation; including rescue team evaluation, equipment evaluation, personnel evaluation, preplan hazard analysis and incident management 2. Describe Phase II, Assessment; including approach assessment and resource assessment 3. Describe Phase III, Pre-Entry Operations; including survival profile of the victim, improving survival profile of the victim, site safety, hazard control and pre-entry briefing 4. Describe Phase VI, Entry and Rescue Operations; including Rescue Group Supervisor, Attendant, Entrant and Back-up Entrant, other team positions, entry and extrication 5. Describe Phase V, Termination; including accountability of personnel, retrieval of equipment, critique and documentation
Standard:	With a minimum 80% accuracy according to the information contained in • Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 8
MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of Instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 8

PREPARATION:

Up to this point we have identified the regulations pertaining to working in confined spaces, the associated hazards, hazard mitigation techniques and equipment required. Once we have this knowledge, we can start to enter confined spaces to train and perform rescue. This lesson plan reviews the five phases of rescue and the components of each phase. The incident command system is covered in detail and includes positions unique to confined space incidents.

PRESENTATION	APPLICATION
	PPT 8-1
I. PHASES OF CONFINED SPACE RESCUE	
	PPT 8-2
A. Five Phases	
1. Phase I: Preparation	
2. Phase II: Assessment	
3. Phase III: Pre-Entry Operations	
4. Phase IV: Entry and Rescue Operations	
5. Phase V: Termination	
	PPT 8-3
II. PHASE 1: PREPARATION	
A. Steps involved	
1. Rescue team evaluation	
2. Equipment evaluation	
3. Pre-planning (Hazard analysis)	
4. Personnel evaluation	
5. Incident Management	
III. RESCUE TEAM EVALUATION	
A. Does the team understand and conform to CAL-OSHA and NFPA standards?	
B. Does the team have enough personnel?	
C. Does the team have enough equipment?	
IV. EQUIPMENT EVALUATION	
A. Minimum equipment to perform rescue	
1. Respiratory protection	
a) SCBA or SAR	
b) One for each member of the entry team and back-up team	
c) One for the victim (optional)	
2. Cascade air system or extra air bottles	
3. Ventilation equipment	
4. Atmospheric monitors	
5. Lock out/Tag out kit	

PRESENTATION	APPLICATION
6. Personal protective equipment 7. Explosion proof lighting 8. Communication system 9. Rope, harnesses, hardware 10. Patient packaging and removal equipment 11. Fall protection / Removal equipment a) Tripod b) Davit mount c) Cable winch 12. Personnel accountability system 13. Tactical worksheets	PPT 8-4
V. PRE-PLANNING (HAZARD ANALYSIS) A. Pre-plan to identify potential rescue sites 1. Locations that routinely perform confined space entry 2. Special projects that involve confined spaces 3. High hazard potential areas like water or sewage treatment facilities B. Contact site representatives and determine 1. Special hazards 2. Chemical processes 3. Location, access, air supply problems	
VI. PERSONNEL EVALUATION	OH – How do we evaluate our personnel to determine if they are suitable for a confined space entry?
A. Need to evaluate personnel to determine if they are suitable for this work B. Rescue personnel need to have the same knowledge as the work entry personnel and be trained in rescue operations C. Evaluation can bring to light problems with	

PRESENTATION	APPLICATION
claustrophobia	PPT 8-5

VII. INCIDENT MANAGEMENT

A. The Incident Command System (ICS) is the framework for managing any incident

B. Prior training in ICS is important so everybody knows where they fit into the system

C. ICS covers all phases of the rescue operations

D. Small incidents can be managed by one person wearing all the hats

E. The ICS expands as the incident grows to maintain an efficient span of control

F. Incidents that have more than one agency responsible are managed by Unified Command

G. Positions that may need to be filled on a large scale incident include

1. Incident Commander
2. Command Staff
    a) Safety Officer
    b) Information Officer
    c) Liaison Officer
3. Section Chiefs
    a) Planning
    b) Finance
    c) Logistics
    d) Operations

H. Under Operations Chief you find

1. Rescue Group Supervisor
2. Attendant
3. Ventilation
4. Entry Team
5. Back-up Team
6. Rigging Team
7. Decon

PRESENTATION	APPLICATION

8. Medical Group

PPT 8-6

VIII. PHASE 2: ASSESSMENT

A. Assessment is the first operational phase of a confined space rescue
B. Managing this incident requires that the ICS frame work be in place as soon as possible
C. Assessment is divided into 2 Phases
   1. Approach Assessment
   2. Resource Assessment

IX. APPROACH ASSESSMENT

A. Review any pre-plans while responding
B. At scene determine
   1. What is the problem
      a) Number of victims
      b) Point last seen
   2. What type of space is it?
   3. What is the space used for?
   4. What product is being stored in this area?
      a) What are the hazards of this product?
      b) Is there a viscous or heated material?
      c) What residue is possible?
      d) Is there an engulfment potential?
   5. Are there any other hazards?
      a) Electrical?
      b) Mechanical?
      c) Stored energy?
      d) Biological?
   6. Where are the entry and exit points?
   7. Evaluate the survivability profile (rescue vs. body recovery)

X. RESOURCES ASSESSMENT

A. Evaluate information received during approach assessment

PRESENTATION	APPLICATION
B. Develop initial plan C. Evaluate on-site resources and those still responding to determine if additional resources are needed D. Request additional resources immediately	PPT 8-7
XI. DOCUMENTATION A. Before entering a “permit-required” confined space it is necessary to document that all necessary measures to make the space safe have been completed	OH – How do we make the space safe?
B. This documentation is made on a “Permit” C. The permit is endorsed by the Entry Supervisor and posted at the entry portal or otherwise made available for entrants to see D. The duration of the permit must not exceed the time required to complete the job E. There is no established format for a permit, but a permit must contain the following minimum information 1. The space to be entered 2. The purpose for entry 3. Date and duration of the permit 4. Names of authorized persons involved a) Entrant(s) b) Attendant(s) c) Entry Supervisor 5. List of hazards and acceptable entry conditions 6. List of hazard controls necessary before any entry 7. Special protective equipment and tools required 8. Atmospheric test readings 9. Who the rescue service is and how to contact them 10. Communications procedures to be used	

PRESENTATION	APPLICATION
11. Any other pertinent information specific to entry 12. Other permits necessary for the authorized work a) Hot work b) Safe work permit F. The permit shall be cancelled by the supervisor when: 1. The entry operations have been completed 2. A condition not covered by the permit occurs	
	OH – What is an example of a condition that would cause the permit to be cancelled?
G. Permits must be retained for at least 1 year to facilitate the review of the permit space program H. Any problems encountered during an entry operation shall be noted on the pertinent permit	
	PPT 8-8
XII. PHASE 3: PRE-ENTRY OPERATIONS A. Preparation is made for entry into the space B. Evaluate the information gathered in the assessment phase to determine the tasks that will need to be done C. Control the hazards 1. Make the general area safe 2. Make the rescue area safe **XIII. MAKING THE GENERAL AREA SAFE** A. Establish perimeter 1. Exclusion Zone (Hot zone) a) Restricted to key personnel only 2. Contamination Reduction Zone (Warm zone) a) May not have if no decontamination is needed 3. Support Zone (Cold zone) a) Scene support B. Establish ventilation	

PRESENTATION	APPLICATION
C. Assign entry and egress points D. Eliminate ignition sources	
	PPT 8-9
XIV. MAKING RESCUE AREA SAFE A. Assign personnel to all the needed positions B. Lock out/ tag out/ block out procedures C. Ventilate the space D. Establish a personnel accountability tracking system E. Establish communication plan F. Provide for entry support 1. Pre-entry medical screening 2. Fluid hydration	
	PPT 8-10
XV. PRE-ENTRY BRIEFING A. Prior to entering a confined space the rescue team needs to be briefed on the following 1. Rescue objective 2. Emergency procedures in the event of a problem 3. Rescue team chain of command 4. Time limits 5. Hazards in the space 6. Signs and symptoms of exposure to hazards B. Once the hazards have been controlled and the briefing given the entry supervisor shall endorse the completed permit, authorizing entry	
	PPT 8-11
XVI. PHASE 4: ENTRY AND RESCUE OPERATIONS A. Entry and rescue operations include 1. Placement of teams 2. Reconnaissance 3. Location of victims 4. Removal of victims 5. Removal of entry personnel	

PRESENTATION	APPLICATION
B. No entry shall begin until all the pre-entry requirements have been fulfilled	
XVII. DUTIES OF THE RESCUE GROUP SUPERVISOR	
A. Rescue group supervisor reports to the IC (or Ops Section Chief if created)	
B. Coordinates all aspects of	
1. Entry	
2. Extrication	
3. Removal of victims	
4. Removal of entry personnel	
	PPT 8-12
XVIII. DUTIES OF THE ATTENDANT	
A. Attendant reports to the Rescue Group Supervisor	
B. Continually monitors the atmosphere and records readings on permit or tactical worksheet	
1. Evaluate readings to determine adequate ventilation	
C. Maintains log of entry teams and the time entered and exited the space	
D. Communicates the progress and needs of the Entry Team to the Rescue Group Supervisor	
E. Primary duty is to communicate with and maintain safety of entrants	
	PPT 8-13
XIX. ENTRY TEAM DUTIES	
A. Work as a team and communicate actions	
B. Communicate with Attendant	
C. Manages air-lines and assist with their movement	
D. Use tag lines to mark forward progress	
E. Be aware of hazards	
1. Elevation	
2. Unstable footing	
3. Machinery	
4. Electrical hazards	

PRESENTATION	APPLICATION
5. Engulfment hazards	
F. Accomplish primary task	
G. Brief other teams going in to complete tasks you have started	
1. Location and status of victims	
2. Specific hazards	
3. Work you have completed	
4. Update on configuration of the space	
H. Once the victim has been located	
1. Coordinate movement with Rigging Team	
2. Immobilize C-Spine, if required	
3. Decide on extrication techniques	
4. Assist in moving the victim through small openings	
a) Try to avoid being blocked in by the victim	
	PPT 8-14
XX. DUTIES OF THE BACK-UP TEAM	
A. Safety stand-by team for entry team	
B. Fully prepared for immediate entry	
1. Personal protective equipment	
2. Respiratory protection	
3. Required equipment	
C. Normally not involved in other support functions	
D. Replaced by additional back-up personnel if they enter the space	
	PPT 8-15
XXI. RIGGING TEAM	
A. Report to the Rescue Group Supervisor and obtain a briefing	
B. Determine the entry and retrieval system to be used	
1. Rope and pulley system	
2. Winch system	
3. High point anchor system	
C. Provide equipment to the entry team	

PRESENTATION	APPLICATION
D. Operate the entry and retrieval systems	
E. Coordinate activities with the attendant	
	PPT 8-16
XXII. OTHER POSITIONS	
A. Safety Officer	
B. Medical group	
1. Medical personnel staged to receive patient	
2. Be ready to provide medical support to rescue personnel	
3. Provide medical monitoring when entry team exits the space	
4. Provide fluid hydration	
5. Transfer victim information to EMS personnel	
a) Location	
b) Surroundings	
c) Condition when found	
d) Present condition	
e) Other pertinent information	
C. Decontamination Group	
1. Decontaminate victims, personnel and equipment as necessary	
D. Logistics Chief	
1. Coordinate logistics with IC and the Operations Chief	
E. Air Supply	
1. Monitor air supply	
2. Change bottles as needed	
3. Request re-supply of filled air bottles as needed	
	PPT 8-17
XXIII. PHASE 5: TERMINATION	
A. After victims and entry personnel have exited the space document the exit time	
B. Debrief entry personnel on	

PRESENTATION	APPLICATION
1. Location and position of the victim 2. Surroundings in which the victim was found 3. Specific problems encountered 4. Any additional information for documentation C. Entry personnel to Rehab 1. Post incident monitoring 2. Hydration D. Consider Critical Incident Stress Debriefing for all personnel involved	
	PPT 8-18
E. Take care of equipment needs 1. Inventory all equipment 2. Account for damaged equipment 3. Clean, maintain, log, restock equipment F. Have responsible party secure the space until investigation is complete G. Plan for post incident analysis H. Cancel entry permit and file I. Notify Cal OSHA if a death or serious injury is involved	
	PPT 8-19
XXIV. SUMMARY	

SUMMARY:

Confined space rescues, like all rescues, have a set of phases they will go through. In this lesson we have outlined five separate phases; Preparation, Assessment, Pre-entry Operations, Entry and Rescue Operations, Termination. We can provide safety for our rescue personnel by performing rescues in accordance with these phases. We have also discussed the roles and responsibilities of rescue team members, the confined space rescue group and how each functions within the incident command system.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 8 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC: 9: Rescue Rope and Related Equipment

TIME FRAME: 1:00

LEVEL OF INSTRUCTION: Level I

AUTHORITY:

- Title 8 CCR, G.I.S.O., § 5157 & NFPA 1983 &1006

BEHAVIORAL OBJECTIVE:

Condition: Given a written test

Terminal Learning Objective: At the conclusion of this chapter, individuals will describe their knowledge of rope standards, equipment (to include use, inspection and care), knots, anchors, system safety factors and basic theoretical mechanical advantage.

Enabling Learning Objective:

1. Describe the standards and regulations that pertain to confined space rescue.
2. Describe the SI system and key terms used.
3. Describe the rope rescue equipment that may be used during a confined space rescue.
4. Describe a static system safety factor and what it means.
5. Demonstrate the ability to correctly tie the knots used in a confined space rescue.
6. Demonstrate the correct way to operate the Tandem Prusik Belay.
7. Demonstrate the ability to correctly assemble and operate simple, compound and complex mechanical advantage systems.

Standard: With a minimum 80% accuracy according to the information contained in

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

MATERIALS NEEDED:

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

Practical Exercise: None

Method of Instruction: Facilitated format in a classroom environment

Instructor/Student Ratio: 1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9
- NFPA 1983: Standard on Line Safety Rope and Equipment for Emergency Services, 2006 ed.

PREPARATION:

Rescue rope and its related equipment will be used in some form at almost every confined space rescue. Knowing the capabilities and limitations of this equipment, how to tie various knots, and how to combine equipment to build systems will increase the speed and safety in which a rescue is performed. If however, the equipment is used incorrectly, the victim as well as the rescuers can be quickly injured or killed.

PRESENTATION	APPLICATION
	PPT 9-1
I. STANDARDS AND REGULATIONS	PPT 9-2

A. Rescue equipment standards come from several sources
   1. National Fire Protection Association (NFPA)
      a) Consensus Standards
      b) Voluntary compliance, except when referenced by OSHA
   2. ASTM International
      a) Consensus Standards
      b) Voluntary compliance
      c) Currently have several rescue related standards
   3. American National Standards Institute (ANSI)
      a) Private sector standards coordinating center
      b) Consensus standards
      c) Voluntary compliance except when referenced by OSHA in the regulation
   4. Occupational Safety and Health Administration (OSHA)
      a) Federal Law
      b) Mandatory compliance unless superseded by state law
      c) No specific rope rescue regulations
   5. California Department of Industrial Relations / Division of Occupational Safety and Health (CAL/ OSHA)
      a) State Agency
      b) Mandatory Compliance
      c) Must meet of exceed federal regulations
      d) No regulation on rope rescue

II. METRIC SYSTEM

A. The Metric System is called SI in all languages

PRESENTATION	APPLICATION

B. Standard measurement in identification of rescue equipment

C. Advantage of SI is that there is only one unit for each physical quantity:
   1. Meter for Length
   2. Kilogram for Mass
   3. Second for Time
   4. Newton for Force

D. Definitions related to strength ratings
   1. Weight
      a) Weight is a force
      b) It is the product of a body's mass multiplied by acceleration due to gravity and is expressed in Newtons
   2. Newton
      a) Metric unit for force
      b) Force that accelerates a 1 kg mass to 1 m/s^2
      c) Expressed as N
   3. Pound/force
      a) US value for force
      b) Expressed as lbf
   4. Mass
      a) Amount of matter of a physical body
      b) Measure of a body's resistance to acceleration
      c) Measured in kilograms
   5. Kilogram
      a) Metric value for mass
      b) Equal to 1000 grams or 2.2 pounds
      c) Expressed as kg
   6. Pound
      a) US value for mass
      b) Expressed as lb

PRESENTATION	APPLICATION
7. Kilo Newton	
a) 1,000 Newtons	
b) Appx. 220 lbs	
c) Expressed as kN	
8. Acceleration of gravity	
a) Varies over the earth	
b) Between 9.77 and 9.83 meters per second squared (m/s^2)	
c) Round to 10 for easy math	
9. 100 kg (mass) x 10 (acceleration of gravity) = 1,000 Newtons or 1 kN	
10. 1 kN = 220 lbf	
11. Load	
a) Either mass or force depending on use	
III. EQUIPMENT DESCRIPTIONS AND CAPABILITIES	
	PPT 9-3
A. Software	
1. Rope	
2. Webbing	
3. Prusik loop	
4. Anchor strap	
5. Load release strap	
6. Commercial harness	
B. Hardware	
1. Carabiner	
2. Anchor plate	
3. Gibbs ascender	
4. Figure eight plate	
5. Brake bar rack	
6. Edge protector	
7. Pulley	
IV. ROPE	
A. Use	

1. Raise, lower, belay

B. Construction

1. Kernmantle design
   a) Kern (core) is appx. 75% of rope strength
      1) Nylon or polyester
   b) Mantle (sheath) is remainder
   c) Mantle can be nylon or polyester
2. Block creel
3. Shall be constructed of virgin fiber
4. Nylon
   a) Most common
   b) Static and low stretch used for rescue
5. Static – a rope with a maximum elongation of 6% to 10% of its minimum breaking stretch
6. Low stretch – a rope with an elongation greater than 6% and less than 10% at 10% of its minimum breaking strength
7. Polyester
   a) Relatively new
   b) Has a polyester sheath and core
   c) Extremely low stretch, less than 1% at 300 lbs
   d) Referred to as high tenacity polyester (HTP)

C. Specifications (General Use)

1. Strength per NFPA 1983 (2006 ed.)
   a) 40 kN (8,992 lbf) = minimum NFPA rating
   b) 600 pound working load
2. Diameter - 12.5 mm (1/2 inch)

D. Care

1. Rope bag
   a) Rope is stuffed into bag, not coiled, for ease of deployment
      1) Keeps rope clean

PRESENTATION	APPLICATION
2) Protects from ultra violet rays	
2. Wash per manufacturers recommendations, ASTM F-1740	
3. Refer to ASTM F-1740 for inspection	
V. WEBBING	
	PPT 9-4
A. Use	
1. Anchor slings, lashing and constructing a load releasing hitch	
B. Construction	
1. 100% Nylon	
2. Needle loom	
C. Specifications	
1. One inch wide	
2. Strength 17 kN (4,000 lbs)	
3. Length	
a) Green 5’	
b) Yellow 12’	
c) Blue 15’	
d) Orange 20’	
D. Care	
1. Same as rope	
VI. PRUSIK LOOP	
NOTE: NFPA 1983 refers to as a *Rope Grab Device*	
A. Use	
1. Pulling cam	
a) Pulls the rope into motion	
2. Braking cam/ratchet/progress capture device	
a) Allows rope to move in one direction	
B. Construction	
1. Diameter – 8mm cord	
2. Length	
a) When used in tandem prusik belay one 56 inches and one 70 inches	

PRESENTATION	APPLICATION

3. Length dependant on pulley size and type

VII. ANCHOR STRAPS

NOTE: NFPA 1983 refers to as *Portable Anchor Device*

A. Use
   1. Make quick, strong anchors for attaching ropes and systems

B. Construction
   1. Sewn 1 ¾" flat nylon webbing with metal "D" rings on each end

C. Specifications (General Use)
   1. Strength per NFPA 1983 (2006 ed.)
      a) Minimum 45 kN (10,120 lbf) without failure
   2. Length
      a) Can be purchased in various lengths
      b) Also sold in an adjustable configuration

NOTE: Consider the use of "quick links" instead of carabiners to avoid tri-axial loading

VIII. LOAD RELEASE STRAP

NOTE: NFPA 1983 refers to as *Auxiliary Equipment*

A. Use
   1. Used whenever a ratchet or tandem prusiks are placed in a system
   2. Allows a ratchet under tension to be released without removing the load

B. Construction
   1. Flat webbing

C. Strength
   1. Per NFPA 1983 kN (8,093 lbf)

IX. COMMERCIAL HARNESS

A. Made from sewn flat webbing

B. After harness is adjusted, buckles should be tied off using an overhand knot

C. When used for fall protection and confined space work meets OSHA criteria

PRESENTATION	APPLICATION

1. Must be full body harness
2. Must have a point of attachment so that when retrieved, entrant is in smallest possible profile

D. Harnesses are divided into three categories:

1. Class I – Harness that fastens around waist and around thighs, or under buttocks, and designed to be used for emergency escape with a design load of 1.33 kN (300 lbf)
2. Class II – Harness that fastens around waist and around thighs, or under buttocks, and designed for rescue with a design load of 2.67 kN (600 lbf)
3. Class III – Harness that fastens around waist and around thighs, or under buttocks, and over shoulders, and designed for rescue with a design load of 2.67 kN (600 lbf)
   a) Class III harness can consist of one or more parts

X. CARABINERS

NOTE: NFPA refers to as *Auxiliary Equipment*

A. Use

1. Attach hardware to hardware and hardware to software

B. Construction

1. Steel or aluminum
2. Locking, non-locking, or auto locking
   a) Only locking should be used
   b) Oval, "D", or modified (pear)
   c) "D" shape is stronger since the shape causes more of the load to be carried by the spine of the Carabiner
3. Carabiners should not be chained or stacked
   a) Twisting can side load the carabiner

C. Specifications

1. Per NFPA 1983 (2006 ed.)
2. 40 kN (8,992 lbf) when loaded along major axis

PRESENTATION	APPLICATION

with gate closed

3. 11 kN (2,473 lbf) when loaded along major axis with gate open
4. 11 kN (2,473 lbf) when loaded along the minor axis

XI. ANCHOR PLATE

PPT 9-5

NOTE: NFPA refers to as *Auxiliary Equipment*

A. Use
   1. Collection point for attaching different pieces of equipment
   2. Holes allow each piece of equipment to have its own attachment point
   3. Used with the RPM rigging system

B. Construction
   1. Aluminum or steel

C. Specifications
   1. Per manufacturer

XII. MECHANICAL ASCENDERS

NOTE: NFPA refers to as *Auxiliary Equipment*

A. Use
   1. Pulling cam
      a) Pulls the rope into motion
   2. Breaking cam
      a) Stops the rope from moving
      b) Not recommended
   3. Ascender
      a) Ascend up a fixed line

B. Construction
   1. Aluminum or steel
   2. Sleeve
   3. Cam
   4. Pin
   5. Spring loaded – optional

PRESENTATION	APPLICATION

C. Specifications
   1. Per NFPA 1983 (2006 ed.)
   2. Tested in manner of use without damage to device or rope

D. Cautions
   1. Neither Gibbs nor Rock Exotica recommend their products to be used for belay systems
   2. Gibbs new rescue model #3 will begin to damage rope at 3,000 lbs. Other Gibbs models will damage rope at lower loads

XIII. DESCENDERS

NOTE: NFPA 1983 (2006 ed.) refers to as *Descent Control Device*

A. Use
   1. Lower
   2. Rappel

B. Types
   1. Figure eight plate
      a) Aluminum or steel
      b) With or without ears
   2. Brake bar rack
      a) Aluminum, steel, or titanium bars
         1) Aluminum bars
            - More friction
            - Streaking of rope
            - Wears out faster
         2) Steel bars
            - Less friction
            - Faster rappel/lower
            - No streaking of rope
         3) Titanium bars
            - Hightest strength to weight ratio
            - Friction between steel and

PRESENTATION	APPLICATION

aluminum

- High heat dissipation

b) Rack can add and subtract friction during use

c) Rope runs straight through the rack greatly reducing twisting of rope

C. Construction

1. Steel rack

a) Straight or "twisted" eye

D. Specifications

1. Six bar minimum

a) One top bar with training groove, some now include a tie off bar

b) Second bar is 1" with straight slot, known as an "idiot" bar

1) Prevents reeving rack incorrectly

c) Bars 3-6 are 7/8" bars with angled slots

2. 22 kN (4946 lbf) without damage to device or rope

XIV. EDGE PROTECTION

A. Use

1. Protect rope and webbing from abrasion and sharp edges

a) Moving rope should have edge rollers or pulleys

b) Fixed lines can be padded with anything that will soften the bends where a rope goes over an edge

c) Webbing has a larger surface area than rope, so edge protection is especially critical

XV. PULLEYS

A. Use

1. Change the direction of a rope (can become a force multiplier)

2. Provide mechanical advantage

3. Tend prusiks (prusik minding pulley)

B. Construction
   1. Aluminum or steel side plates
   2. Aluminum alloy wheels
   3. Sealed ball bearing or,
      a) Oilite bushing
      b) Needle bearing
   4. Becket (bottom attachment hole)

C. Specifications
   1. Sizes - 2”, 3”, or 4”
   2. ½” diameter rope usage

D. Types
   1. Prusik minding
   2. Rescue
   3. Knot passing

E. Pulley theory
   1. Fixed pulley
   2. Class 1 lever
   3. Fulcrum located at the pin in the center of the sheave
   4. Distance from the pin to where the rope leaves the sheave on the load side is equal to the distance from the pin to where the rope leaves the sheave on the effort side
   5. Two lever arms are equal resulting in 1:1 mechanical advantage

F. Moving pulley
   1. Class 2 lever
   2. Fulcrum is located on the edge of the sheave below the anchor point
   3. One lever arm extends from the fulcrum to the pin
   4. The other extends from the fulcrum to the point the rope leaves the sheave and goes to the effort

PRESENTATION	APPLICATION
5. This lever arm is twice as long as the first resulting in 2:1 mechanical advantage	
G. Specifications	
1. Per NFPA 1983 (2006 ed.)	
2. General use rated at 36 kN (8093 lbf)	
3. Becket rated at 19.5 kN (4383 lbf)	
XVI. STATIC SYSTEM SAFETY FACTOR (SSSF)	
	PPT 9-6
A. Safety factor	
1. Ratio of the breaking strength of an item and the maximum expected load	
B. The strength of the weakest link in a system, divided by the load is the actual Static System Safety Factor	
C. Systems can have different SSSF throughout	
D. To date there is no universal standard for a safety factor	
1. Some mountain rescue teams use a 4:1 SSSF	
2. Some rescue organizations have considered a 10:1 SSSF	
3. NFPA uses a 15:1 safety factor for life safety ropes to have a “G” rating	
a) This 15:1 ratio was never intended for the entire system	
E. Failure of some part of a system can suddenly make a system dynamic	
1. Tests show that dynamic loading greatly increases the loads on a system	
2. Dividing the minimum breaking force by maximum dynamic force determines the Dynamic System Safety Factor	
3. Actual dynamic forces are impossible to predict	
F. Proper management of a rescue system will keep loads at a manageable level	
XVII. OTHER EQUIPMENT CONSIDERATIONS	
A. Marking equipment	
1. Each piece of equipment should be marked	

a) Inventory
b) History

2. Marking may show
   a) Ownership
   b) In-service date
   c) Manufacturer
   d) Rope end
   e) Identification number
3. Write on nylon products with a laundry marking pen
   a) Sanford Rub-a-Dub marking pen
4. Hardware can be marked with tape, paint or permanent marker
   a) Some manufacturers advise against using stamps or electric pencils

B. Equipment inspection

1. Rope - (3 parts, visual, tactile, rope log inspection)
   a) Damage, i.e. hard spots, soft spots, lumps, bumps, abrasions, discoloration, melted or glazed spots and staining
   b) Visually inspect and feel rope for damage
      1) Putting the rope under tension can help feel irregularities
   c) Check rope log for previous entries
2. Webbing
   a) Check the same as rope for irregularities
   b) Check for faded colors from over exposure to the sun
   c) Damage to webbing is less tolerable than damage to rope
      1) Webbing has much larger surface area
3. Carabiners
   a) Inspect

PRESENTATION	APPLICATION

1) Dents/burns
2) Rust
3) Proper gate function
4) Proper lock function

4. Mechanical ascenders
   a) Inspect
      1) Worn cam teeth
      2) Egg shaped hole for pin placement
      3) Cracks around holes for pin placement
      4) Worn cam or chain holding pin and cam sleeve
5. Pulleys
   a) Inspect
      1) Proper movement of side plates and sheave
      2) Egg shaped attachment holes indicate the pulley has been over stressed
      3) Tightness of nuts or bolts holding pulley together
6. Descenders
   a) Inspect
      1) Wear
      2) Cracks
      3) Distortion
      4) Nicks
      5) Sharp spots
      6) If 15% of the material is worn away at any spot, retire the descender

C. Equipment logs
   1. Each piece of rescue equipment should have a log
   2. Log should document
      a) Type of equipment

b) Number

c) Manufacturer

d) Size

e) Model

f) Serial number

g) Color

h) Date placed in-service

i) Every use

j) Who inspected

k) Comments of damage or wear

D. Washing equipment

1. Equipment should be kept clean
2. Wash rope and webbing in a washing machine with a mild soap solution
3. Add a small amount of fabric softener
   a) Replaces lubricant that rope loses during use and washing
4. Hardware should be washed in warm soapy water, rinsed and dried

E. Retiring equipment

1. Retire any equipment with obvious damage
2. Retire equipment without obvious damage if you suspect a problem
3. Permanently mark any retired equipment
4. ASTM F-1740 recommends 10 year shelf life for rope regardless of use

XVIII. KNOTS

A. What makes a good knot

1. Strong - efficient
2. Easy to tie
3. Easy to identify
4. Easy to inspect
   a) To make sure it is tied correctly
5. Easy to untie after loading

PRESENTATION	APPLICATION

6. Easy to learn

B. Knot efficiency

1. Rope strength is based on tests that pull on a straight rope until it breaks
2. Bends in a rope reduce the rope strength
   a) In a bend all of the rope fibers are not being loaded equally
3. Tighter bends weaken a rope more
4. Knots can be rated on the rope strength that remains after the knot is tied
   a) This is known as knot efficiency

C. Rules for knots

1. Always tie clean knots
   a) Easier to inspect
   b) Stronger

XIX. TYPES OF KNOTS

PPT 9-7

A. Overhand knot

1. Used to tie off knots and in making other knots

B. Overhand bend (water knot)

1. Used to tie webbing into loops or webbing together
2. Knot efficiency 64%

C. Half hitch

1. Use to tie off webbing

D. Mariner's knot

1. Load release hitch (LRH) used to attach a ratchet or belay to an anchor

E. Webbing Harness

1. Used to tie a harness for a rescuer or ambulatory victim

F. Double fisherman

1. Used to tie the knot to form a prusik loop

G. Prusik

PRESENTATION	APPLICATION
1. Friction knot	
H. Figure eight	PPT 9-8
1. Used as a stopper knot and the basis for the family of eights	
I. Figure eight bend	
1. Used to tie two rope together	
2. Knot efficiency 81%	
J. Figure eight on a bight	
1. Used to form a loop in a rope	
2. Knot efficiency 80%	
K. Figure eight follow through loop	
1. Used to tie a rope around an anchor	
L. Tensionless hitch	
1. Used to tie a rope to an anchor	
2. Knot efficiency 100%	
XX. ANCHORS	PPT 9-9
A. Anchors	
1. A "bomb proof", stationary, hold fast to which rigging is attached	
B. Anchors must be able to withstand high loads greater than the load that is being lifted/lowered, hauled or stabilized	
C. Type of anchors	
1. Natural anchors	
a) Can be obvious or obscure	
b) Most frequently associated with "wild land" environments, but can also have urban applications	
c) Examples of natural anchors	
1) Trees	
2) Boulders	
3) Brush	

4) Root systems

2. Artificial or manmade anchors
   a) In an urban catastrophe, rescuers must be prepared to locate and/or rig manmade anchors
   b) Examples of artificial or manmade anchors
      1) Pitons
      2) Fire trucks
      3) Pipes
      4) Buildings
      5) Structural components
      6) Deadman

OH - What other improvised anchors could be utilized?

D. Selecting anchors
1. Rescuers must give careful consideration to the selection of any anchor(s) to be used in a rescue system
2. Ideally the rescuer should choose a single bomb proof anchor if at all possible
3. Other considerations include
   a) Purpose of the system
   b) Amount of load
   c) Direction of pull/ loading
   d) Strength of anchor
   e) Mass of anchor
   f) Contour of anchor
   g) Location of anchor

E. Methods of attaching to single point anchors

NOTE: The following anchor attachments are listed in order of priority for use, with the method of attachment causing the least stress on the rope or sling listed first

1. Full strength tie off

PRESENTATION	APPLICATION

a) Rope is wrapped around smooth surface of pipe, pole, tree, etc.

b) Friction of rope against surface holds rope in place with no other tie-off

c) Loose knots may need to be tied around rope to keep gravity from unwinding it form anchor

d) Caution

1) Oily or greasy pole will damage end of rope

- Use webbing anchor sling as alternative

2. Multi-loop/ Wrap 3 pull 2

3. Basket sling

4. Single loop

a) Nylon webbing

1) Tied with an overhand bend (Water Knot)

b) Rope

1) Tied with a figure eight bend

5. Lark's foot/ girth hitch

F. Multiple point anchors

1. Situations may arise where rescuers will not be able to utilize a single point anchor that is adequate for work to be performed

a) At such times rescuers will need to develop and employ a multiple point anchor

2. Multiple point anchors consist of several anchor points that are inadequate to serve as single anchors by themselves, but when properly rigger together are capable of bearing expected load

3. This type of anchor requires careful thought and adequate rigging

4. Number of points that can be utilized in a multiple point system is theoretically limitless

PRESENTATION	APPLICATION

a) However, practical application generally calls for a two or three point system

NOTE: Discuss and demonstrate three types of multiple point anchor systems

G. Examples of multiple point anchors

1. Back tied or in-line anchor system
   - a) Anchor points are in-line with rope securing load
   - b) Anchor points are tensioned together to create strength in-line with anchor point close to load
   - c) Anchor points are tensioned together with pretension back tie or pulley system
   - d) Back tied or in-line anchor should remain in-line with rope
     - 1) A shift from side to side may cause one or more of the in-line anchors points to fail due to overload starting with anchor point closest to load

2. Load distributing anchors (self equalizing)
   - a) Centers system between two or more anchors
   - b) May solve problems caused by a load shift
   - c) Once full load is on system, friction is too great to allow further shift
   - d) Problems occur when one anchor point fails
     - 1) Shift in system can shock load remaining anchor point(s) and load
   - e) Keep anchor legs as short as possible to reduce shock load

H. Critical angle

1. When utilizing load sharing or self-adjusting multiple point anchor systems, it is necessary to ensure that the load is divided equally between the anchor points

PRESENTATION	APPLICATION

2. Regardless of the system chosen, there is an additional consideration required to minimize stress on the entire rigging
   a) Angles traced by the slings connecting any two anchor points need to be as small as possible
      1) The wider the angle the greater the force on the anchors

3. A small angle of 25˚ between the sling material create a force, on each side of the angle, approximately equal to half of the weight of the load
4. An angle of 120˚ between sling material creates a force on a single anchor point equal to the whole load
   a) As the sling angle between anchor points opens up, the resulting forces increase dramatically
5. Maximum field angle should be 90˚

XXI. RESCUE SYSTEMS

PPT 9-10

A. Belay system
   1. Used to provide an added margin of safety in the event of primary system failure
   2. Consists of a second rope attached to a separate anchor
   3. Two commonly used belay systems
      a) Tandem prusiks with a LRH
      b) Traverse 540 rescue belay (optional)
   4. Set up belay close to main line
      a) Prevents pendulum effect if main line fails
   5. Use different color rope
      a) Assists in communicating rope commands
   6. Tandem prusik belay system

PRESENTATION	APPLICATION

a) Testing shows tandem, triple wrap, 8 mm prusiks work best for holding large shock loads

b) Attach prusiks to load releasing hitch to aid in releasing system in lowering operating

7. 540 Rescue Belay

a) Has a built in LRH

B. Lowering systems

1. Most basic system to build and operate

2. Utilizes eight a figure 8 plate or brake bar rack attached to anchor

a) Provides friction

3. Consists of main line friction and belay line with tandem prusiks or a 540

4. Load is lowered on main line

5. Belay line kept slightly slack

a) Belay line not helping carry load

b) No excess slack that could shock load belay system in event of main system failure

C. Raising systems

1. Mechanical advantage system of ropes, pulleys and ratchet used to raise loads

a) Pulley can be either a change of direction (force multiplier) or mechanical advantage

1) Fixed pulley

- Change of direction

2) Traveling pulley

- Mechanical advantage

b) Ratchet is a gain saver in system and keeps load from being lowered back down

2. System consists of a mechanical advantage system and a belay system

PRESENTATION	APPLICATION

D. Pulley systems

1. Simple system
   a) All moving pulleys are moving at the same speed as load
   b) Most common is 3:1 "Z" rig
   c) Others include 2:1 and 4:1 for use with tripods, davits, and ladder systems
2. Compound system
   a) Defined as one simple pulley system pulling on another pulley system
   b) Simple systems are multiplied to become compound
   c) Example
      1) A 2:1 pulling on a 3:1= 6:1
3. Complex system
   a) System which has moving pulleys at different speeds
      1) Not a series of simple systems pulling on each other, but usually contains at least one simple system
4. Piggyback system
   a) Mechanical advantage (M/A) system that is attached to a separate rope holding load
5. Calculating mechanical advantage (M/A)
   a) Only moving pulleys create additional mechanical advantage
   b) Start at input end of haul line
      1) End where pulleys are working
      2) Unit of tension at this end will be 1
   c) This unit of 1 follows along rope until first pulley is reached
      1) If 1 unit enter pulley, 1 unit must exit
      2) This leaves 2 units of tension at the attachment point
   d) Continuing out of pulley, rope next enters

PRESENTATION	APPLICATION
and leaves a change of direction pulley attached to the anchor 1) Since this is a stationary pulley, nothing is added to mechanical advantage 2) Therefore, the unit of 1 comes out of pulley and moves down to where the prusik is attached e) This is where mechanical advantage is gained 1) 1 unit meets 2 units and both are added together yielding 3 units of tension being applied directly to load 2) When comparing 3 units of tension at output end to 1 unit of tension at input end, a 3:1 mechanical advantage is produced	PPT 9-11

SUMMARY:

A good working knowledge of rescue equipment, knots and system is vital to performing safe and effective confined space rescue. Once you have the basic knowledge to the capabilities and limitations of rescue equipment you will be able to combine this equipment to construct basic systems. Two basic systems which will be frequently encountered include lowering systems and raising systems. Lowering systems can lower a rescuer into a confined space or act as fall protection for a rescuer who is climbing down a ladder. Raising systems can be used to haul victims, rescuers and equipment out of a space.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	10: High-Point Anchor Systems
TIME FRAME:	0:30
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter individuals will be able to identify and describe common high point anchor devices and their related mechanical advantage systems.
Enabling Learning Objective:	1. Describe the use of a tripod including safe loading considerations and common lifting devices 2. Describe the various davit arm devices and their advantages and disadvantages 3. Identify and explain the correct operation of the self-retracting lifeline type fall protection devices 4. Describe the various types of ladder systems that may be used as improvised high point for confined space rescue
Standard:	With a minimum 80% accuracy according to the information contained in • <u>Confined Space Entry and Rescue Manual,</u> 2^{nd} ed (2007), CMC Rescue Inc., Chapter 10

MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of Instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36
REFERENCES:	• <u>Confined Space Entry and Rescue Manual,</u> 2^{nd} ed (2007), CMC Rescue Inc., Chapter 10

PREPARATION:

Accessing and extricating victims from confined spaces can be a difficult task. Many times, suitable anchor points to attach retrieval devices to are unavailable. Commercial retrieval devices can assist by giving you a complete self supporting system for lowering, raising and fall protection. These systems are quick and easy to assemble and can be used with commercial winches or with rope based rescue systems.

PRESENTATION	APPLICATION

PPT 10-1

I. TRIPOD

PPT 10-2

A. Free standing devices used for entry, retrieval, and rescue operations

B. Telescoping legs adjust to varying heights and angles

C. Designed to have the loads placed downward on the legs or within the footprint of the tripod

   1. Commercial winches may be attached to the legs

   2. Rope systems need to have the load applied within the confines of the legs

PPT 10-3

D. Sizes vary based upon intended use and manufacturer

   1. 9' – 12' suitable for rescue operations

   2. Ensure that all tripods meet the ANSI strength requirements of 5,000 pounds

      a) This provides approximately a 350 pound working load for the tripod

E. High-point anchor systems should utilize a retrieval, fall protection, and/or mechanical advantage system

F. May also be used with rope based rescue systems

   1. Consider the loads that will be generated when using the rope based rescue system

      a) A rope supporting a 200 pound person going through a “change of direction” pulley affixed to a tripod will generate more than 400 pounds of force on the tripod

      b) The same 200 pound load supported on a 2:1 mechanical advantage (MA) system will generate more than 300 pounds of force on the tripod

      c) The same 200 pound load supported on a 4:1 mechanical advantage (MA) system will generate approximately 250 pounds of force on the tripod

PRESENTATION	APPLICATION
d) Always consider the allowable working load for the tripod	
2. Consider the use of a "soft link" or swivel to eliminate twisting of rope systems and potential side-loading of rope rescue hardware	PPT 10-4
II. DAVIT ARMS	
A. Manufactured device used for lowering or retrieval work	
B. Commonly found in industry	
C. Can be free standing or used with a fixed mounting device	
D. Generally are shorter than tripods making it harder to remove packaged victims from confined spaces	
E. Generally used in conjunction with commercial winches and fall protection devices	PPT 10-5
III. FALL PROTECTION SYSTEMS	
A. Generally a self-retracting device attached to a high-point anchor system	
1. Cable is attached to the person being protected	
2. Generally, attached to a connection located high on the back of the wearer	
B. If a worker falls, the fall protection system is intended to catch them	
C. System can be reset by removing the load from the system	
D. Many incorporate an emergency retrieval winch	
E. May have a "load indicator" mechanism on the hook or winch housing to indicate if the device has sustained a substantial load	
Note: This lesson plan applies to no specific brand and/or model of the equipment. It is important to understand that there are numerous manufacturers of similar equipment and it is essential that you develop a presentation that applies to your specific equipment	

PRESENTATION	APPLICATION
Summary Powerpoint Slide	PPT 10-6

SUMMARY:

High-point anchor systems can be a great asset at the rescue scene. They are quick and easy to assemble and provide a self supporting system. These systems can be utilized with commercial winches or rope based rescue systems. Remember that most of these devices have a 350 pound working load. It is easy to generate more force than that using rope rescue systems with a mechanical advantage. Know your load, your rope rescue systems and how to calculate the load that will be placed on your high-point anchor system.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 10 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	11: Communications
TIME FRAME:	0:30
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a written test
Terminal Learning Objective:	At the conclusion of this chapter, individuals will describe methods of communicating during a confined space rescue.
Enabling Learning Objective:	1. Describe how to effectively communicate using a two way radio. 2. Describe how to effectively communicate using rapping and tapping signals, 3. Describe how to effectively communicate using light signals 4. Describe how to effectively communicate using rope signals. 5. Describe how to effectively communicate using hand signals. 6. Describe how to effectively communicate using a hard wired communication system. 7. Describe how to effectively communicate using verbal communications.
Standard:	With a minimum 80% accuracy according to the information contained in • <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 11
MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise	None
Method of Instruction:	Facilitated format in a classroom environment

Instructor/Student Ratio: 1:36

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION:

It is imperative that confined space entrants and attendants communicate throughout a confined space entry operation. Only through the use of a communication plan can both parties be aware of problems that may require evacuation of the space. CAL-OSHA requires that a communications plan allowing the entrant and the attendant to communicate be in place before an entry begins. In addition, a back-up communications plan should be identified prior to entry. Techniques and equipment for communications vary. The configuration of the space, ambient noise, and cost are just some of the considerations when evaluating your options for a communication plan.

PRESENTATION	APPLICATION

PPT 11-1

I. COMMUNICATIONS TECHNIQUES/EQUIPMENT

PPT 11-2

A. Battery operated portable radios
   1. Push to talk operations often become cumbersome for entrants
   2. Voice activated operations can cause entrant to hold frequency due to excessive communication and background noise
   3. Ear/mike operations work well if fitted earpiece is used
   4. Allows for two-way use and multiple users
   5. Tactical frequency should be identified for entry
   6. Reception/transmission can be undependable in confined space operations
   7. Transmissions can be scanned by other parties
   8. Common equipment that we already have and have trained on
   9. Portable radios can cause interference with unshielded atmospheric monitoring equipment
   10. Electronic equipment should be intrinsically safe

B. Hard wire systems
   1. Push to talk, voice activated and conference mode models are available
   2. Transmissions cannot be scanned
   3. Available in ear/mike, throat mike and in mask mike options
   4. Available with single user at each end, multiple user systems and “talk box” speaker systems
   5. Hard wire can restrict movement and cause line management complications
   6. Electronic equipment should be intrinsically safe

C. Voice
   1. Basic voice clear text

PRESENTATION	APPLICATION
2. Impaired by respiratory protection 3. Impaired by high noise environments 4. No batteries or tag lines 5. Limited by distance or space configuration D. Hand Signals 1. Basic signals must be confirmed before entry 2. Signals must be committed to memory 3. Entrant and attendant must have visual contact 4. Lighting in the space may impair this plan 5. Limited application	
	PPT 11-3
E. Rope Signals 1. Basic signals must be confirmed before entry 2. Signals must be committed to memory 3. Can restrict movement of the entrant 4. Must be performed on a line that is not load bearing 5. Common system used is OATH a) O = Ok – 1 pull b) A = Add line – 2 pulls c) T = Take up or tension the line – 3 pulls d) H = HELP – 4 pulls 6. Limited application	
	PPT 11-4
F. Tapping or rapping codes (signals) 1. Basic codes (signals) 2. Codes (signals) must be committed to memory 3. Does not limit entrants movement 4. Limited application 5. Common system used is OATH a) O = OK – 1 tap b) A = Add line – 2 taps c) T = Take up or tension the line – 3 taps	

PRESENTATION	APPLICATION
d) H = HELP – 4 taps G. Personal Distress Device/Personal Alarm Locator (PDD or PAL) 1. It is recommended that each entrant have one 2. Must be capable of manual activation in order to utilize a system like the OATH system H. Light Signals 1. Basic signals must be confirmed before entry 2. Signals must be committed to memory 3. Entrant and attendant must have visual contact 4. Common system used is OATH a) O = Ok – 1 flash b) A = Add line – 2 flashes c) T = Take up or tension the line – 3 flashes d) H = HELP – 4 flashes 5. Lighting in the space may impair this plan 6. Limited application I. Back-up Plans 1. Regardless of the choice of the primary communications plan, a back-up plan should be identified during the pre-entry briefing prior to the entry	PPT 11-5

SUMMARY:

A communication plan is required when performing permit required confined space entries. There are numerous options when choosing the plan/equipment you will utilize, some of which include portable radios, hardwire, hand signals, rope signals, tapping and rapping codes, light signals etc. The choice of what type of equipment shall be used is left up to the employer. Additional direction is presented in the non-mandatory sample programs where we are given direction to utilize continuous power over voice communications in certain situations. Regardless of what type of equipment is used, the over-riding priority is to provide a reliable communications link between the entrant and the attendant.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	12: Permitting Confined Spaces
TIME FRAME:	0:30
LEVEL OF INSTRUCTION:	Level I
AUTHORITY:	• Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a written test
Terminal Learning Objective:	At the end of this chapter the student will be able to complete a permit for a confined space entry.
Enabling Learning Objective:	1. List the reasons for permitting a confined space 2. List the 15 requirements of a confined space entry permit 3. Describe the local agency policy for when a permit is issued and its duration
Standard:	With a minimum 80% accuracy according to the information contained in • Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 12
MATERIALS NEEDED:	• Writing board/pad with markers/erasers • Appropriate audiovisual equipment • Appropriate audiovisual materials
Practical Exercise:	None
Method of Instruction:	Facilitated format in a classroom environment
Instructor/Student Ratio:	1:36
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 12 • Worker Deaths in Confined Spaces, National Institute for Occupational Safety and Health (NIOSH), January 1994 • Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), February 1994 • Complete Confined Spaces Handbook, John F. Rekus, 1994 •

PREPARATION:

Cal-OSHA requires that a permit be completed before entering into any permit-required space. The confined space permit serves as a tactical worksheet or checklist to assist in managing your rescue. A permit system also helps in preplanning confined space hazards, determining hazard control techniques, identifies special equipment required for entry, and identifies training needs.

PRESENTATION	APPLICATION
	PPT 12-1
I. REASONS FOR PERMITTING	
	PPT 12-2
A. Written/Issued for a specific purpose	
B. Required by Cal-OSHA Regulations	
C. Serves as documentation for all actions and assessments	
D. Serves as a safety checklist	
E. Serves as a tactical log	
F. Provides incident action plan, size-up, and safety related information	
G. Becomes a legal document	
1. Must be kept on file for one year	
	PPT 12-3
II. REQUIRED INFORMATION FOR PERMIT	
A. Identification of Space(s)	
B. Defines purpose of entry	
C. Documents date and intended duration of entry	
D. Provides descriptions of hazards	
E. Lists measures used to isolate and manage hazards	
	PPT 12-4
F. Lists acceptable entry conditions	
G. Lists the findings of initial and periodic atmospheric monitor readings	
H. Describes communication procedures	
I. Lists special equipment needs	
	PPT 12-5
J. Identifies all personnel and assigned positions	
K. Lists additional permits required	
L. Provides information for notification and activation of rescue teams	
M. Provides other relevant information	
N. Includes signature (endorsement) of Entry Supervisor	

PRESENTATION	APPLICATION
	PPT 12-6
III. PERMITTING CONSIDERATIONS	
A. Duration of the permit is based upon local agency operational procedures	
2. Refer to local policies for how, when and why a new permit must be issued	
	PPT 12-7
IV. SUMMARY	

SUMMARY:

Cal-OSHA requires that a permit be completed prior to entering permit-required confined spaces. The confined space permit is part of a permit system identified in the rescue agency's operational policies and procedures. A permit system also helps in pre-planning confined space, hazards determining hazard control techniques, identifying equipment required for entry and determining training needs.

EVALUATION:

The student will complete the activity and/or written test at a time determined by the instructor.

ASSIGNMENT:

Review your notes and read Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 12 in order to prepare yourself for the upcoming test. Study for our next session.

TOPIC:	How To Tie A Figure Eight Stopper
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a section of rope
Behavior:	The student will tie a figure eight stopper knot
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Section of ½" kernmantle rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Form a bight.	1a. 18 inches from the end of the rope
2. Wrap the working end.	2a. Around the standing point 2b. One full turn
3. Pass the working end.	3a. Insert working end of rope through the bight
4. Dress the knot.	4a. By pulling on both the working end and the standing part. 4b. At the same time

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 Figure Eight On A Bight
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a section of rope
Behavior:	The student will tie a figure eight on a bight
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Section of ½" kernmantle rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Form a bight.	1a. In the working end of the rope 1b. Using approximately 18" of the end of the rope
2. Form a second bight.	2a. At approximately the half way point of first bight
3. Wrap first bight.	3a. Around the standing part 3b. One full turn
4. Insert first bight.	4a. Insert first bight into second bight 4b. To desired size 4c. Final loop best kept at approximately 2" for confined space operations
5. Extend the bight.	5a. Through the knot 5b. To the desired size 5c. Best kept at Approx. 2 inches or less for confined space operations.
6. Dress the knot.	6a. By pulling on the bight and the standing and working part of the rope 6b. At the same time

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 Figure Eight Follow Through

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a section of rope

Behavior: The student will tie a figure eight follow through knot

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Section of ½" kernmantle rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Tie a loose figure eight stopper knot.	1a. In the working end of the rope 1b. Leave enough distance between knot and end of rope for desired use
2. Encircle the object.	2a. With the working end of the rope
3. Feed the working end of the rope.	3a. Through the figure eight in reverse working form the object toward the rescuer 3b. Following all turns in original knot
4. Dress the knot.	4a. By pulling on the working end and standing part 4b. At the same time

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 Figure Eight Bend
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a section of rope
Behavior:	The student will tie a figure eight bend
Standard:	Completing all operations according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- One section of rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space rescues, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Tie a loose figure eight stopper knot.	1a. In one end of the rope
2. Feed the end of another rope.	2a. Starting at the standing end 2b. Through the figure eight knot in reverse 2c. Following the original path
3. Dress the knot.	3a. By pulling on both the working end and the standing part 3b. At the same time

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: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR GISO 5157 and NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a section of rope

Behavior: The student will tie a square knot

Standard: Completing all operations according to the job breakdown

MATERIALS NEEDED:

- One section of rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: It is important that knots are tied correctly, for the use in rope systems. These knots are used to construct rope systems and attach rescuers and victims to rope systems. The knots and systems should be inspected after they are tied and before the rope or systems are loaded and used.

OPERATIONS	KEY POINTS
1. Grasp one end of rope	1a. With right hand
2. Grasp other end of rope	2a. With left hand
3. Wrap end of rope in left hand	3a. Around end of rope in right hand one full turn
4. Wrap end of rope in right hand	4a. Around end of rope in left hand one full turn
5. Pull out slack to tighten knot	5a. Pulling each end of rope away from the knot

NOTE: A Safety knot may be tied on each end of the square knot using half hitches, overhand bend, or double overhand bend

NOTE: This knot is used in Confined Space Rescue for securing patients in the Sked Stretcher per manufacturers instructions

APPLICATION:

The student will practice tying a square knot under supervision.

EVALUATION:

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

ASSIGNMENT:

Practice this square knot in order to prepare yourself for the upcoming performance test. Study for our next session.

TOPIC:	How To Tie An Overhand Bend
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a section of rope
Behavior:	The student will tie an overhand bend
Standard:	Completing all operations according to the job breakdown
MATERIALS NEEDED:	• One section of rope
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9
PREPARATION:	To complete confined space rescues, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire operation.

OPERATIONS	KEY POINTS
1. Tie a loose overhand knot.	1a. In one end of the webbing 1b. Leaving a 2 inch tail
2. Feed the other end of the webbing.	2a. Through the overhand knot in reverse 2b. Following the original path 2c. Keeping the webbing flat and untwisted in the knot
3. Dress the bend.	3a. By pulling on both the working end and the standing part 3b. At the same time 3c. Leaving a minimum 2 inch tail

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 Double Overhand Bend (Double Fisherman Knot)
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a section of rope
Behavior:	The student will tie a double overhand bend
Standard:	Completing all operations according to the job breakdown
MATERIALS NEEDED:	• Job breakdown • Section of rope
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9
PREPARATION:	To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Align the ends of the rope.	1a. Overlapping each other 1b. Ends pointing opposite directions 1c. Approximately 28 inches of overlap
2. Grasp the rope.	2a. With non-dominant hand 2b. Between the two ends 2c. Maintaining alignment
3. Wrap the working end.	3a. Twice around the standing part 3b. With the dominant hand 3c. Towards the non-dominant hand 3d. Forming an “X” with the second wrap
4. Insert working end.	4a. Under both wraps 4b. With non-dominant hand towards dominant hand
5. Turn the line	5a. Around, to repeat steps 3 and 4
6. Repeat operations 3 and 4	
7. Dress the knot	7a. By pulling both standing parts at the same time 7b. Removing all slack

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 Three-Wrap Prusik To A Rescue Rope

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a prusik loop and a section of rope

Behavior: The student will attach a three-wrap prusik hitch to a rescue rope

Standard: Completing all operations according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 prusik loop
- 1 section of ½" rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most confined space operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Position prusik loop.	1a. In the dominant hand 1b. Double overhand bend in hand 1c. Next to the rescue rope
2. Wrap prusik loop.	2a. Around rescue rope 2b. Three times 2c. Using double overhand bend 2d. Insert double overhand bend through prusik loop bight with each wrap
3. Dress the hitch.	3a. Pulling from one side of double overhand bend 3b. Until all wraps are uniform around rescue rope 3c. First wrap on interior 3d. Last wrap on interior 3e. Double overhand bend is between the wraps on rescue rope 3f. Bight in prusik loop

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 Construct A Modified Truckers Hitch
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a section of rope
Behavior:	The student will construct a modified truckers hitch
Standard:	Completing all operations according to the job breakdown
MATERIALS NEEDED:	• Job breakdown • One section of ½” kernmantle rope
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9
PREPARATION:	The modified truckers hitch is useful when tensioning the guy lines on a ladder gin and ladder “A” frame.

OPERATIONS	KEY POINTS
1. Tie a figure eight on a bight.	1a. As per pervious instruction 1b. In guy line 1c. Between load and anchor 1d. Forming a six inch minimum bight
2. Attach the carbiner.	2a. To the figure eight on a bight 2b. Bight down, flip up
3. Reeve the guy line.	3a. Around anchor or carabiner in anchor sling. 3b. Lock the carabiner 3c. Returning towards load 3d. Stopping at figure eight on a bight
4. Reeve running end of guy line.	4a. Into carabiner attached to figure eight on a bight 4b. Lock the carabiner
5. Pull rope through carabiner.	5a. Until all slack is removed between anchor and figure eight on a bight
6. Haul on rope.	6a. Until proper tension is obtained 6b. Do not tension too much
7. Tie a half hitch on a bight.	7a. As per previous instruction 7b. On anchor side of carabiner in figure eight on a bight. 7c. Half hitch on a rope forming bight through carabiner 7d. Pull tight up against the carabiner attached to the figure eight on a bight
8. Tie a half hitch on a bight.	8a. Tie a second half hitch on a bight up against the first half hitch on a bight

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 Tensionless Hitch

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a tie rope, carabiner, and a round, vertical anchor point

Behavior: The student will tie a tensionless hitch

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 length of ½" rope
- 1 carabiner
- 1 round, vertical anchor point

REFERENCES:

- <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most rescue systems, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Tie a figure eight on a bight	1a. In the working end of the rope 1b. As per previous instruction
2. Grasp the rope	2a. By the standing part 2b. Leaving enough rope to wrap the anchor point three times and secure the working end
3. Form a loop	3a. Around the anchor point 3b. With the working end 3c. As low as possible
4. Form a second loop	4a. Around the anchor point 4b. With the working end 4c. Above the first loop
5. Form a third loop	5a. Around the anchor point 5b. With the working end 5c. Above the second loop
6. Attach a carabiner	6a. To the figure eight on a bight
7. Attach the carabiner	7a. To the standing part of the rope 7b. In front of the anchor
8. Dress the wraps	8a. Keeping the standing part of the rope straight as it passes through the carabiner 8b. So no angle is formed in the standing part of the rope
9. Lock the carabiner	

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 Single Loop Anchor Sling

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given the webbing and an anchor point

Behavior: The student will tie a single loop anchor sling

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 length of webbing

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most rescue systems, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Pass the working end of the webbing	1a. Around the anchor point
2. Tie an overhand bend	2a. In the webbing
3. Position the overhand bend	3a. On one side of the webbing 3b. Between the anchor point and load attachment

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 Multi Loop Anchor Sling (Wrap Three, Pull Two)
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given webbing and an anchor point
Behavior:	The student will tie a multi loop anchor sling
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 length of webbing
- 1 suitable anchor point

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation

OPERATIONS	KEY POINTS
1. Pass the working end of the webbing	1a. Around the anchor point three times
2. Tie an overhand bend	2a. In the webbing 2b. As per previous instruction
3. Position and hold the overhand bend	3a. In one hand
4. Grasp the two wraps of the webbing around the anchor	4a. With the other hand
5. Pull the two wraps of the webbing	5a. In the direction of the load 5b. Forming two bights
6. Allow the overhand bend in the other hand to simultaneously move toward the front of the anchor	6a. Leaving the overhand bend in front of the anchor

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 Basket Sling
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given Webbing and an anchor point
Behavior:	The student will tie a basket hitch
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 length of webbing
- 1 suitable anchor poin

REFERENCES:

- <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Tie an overhand bend	1a. In the webbing 1b. Removing any twists 1c. As per previous instruction 1d. Creating a sling
2. Form a bight	2a. At one end of the sling
3. Pass the bight	3a. Around the anchor point
4. Bring the bight together	4a. With the bight formed at the opposite end of the sling 4b. Both bights on the load side of the anchor 4c. Removing any slack in the sling
5. Position the overhand bend	5a. In one leg of the sling 5b. Away from the attachment point

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 Construct A Back-Tied Anchor System
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given webbing, carabiners, rope, and anchor points
Behavior:	The student will construct a back tied anchor system
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 3 lengths of webbing
- 2 carabiners
- 2 suitable anchor points
- 1 rope

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Tie a multi loop anchor sling	1a. Around the anchor point closest to the load 1b. As per previous instruction
2. Attach a carabiner	2a. To the anchor sling 2b.Bite down 2c.Flip up
3. Tie a second multi loop anchor sling	3a. Around the same anchor as in 1a 3b. Starting this time on the second anchor side of the anchor 3c. Intertwining the webbing with the first anchor sling 3d. Pulling the two bights toward the second anchor
4. Attach a carbiner	4a. To the second multi loop anchor sling 4b. Bite down 4c. Flip up
5. Tie a third multi loop anchor sling	5a. Around the second anchor point 5b. Pulling the two bights of the anchor sling toward the first anchor point
6. Attach a carabiner	6a. To the third anchor sling 6b. Bite down 6c. Flip up
7. Tie a figure eight on a bight	7a. In the end of a rescue rope 7b. As per previous instruction
8. Attach the figure eight on a bight	8a. To the carabiner on the second anchor sling

OPERATIONS	KEY POINTS
9. Attach the standing part of the rescue rope	9a. Through the carabiner on the third anchor sling 9b. Removing all the slack
10. Attach the standing part of the rescue rope	10a. Through the carbiner on the second anchor sling 10b. Removing all the slack 10c. Creating a 3:1 mechanical advantage 10d. Lock the carabiner
11. Attach the standing part of the rescue rope	11a. Through the carabiner on the third anchor sling 11b. Removing all the slack 11c. Lock the carabiner
12. Tension the backtie rope	12a. By pulling on the 3:1 with COD
13. Tie of the rescue rope	13a. With two half hitches 13b. Keeping the rope tensioned
14. Retension the rope	14a. Prior to operating the system 14b. Removing any slack caused by stretch

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 And Operate A Brake Bar Rack As Part Of The RPM
TIME FRAME:	0:15
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given an anchor sling, anchor plate, brake bar rack, prusik minding pulleys, load release strap, prusiks, carabiners, rescue rope and appropriate personal protective equipment.

Behavior: The student will attach and operate a brake bar rack as part of the RPM

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 anchor sling
- 1 anchor plate
- 1 brake bar rack
- 2 prusik minding pulleys
- 1 load release strap
- 1 short prusik
- 1 long prusik
- 6 carabiners
- 1 rescue rope
- 1 suitable anchor
- Appropriate personal protective equipment

REFERENCES:

- <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

NOTE: The CMC Manual does not use the term "RPM" for this system

OPERATIONS	KEY POINTS
1. Attach an anchor sling	1a. To a suitable anchor 1b. As per previous instruction
2. Attach a carabiner	2a. To the anchor sling 2b. Bite down 2c. Flip up
3. Attach the anchor plate	3a. To the carabiner 3b. Lock the carabiner
4. Attach a carabiner	4a. To the anchor plate 4b. Second hole from the left 4c. Bite down 4d. Flip up
5. Attach a brake bar rack	5a. To the carabiner 5b. Training groove up 5c. Bars 2-6 disengaged
6. Tie a figure eight on a bight	6a. In the running end of the rope 6b. For attachment to the load 6c. As per previous instruction
7. Attach a carabiner	7a. To the figure eight on a bight
8. Using the brake hand, pass the running end of the lowering line over the first bar	8a. Over the training groove 8b. Bringing running end of rope completely under the first bar 8c. Stopping when the running end of the rope is towards the load

OPERATIONS	KEY POINTS
9. Engage the second bar	9a. With the control hand 9b. Onto the rack 9c. Slide bar up until it engages rope near the first bar
10. Using the brake hand, pass the running end of the lowering line under the second bar	10a. Bringing running end of rope completely over the second bar 10b. Stopping when the running end of the rope is towards the load
11. Engage the third bar	11a. With the control hand 11b. Onto the rack 11c. Slide bar up until it engages rope near the second bar
12. Using the brake hand, pass the running end of the lowering line over the third bar	12a. Bringing running end of rope completely under the third bar 12b. Stopping when the running end of the rope is towards the load
13. Engage the fourth bar	13a. With the control hand 13b. Onto the rack 13c. Slide bar up until it engages rope near the third bar
14. Using the brake hand, pass the running end of the lowering line under the fourth bar	14a. Bringing running end of rope completely over the fourth bar 14b. Stopping when the running end of the rope is towards the load
NOTE: Use four bars minimum for a single person load	
15. Cradle the bars in the control hand	

OPERATIONS	KEY POINTS
16. Hold the running end of the lowering line	16a. In the brake hand
17. Move the brake hand	17a. Away from the standing part
	17b. To begin descent
18. Spread the bars apart	18a. With the control hand
	18b. To increase the speed of descent
19. Move the bars together	19a. With the control hand
	19b. To decrease the speed of descent
20. Using the brake hand, bring the running end of the lowering line	20a. Over the top of the brake bar rack
	20b. Up toward the standing part
	20c. Brake hand up in front of brake bar rack
21. Engage the fifth bar	21a. For heavier loads requiring more friction
	21b. With the control hand
	21c. Onto the rack
	21d. Slide bar up until it engages rope near the fourth bar
22. Using the brake hand, bring the running end of the lowering line over the fifth bar	22a. Bringing running end of rope completely under the fifth bar
	22b. Stopping when the running end of the rope is towards the load
23. Engage the sixth bar	23a. For heavier loads requiring more friction
	23b. With the control hand
	23c. Onto the rack
	23d. Slide bar up until it engages rope near the fifth bar

OPERATIONS	KEY POINTS
24. Using the brake hand, bring the running end of the lowering line under the sixth bar	24a. Bringing running end of rope completely over the sixth bar 24b. Stopping when the running end of the rope is towards the load
25. Disengage sixth bar	25a. For lighter loads requiring less friction
26. Using the brake hand, pass the running end of the lowering line under the sixth bar	26a. Bringing running end of rope completely under the sixth bar 26b. Stopping when the running end of the rope is towards the load
27. Disengage sixth bar	27a. With the control hand 27b. By gently squeezing the bottom of the rack
28. Move the brake hand	28a. Away from the standing part 28b. To begin descent
29. Disengage fifth bar	29a. For lighter loads requiring less friction
30. Using the brake hand, pass the running end of the lowering line over the fifth bar	30a. Bringing running end of rope completely over the fifth bar 30b. Stopping when the running end of the rope is towards the load
31. Disengage fifth bar	31a. With the control hand 31b. By gently squeezing the bottom of the rack
32. Move the brake hand	32a. Away from the standing part 32b. To begin descent

OPERATIONS	KEY POINTS
33. Bring the running end of the lowering line	33a. Completely over the fourth bar 33b. Stopping when the running end of the rope is towards the load 33c. Brake hand up in front of brake bar rack
34. Wrap the running end of the lowering line	34a. Between the front of the rack and the standing part of the rope 34b. With the brake hand
35. Wrap the running end of the lowering line	35a. Between the two legs of the rack 35b. Capturing the fourth bar
36. Repeat operations 34 and 35	
37. Tie an overhand on a bight to secure the brake bar rack	37a. Form a 18-24 inch bight with the working end of the rope 37b. Wrap bight around the brake bar rack 37c. Insert end of bight through back side of bight to form an overhand on a bight 37d. Pull on bight and running end of rope to tighten knot

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 Construct And Operate A Load Release Hitch As Part Of The RPM
TIME FRAME:	0:20
LEVEL OF INSTRUCTION:	Level II
AUTHORITY	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given an anchor sling, anchor plate, brake bar rack, prusik minding pulleys, load release strap, prusiks, carabiners, rescue rope and appropriate personal protective equipment.
Behavior:	The student will construct and operate a load release hitch as part of the RPM
Standard:	Completing all operations according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 CMC Pro Series Load Release Strap
- 1 aluminum carabiner (red)
- 1 rescue rope
- 1 anchor sling
- 3 carabiners
- 1 short prusik
- 1 prusik minding pulley
- 1 anchor plate
- 1 brake bar rack

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation

NOTES:

This lesson plan applies to the CMC Pro Series Load Release Strap. You must develop a lesson plan that is specific to the particular load release strap you are using.

The CMC Manual does not use the term “RPM” for this system.

OPERATIONS	KEY POINTS
1. Hold CMC Pro Series load release strap in left hand	1a. Loop end facing down 1b. Left thumb in upper “D” ring
2. Pull down on loop	2a. With right hand 2b. Until bottom “D” ring contacts the double section of web
3. Start wrapping running end of web around the doubled section of the load release strap	3a. Wrap counterclockwise 3b. Approximately six wraps 3c. Keeping the web flat
4. Form a bight in the web	4a. Near the manufacturer tags
5. Push the bight	5a. Between the strands of the load release strap 5b. Approximately 2-3 inches
6. Attach the red (aluminum) carabiner to the loop in the end of the load release strap	6a. Bite down 6b. Flip up
7. Attach the carabiner	7a. To the bight referenced in #5 above
8. Lock the carabiner	
9. **NOTE:** The “D” ring nearest to the red carabiner will be referred to as the anchor end	
10. Attach one carabiner	10a. To the fourth hole on the anchor plate 10b. Bite down 10c. Flip up

OPERATIONS	KEY POINTS
11. Attach the anchor end of the load release strap to the carabiner referenced in #10	11a. Lock the carabiner
12. Attach two carabiners to the "D" ring on the load end of the load release strap	12a. Bite down 12b. Flip up
13. Attach the short prusik loop to the main line	13a. Three wrap
14. Attach the short prusik	14a. To the carabiner on the outside of the load release strap 14b. Lock the carabiner
15. Attach a prusik minding pulley	15a. To the second carabiner 15b. Lock the carabiner
NOTE: Have a student pull on the running end of the main line to simulate a load	
16. Using the brake hand, grasp the rope behind the ratchet prusik.	
17. Using the brake hand, pass the running end of the lowering line over the first bar of the brake bar rack	17a. Over the training groove 17b. Bringing running end of rope completely under the first bar 17c. Stopping when the running end of the rope is towards the load 17d. Removing all slack in rope between front of rack and ratchet prusik
18. Engage the second bar	18a. With the control hand 18b. Onto the rack 18c. Slide bar up until it engages rope near the first bar

OPERATIONS		KEY POINTS	
19.	Using the brake hand, pass the running end of the lowering line under the second bar	19a.	Bringing running end of rope completely over the second bar
		19b.	Stopping when the running end of rope is towards the load
20.	Engage the third bar	20a.	With the control hand
		20b.	Onto the rack
		20c.	Slide bar up until it engages rope near the second bar.
21.	Using the brake hand, pass the running end of the lowering line over the third bar	21a.	Bringing running end of rope completely under the third bar
		21b.	Stopping when the running end of the rope is towards the load
22.	Engage the fourth bar	22a.	With the control hand
		22b.	Onto the rack
		22c.	Slide bar up until it engages rope near the third bar
23.	Using the brake hand, pass the running end of the lowering line under the fourth bar	23a.	Bringing running end of rope completely over the fourth bar
		23b.	Stopping when the running end of the rope is towards the load

NOTE: Use four bars minimum for a single person load

OPERATIONS	KEY POINTS
24. Bring the running end of the lowering line	24a. Completely over the fourth bar 24b. Stopping when the running end of the rope is towards the load 24c. Brake hand up in front of brake bar rack
25. Wrap the running end of the lowering line	25a. Between the front of the rack and the standing part of the rope 25b. With the brake hand
26. Wrap the running end of the lowering line	26a. Between the two legs of the rack 26b. Capturing the fourth bar
27. Repeat operations 25 and 26	
28. Tie an overhand on a bight to secure the brake bar rack	28a. Form a 18-24 inch bight with the working end of the rope 28b. Wrap bight around the brake bar rack 28c. Insert end of bight through back side of bight to form an overhand on a bight 28d. Pull on bight and running end of rope to tighten knot
29. Unlock the red carabiner on the load release strap	
30. Open gate and remove carabiner from bight formed in load release strap	30a. Leaving carabiner in loop end of load release strap
31. Pull on red carabiner to remove bight from center of load release strap	

OPERATIONS	KEY POINTS
32. Slowly unwrap load release strap	32a. Until load is resting on brake bar rack
33. Unlock carabiner holding the ratchet prusik	
34. Remove ratchet prusik from carabiner	
35. Remove ratchet prusik from rope	
36. Return ratchet prusik to carabiner	
37. Rebuild CMC Load Release Strap	37a. As per previous instruction

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 Construct And Operate The RPM

TIME FRAME: 0:30

LEVEL OF INSTRUCTION: Level II

AUTHORITY Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given webbing, carabiners, brake bar rack, prusiks, pulleys, load release strap, rescue rope.

Behavior: The student will construct and operate the RPM

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 anchor plate
- 1 brake bar rack
- 1 load release device (LRD)
- 2 prusik minding pulley
- 1 20 foot anchor sling
- 1 short prusik
- 1 long prusik
- 1 150 foot rescue rope
- 7 carabiners
- Simulated load

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: The RPM is a simple to construct, simple to operate rope rescue system. It includes the gear necessary to raise and lower a rescuer and/or victim. It can be easily incorporated into most confined space rescues.

NOTES: This lesson plan uses the CMC Load Release Strap as part of the RPM. You must develop a lesson plan that is specific to the particular load release device you are using with your RPM.

The CMC Manual does not use the term "RPM" for this system.

OPERATIONS	KEY POINTS
Establish an Anchor Point	
1. Form a multi-loop anchor sling	1a. Around the anchor
2. Attach a carabiner	2a. To the anchor sling 2b. Bite down 2c. Flip up
Construction of the RPM	
3. Attach an anchor plate	3a. To the carabiner
4. Attach a carabiner to the anchor plate	4a. First hole from the left 4b. Bite down 4c. Flip up
5. Attach a brake bar rack	5a. To the carabiner 5b. Lock the carabiner
6. Attach a carabiner to the anchor plate	6a. Second hold from the left 6b. Bite down 6c. Flip up
7. Attach a pulley	7a. To the carabiner
8. Attach a long prusik	8a. To the same carabiner 8b. Lock the carabiner
9. Attach a carabiner to the anchor plate	9a. Third hole from the left 9b. Bite down 9c. Flip up
10. Attach a CMC Load Release Strap	10a. To the carabiner 10b. Lock the carabiner

OPERATIONS	KEY POINTS
11. Attach 2 carabiners to the end of the CMC Load Release Strap	11a. Bite down 11b. Flip up
12. Attach a short prusik	12a. To the outside carabiner 12b. Lock the carabiner
13. Attach a prusik	13a. To the inside carabiner 13b. Lock the carabiner
To use for a lowering Operations	
14. Tie a figure eight on a bight	14a. In the running end of the rescue rope 14b. For attachment to the load 14c. As per previous instruction
15. Attach a carabiner	15a. To the figure eight on a bight
16. Using the brake hand, pass the running end of the lowering line over the first bar	16a. Over the training groove 16b. Bringing running end of rope completely under the first bar 16c. Stopping when the running end of the rope is towards the load
17. Engage the second bar	17a. With the control hand 17b. Onto the rack 17c. Slide bar up until it engages rope near the first bar
18. Using the brake hand, pass the running end of the lowering line under the second bar	18a. Bringing running end of rope completely over the second bar 18b. Stopping when the running end of the rope is towards the load

OPERATIONS	KEY POINTS
19. Engage the third bar	19a. With the control hand 19b. Onto the rack 19c. Slide bar up until it engages rope near the second bar.
20. Using the brake, hand, pass the running end of the lowering line over the third bar	20a. Bringing running end of the rope is towards the load
21. Engage the fourth bar	21a. With the control hand 21b. Onto the rack 21c. Slide bar up until it engages rope near the third bar
22. Using the brake hand, pass the running end of the lowering line under the fouth bar	22a. Brining running end of rope completely over the fourth bar 22b. Stopping when the running end of the rope is towards the load
NOTE: Always use a minimum of four bars for a single person load, and all six bars for a five person load.	
23. Attach the load to the main line	23a. Lock the carabiner
24. Cradle the bars in the control hand	
25. Hold the running end of the lowering line	25a. In the brake hand
26. Move the brake hand	26a. Away from the standing part 26b. To begin descent
27. Spread the bars apart	27a. With the control hand 27b. To increase the speed of descent

OPERATIONS	KEY POINTS
28. Move the bars together	28a. With the control hand 28b. To decrease the speed of descent
29. Bring the running end of the lowering line	29a. Completely over the fouth bar 29b. Stopping when the running end of the rope is towards the load 29c. Brake hand up in front of brake bar rack
30. Wrap the running end of the lowering line	30a. Between the front of the rack and the standing part of the rope 30b. With the brake hand
31. Wrap the running end of the lowering line	31a. Between the two legs of the rack 31b. Capturing the fourth bar
32. Repeat operations 30 and 31	
33. Tie an overhand on a bight to secure the brake bar rack	33a. From a 18-24 inch bight with the working end of the rope 33b. Wrap bight around the brake bar rack 33c. Insert end of bight through back side of bight to form an overhand on a bight 33d. Pull on bight and running end of rope to tighten knot
To use for a raising operation	
34. Attach the short prusik loop from the RPM to the main line	34a. Three wrap
35. Attach the short prusik	35a. To the carabiner at the end of the load release strap 35b. Lock the carabiner
36. Form a bight in the main line	36a. Behind the short prusik

OPERATIONS	KEY POINTS
37. Attach the prusik minding pulley	37a. To the bight formed in the main line
38. Attach the prusik minding pulley	38a. To the second carabiner at the end of the load release strap 38b. Lock the carabiner
39. Attach the long prusik loop	39a. To the main line 39b. Appx 3 feet in front of the short prusik
40. Form a bight	40a. In the running end of the main line
41. Attach a prusik minding mechanical advantage pulley	41a. To the bight formed in the main line
42. Attach a carabiner	42a. To the prusik minding mechanical advantage pulley 42b. Bite down 42c. Flip up
43. Attach the carabiner with mechanical advantage pulley	43a. To the long prusik loop 43b. Lock the carabiner
44. Extend the long prusik as far as possible	44a. To ensure the longest haul and fewest resests
45. Pull on the running end of the main line	45a. To raise the load
46. Allow load to set on ratchet prusik	46a. To convert back to a lowering system from a raising system
47. Unlock and remove carabiner attaching long prusik to mechanical advantage pulley	
48. Remove rope from mechanical advantage pulley	

OPERATIONS	KEY POINTS
49. Remove long prusik from main line	
50. Attach mechanical advantage pulley and haul prusik to carabiner	50a. Return this system to its proper place on the anchor plate
51. Unlock carabiner holding change of direction pulley	
52. Remove change of direction pulley from carabiner	
53. Remove rope from change of direction pulley	53a. Replace pulley onto second carabiner at end of load release strap
54. Using the brake hand, grasp the rope behind the ratchet prusik.	
55. Using the brake hand, pass the running end of the lowering line over the first bar of the brake bar rack	55a. Over the training groove 55b. Bringing running end of rope completely under the first bar 55c. Stopping when the running end of the rope is towards the load 55d. Removing all slack in rope between front of rack and ratchet prusik
56. Engage the second bar	56a. With the control hand 56b. Onto the rack 56c. Slide bar up until it engages rope near the first bar
57. Using the brake hand, pass the running end of the lowering line under the second bar	57a. Bringing running end of rope completely over the second bar 57b. Stopping when the running nd of the rope is towards the load

OPERATIONS	KEY POINTS
58. Engage the third bar	58a. With the control hand 58b. Onto the rack 58c. Slide bar up until it engages rope near the second bar
59. Using the brake hand, pass the running end of the lowering line over the third bar	59a. Bringing running end of rope completely under the third bar 59b. Stopping when the running end of the rope is towards the load
60. Engage the fourth bar	60a. With the control hand 60b. Onto the rack 60c. Slide bar up until it engages rope near the third bar
61. Using the brake hand, pas the running end of the lowering line under the fourth bar	61a. Bringing running end of rope completely over the fourth bar 61b. Stopping when the running end of the rope is towards the load
NOTE: Always use a minimum of four bars for a single person load and all six bars for a two person load	
62. Bring the running end of the lowering line	62a. Completely over the fourth bar 62b. Stopping when the running end of the rope is towards the load 62c. Brake hand up in front of brake bar rack
63. Wrap the running end of the lowering line	63a. Completely over the fourth bar 63b. With the brake hand
64. Wrap the running end of the lowering line	64a. Between the two legs of the rack 64b. Capturing the fourth bar

OPERATIONS	KEY POINTS
65. Repeat operations 63 and 64	
66. Tie an overhand on a bight to secure the brake bar rack	66a. As per previous instruction
67. Unlock the carabiner on the load release strap	
68. Open gate and remove carabiner from bight formed in load release strap	68a. Leaving carabiner in loop end of load release strap
69. Pull carabiner to remove bight from center of load release strap	
70. Slowly unwrap load release strap	70a. Until load is resting on brake bar rack
71. Unlock carabiner holding the ratchet prusik	
72. Remove ratchet prusik from carabiner	
73. Remove the ratchet prusik from rope	
74. Return ratchet prusik to carabiner	
75. Rebuild CMC Load Release Strap	75a. As per previous instruction

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 CONSTRUCT AND OPERATE A TANDEM PRUSIK BELAY SYSTEM

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, GISO 5157 and NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a rope, hardware and software

Behavior: The student will construct and safely operate a tandem prusik belay system

Standard: Completing all operations within 15 minutes according to the job breakdown with 100% accuracy

MATERIALS NEEDED:

- Job breakdown
- One rope bag
- One 15' webbing
- 3 steel carabiners
- One load releasing hitvh
- One short prusik
- One long prusik

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: In all emergency rope operations, an important part of the rope system is the utilization of a belay line (safety line or back-up line). This belay line is used to catch the load in the event of a main line failure.

OPERATIONS		KEY POINTS	
1.	Tie webbing sling around anchor point	1a.	Using webbing to form a Basket Sling or Multi-loop anchor
2.	Attach load releasing hitch to anchor sling	2a.	Using steel carabiner
		2b.	Lock carabiner
3.	Attach short prusik to rope life line	3a.	To the running end of the belay line
		3b.	Using three wrap prusik hitch
4.	Attach long prusik to rope life line	4a.	In front of the short prusik on the belay line
		4b.	Using three wrap prusik hitch
		4c.	Between short prusik and the load
5.	Attach both prusiks to load end of load releasing hitch	5a.	Using steel carabiner
		5b.	Long prusik first
		5c.	Short prusik second
		5d.	Lock carabiner
6.	Attach end of life line to load	6a.	Using steel carabiner
		6b.	Lock carabiner
7.	Place Prusik Minding Hand(PMH) around tandem prusik hitches and rope	7a.	Form a circle with the index finger and thumb around the line and against the load side of the long prusik
		7b.	Slide long prusik toward anchor until it contacts the short prusik and rest the remaining fingers of the PMH around the long and short prusiks

OPERATIONS		KEY POINTS	
8.	With PMH, slide tandem prusiks towarad the anchor	8a.	Develop 2”-3” OF slack
9.	Place Control Hand (CH) around load side of rope	9a.	Angle the line to form a “Z” by rotating the hand and wrist
10.	As load moves away from anchor, pull line through tandem prusiks	10a.	Maintain less than 2 feet of slack in the line
11.	When CH reaches arm’s length	11a.	Repeat steps 9 and 10
12.	Set prusiks when directed	12a.	Slide / push tandem prusiks toward the load with PMH

APPLICATION:

The student will practice constructing and operating a tandem prusik belay system while under supervision.

EVALUATION:

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

ASSIGNMENT:

Practice constructing and operating a tandem prusik belay system in order to prepare yourself for the upcoming performance test. Study for our next session.

TOPIC:	How To Convert A Tandem Prusik Belay System To A Retrieval Line
TIME FRAME:	0:15
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a Tandem Prusik Belay System, pulleys, carabiners, anchor sling and appropriate PPE
Behavior:	The student will convert a Tandem Prusik Belay System to a retrieval line
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 Tandem Prusik Belay System
- 1 - 15 foot anchor sling
- 1 carabiner
- 1 rescue pulley
- 1 prusik minding pulley

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To perform a quick non-entry rescue, a few basic rope skills must be mastered. The accuracy and speed with which these basic skills are employed, can make a difference in the outcome of the rescue operation.

OPERATIONS	KEY POINTS
1. Form a Multi-loop anchor sling	1a. Around an anchor
2. Attach a Tandem Prusik Belay System (Module 5, Lesson 1)	2a. To the anchor sling 2b. Lock the carabiner
3. Detach long prusik from carabiner	3a. At end of load releasing strap
4. Slide three wrap long prusik toward load	4a. Approximately 3 feet in front of the short prusik
5. Form a bight in the belay line	5a. Behind the short prusik
6. Attach prusik minding pulley	6a. To the bight formed in the belay line
7. Attach the prusik minding pulley	7a. To the carabiner at the end of the load releasing strap 7b. Lock the carabiner
8. Form a bight	8a. In the running end of the belay line
9. Attach a mechanical advantage pulley	9a. To the bight formed in the belay line
10. Attach a carabiner	10a. To the mechanical advantage pulley 10b. Bite down 10c. Flip up
11. Attach the carabiner with mechanical pulley	11a. To the long prusik 11b. Lock the carabiner
12. Extend the long prusik as far as possible toward the load	12a. To ensure the longest haul and fewest resets
13. Pull on the running end of the line	13a. To retrieve the load

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 Construct And Operate A 2:1 Ladder Rig Mechanical Advantage System

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given rope, carabiners, pulleys, high directional anchor point, appropriate PPE

Behavior: The student will construct and operate a 2:1 ladder rig mechanical advantage system

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 – 200 foot section of rope
- 2 carabiners
- 2 pulleys
- High anchor point

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: The simple 2:1 mechanical advantage system is a versatile confined space rope rescue system that combines ease of construction with portability.

OPERATIONS	KEY POINTS
1. Tie a figure eight on a bight	1a. In the working end of the rope 1b. Keeping the bight small (approximately 1-2 inches)
2. Form a large loop with the running end	2a. Around the figure eight on a bight 2b. 2 to 3 feet in diameter
3. Place a change of direction pulley	3a. Above the figure eight on a bight 3b. Below the loop
4. Place a mechanical advantage pulley	4a. Opposite the pulley in #3
5. Place the running end of the rope	5a. Through the mechanical advantage pulley
6. Attach a carabiner	6a. To the mechanical advantage pulley
7. Place the running end of the rope	7a. Through the change of direction pulley
8. Attach a carabiner	8a. To the change of direction pulley
9. Attach the figure eight on a bight to the carabiner holding the change of direction pulley	
10. Attach the change of direction pulley	10a. To the high directional anchor 10b. Bite down, so carabiner locks in downward direction 10c. Lock carabiner
11. Attach the mechanical advantage pulley	11a. To the load 11b. Bite down, flip up 11c. Lock carabiner
12. Pull on the running end of the rope	12a. To operate the 2:1

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 Construct And Operate A 3:1 Z-Rig Mechanical Advantage System Through a High Point Anchor

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a RPM, rescue rope, pulleys, carabiners, appropriate PPE, anchor slings, suitable high anchor point

Behavior: The student will construct and operate a 3:1 Z-rig mechanical advantage system

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 anchor plate
- 1 brake bar rack
- 1 load release strap
- 1 prusik minding pulley
- 3 rescue pulleys (or PMP's)
- 1 20 foot anchor sling
- 2 5 foot anchor slings
- 1 short prusik
- 1 long prusik
- 1 150 foot rescue rope
- 9 carabiners
- 1 swivel (optional)
- Tripod, or other suitable high anchor point

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: The Z-rig is a simple to construct, and simple to operate, mechanical advantage system. It can be easily incorporated into most confined space rescues.

OPERATIONS	KEY POINTS
1. Form a multi-loop anchor sling	1a. Around the anchor
2. Attach the completed RPM	2a. To the anchor sling
3. Tie a figure eight on a bight	3a. As per previous instruction
4. Attach a carabiner to the figure eight on a bight	4a. Bite down 4b. Flip up
5. Place the figure eight on a bight	5a. Near the space
6. Form a multi loop anchor sling	6a. Around the top of the high directional
7. Attach a directional pulley to the rope	7a. Approximately. 10 feet from the figure eight on a bight 7b.For use as the high directional
8. Attach a carabiner to the high directional pulley	
9. Attach high directional pulley system to the high directional anchor	9a. Bite down 9b. Flip up 9c. Lock the carabiner
10. Form a multi loop anchor sling	10a. Around the low directional anchor
11. Attach a directional pulley to the rope	11a. Appx. 10 feet below the high directional pulley
12. Attach a carabiner to the low directional pulley	
13. Attach low directional pulley system to the low directional anchor	13a. Bite down 13b. Flip up 13c. Lock the carabiner

OPERATIONS	KEY POINTS
14. Attach the figure eight on a bight to a simulated rescue load	14a. Bite down 14b. Flip up 14c. Lock the carabiner
15. Attach the short prusik loop from the RPM to the main line	15a. Three wrap 15b. Per previous instruction
16. Attach the short prusik	16a. To the carabiner at the end of the load release strap 16b. Lock the carabiner
17. Form a bight in the main line	17a. Behind the short prusik
18. Attach the prusik minding pulley	18a. To the bight formed in the main line
19. Attach the prusik minding pulley	19a. To the second carabiner at the end of the load release strap 19b. Lock the carabiner
20. Attach the long prusik loop	20a. To the main line 20b. Appx. 3 feet in front of the short prusik
21. Form a bight	21a. In the running end of the main line
22. Attach a mechanical advantage pulley	22a. To the bight formed in the main line
23. Attach a carabiner	23a. To the mechanical advantage pulley 23b. Bite down 23c. Flip up
24. Attach the carabiner with mechanical advantage pulley	24a. To the long prusik loop 24b. Lock the carabiner

OPERATIONS	KEY POINTS
25. Extend the long prusik as far as possible	25a. To ensure the longest haul and fewest resets
26. Pull on the running end of the main line	26a. To raise the load

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 Construct And Operate A 3:1 Piggyback Mechanical Advantage System

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a RPM, rescue ropes, pulleys, carabiners, appropriate PPE, anchor slings

Behavior: The student will construct and operate a 3:1 piggyback mechanical advantage system

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 anchor plate
- 1 brake bar rack
- 1 load release strap
- 1 prusik minding pulley
- 1 rescue pulley (or PMP)
- 1 20 foot anchor sling
- 1 short prusik
- 1 long prusik
- 1 150 foot rescue rope
- 6 carabiners
- Host rope (to attach piggyback to)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most confined space operations, a few basic knots must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Form a multi loop anchor sling	1a. Around the anchor
2. Attach an RPM	2a. To the anchor sling 2b. Lock the carabiner
3. Tie a figure eight on a bight	3a. As per previous instruction 3b. In the working end of the piggyback rope
4. Attach a carabiner to the figure eight on a bight	4a. Bite down 4b. Flip up
5. Attach the short prusik from the RPM to the piggyback line	5a. Three wrap
6. Attach the short prusik	6a. To the carabiner at the end of the load release strap 6b. Lock the carabiner
7. Form a bight in the piggyback line	7a. Behind the short prusik
8. Attach the prusik minding pulley	8a. To the bight formed in the piggyback line
9. Attach the prusik minding pulley	9a. To the second carabiner at the end of the load release strap 9b. Lock the carabiner
10. Attach the long prusik loop	10a. To the piggyback line 10b. Approximately 3 feet in front of the short prusik
11. Form a bight	11a. In the running end of the piggyback line
12. Attach a mechanical advantage pulley	12a. To the bight formed in the piggyback line

OPERATIONS	KEY POINTS
13. Attach a carabiner	13a. To the mechanical advantage pulley 13b. Bite down 13c. Flip up
14. Attach the carabiner with mechanical advantage pulley	14a. To the long prusik loop 14b. Lock the carabiner
15. Extend the long prusik as far as possible	15a. To ensure the longest haul and fewest resets
16. Attach a prusik to the main line	16a. Three wrap 16b. To be used as the hauling point for the piggyback system
17. Attach the figure eight on a bight with carabiner referenced in #4	17a. To the prusik attached to the main line
18. Pull on the running end of the main line	18a. To raise the load

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 Construct And Operate A 4:1 Mechanical Advantage System

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a rope, double sheave pulleys, carabiners, overhead anchor, appropriate PPE

Behavior: The student will construct and operate a 4:1 mechanical advantage system.

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 - 200 foot section of rope
- 2 double sheave pulleys
- 3 carabiners
- An overhead anchor

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: The simple 4:1 mechanical advantage system is a versatile confined space rescue rope system that combines ease of construction with portability.

OPERATIONS	KEY POINTS
1. Tie a figure eight on a bight	1a. In the working end of the rope 1b. Keeping the bight small (approximately 1-2 inches)
2. Form a large loop with the running end	2a. Around the figure 8 on a bight 2b. 2 to 3 feet in diameter
3. Place a double sheaved change of direction pulley (with a becket)	3a. Above the figure eight on a bight 3b. Below the loop 3c. Becket facing the figure eight on a bight
4. Place a double sheaved mechanical advantage pulley (becket optional)	4a. Opposite the pulley system in number 3 4b. Becket facing the other becket (if so equipped)
5. Attach a carabiner	5a. To the figure eight on a bight
6. Attach figure eight on a bight with carabiner	6a. To the becket of the change of direction pulley 6b. Bite down, so carabiner is locking downward 6c. Lock the carabiner
7. Place the running end of the rope through the mechanical advantage pulley	7a. Through the bottom sheave
8. Place the running end of the top loop through the change of direction pulley	8a. Also through the bottom sheave
9. Make a second large loop with the running end	9a. 2-3 feet in diameter 9b. Around both pulleys
10. Place the running end of the second loop through the mechanical advantage pulley	10a. Through the top sheave

OPERATIONS	KEY POINTS
11. Place the running end of the second loop through the change of direction pulley	11a. Also through the top sheave
12. Attach a carabiner	12a. To the change of direction pulley
13. Attach the change of direction pulley system with carabiner	13a. To the high anchor point 13b. Bite down, so carabiner is locking downward 13c. Lock the carabiner
14. Attach a carabiner	14a. To the mechanical advantage pulley system 14b. Bite down, so carabiner is locking downward
15. Attach the mechanical advantage pulley system	15a. To the load 15b. Lock the carabiner
16. Pull on the running end of the rope	16a. To operate the 4:1

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 Construct And Operate A 4:1 Pre-Rig Mechanical Advantage System
TIME FRAME:	0:15
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a rope, CMC Rescue CSR Pulley Set, carabiners, overhead anchor and appropriate PPE
Behavior:	The student will construct and operate a 4:1 pre-rig mechanical advantage system
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 - 200 foot section of rope
- 1 CMC Rescue CSR Pulley Set
- 3 carabiners
- An overhead anchor

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: The simple 4:1 mechanical advantage system is a versatile confined space rescue rope system that combines ease of construction with portability.

Note: This lesson plan applies to the CMC Rescue CSR Pulley set. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Tie a figure eight on a bight	1a. In the working end of the rope 1b. Keeping the bight small (approximately 1-2 inches)
2. Form a large loop with the running end	2a. Around the figure eight on a bight 2b. 2 to 3 feet in diameter
3. Place the top pulley system	3a. Above the figure eight on a bight 3b. Below the loop 3c. Becket and cam facing the figure eight on a bight 3d. Ensure the cam is pinned in the open position
4. Place the bottom pulley system	4a. Opposite the top pulley system 4b. Becket facing the top pulley system
5. Attach a carabiner	5a. To the figure eight on a bight
6. Attach figure eight on a bight with carabiner	6a. To the becket on the top pulley system 6b. Lock the carabiner
7. Place the running end of the rope through the bottom pulley system	7a. Between the gold and blue sheaves 7b. From right to left
8. Place the running end of the top loop through the top pulley system	8a. Between the gold and blue sheaves 8b. From left to right
9. Make a second large loop with the running end	9a. 2-3 feet in diameter 9b. Around both pulley sets
10. Place the running end of the second loop through the bottom pulley system	10a. Between the blue and red sheaves 10b. From right to left

OPERATIONS	KEY POINTS
11. Place the running end of the top loop through the top pulley system	11a. Between the blue and red sheaves 11b. From left to right
12. Place the running end of the rope	12a. Through the slot opposite the cam 12b. Release the pin holding the cam open
13. Ensure the 15 foot supplied cord is attached to the cam	13a. For remote operation of the cam
14. Attach a carabiner	14a. To the top pulley system
15. Attach the top pulley system	15a. To the high anchor point 15b. Bite down 15c. Flip up 15d. Ensure carabiner is locking in downward position
16. Attach a carabiner	16a. To the bottom pulley system 16b. Bite down 16c. Flip up 16d. Ensure carabiner is locking in downward position
17. Attach the bottom pulley system	17a. To the load 17b. Lock the carabiner
18. Pull on the running end of the rope	18a. To raise the load slightly 18b. Unweighting the cam
19. Pull down on the 15 foot cord	19a. To hold the cam open
20. Lower load slowly	20a. Hand over hand
21. Release 15 foot cord	21a. To hold the load in position

OPERATIONS	KEY POINTS
22. Pull on the running end of the rope	22a. To raise the load 22b. Cam will self tend

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 Two Half Hitches
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a tie rope, appropriate PPE and a vertical anchor point
Behavior:	The student will wrap the rope around a vertical anchor point and secure it with two half hitches
Standard:	Completing all operations with 100% accuracy according to the job breakdown
MATERIALS NEEDED:	• Job breakdown • 1 length of ½" tie rope • 1 vertical anchor point
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9
PREPARATION:	To complete most rescue systems, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation

OPERATIONS	KEY POINTS
1. Pass the working end of the rope	1a. Around a vertical anchor point 1b. 2' from the working end 1c. With the dominant hand
2. Pass the working end of the rope	2a. Over the standing part 2b. Forming a loose loop around the anchor point
3. Pass the working end of the rope	3a. Up and through the loop 3b. From below the loop
4. Remove any slack	4a. From the loop 4b. To form the first half hitch 4c. By pulling the working end
5. Pass the working end of the rope	5a. Under the standing part
6. Pass the working end of the rope	6a. Down through the loop 6b. From above the standing part
7. Remove any slack	7a. To form the second half hitch
8. Dress the hitches	

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 Round Turn And Two Half Hitches
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given webbing, appropriate PPE and an anchor point
Behavior:	The student will wrap the webbing around an anchor point and secure with a round turn and two half hitches
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 5' length of 1" webbing
- 1suitable anchor point

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most rescue systems, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Pass the working end of the webbing	1a. Around the anchor point 1b. 1½ times
2. Remove any slack	2a. In the round turn 2b. By pulling on the working end of the webbing
3. Form two half hitches	3a. Around the standing part of the webbing 3b. As per previous instruction
4. Remove any slack	4a. In the hitches 4b. By pulling on the working end of the webbing

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 A Hasty Chest Harness (Double Locking Larksfoot) To A Victim
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given webbing, tie rope, appropriate PPE and a carabiner
Behavior:	The student will tie and attach a hasty chest harness to a simulated victim
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

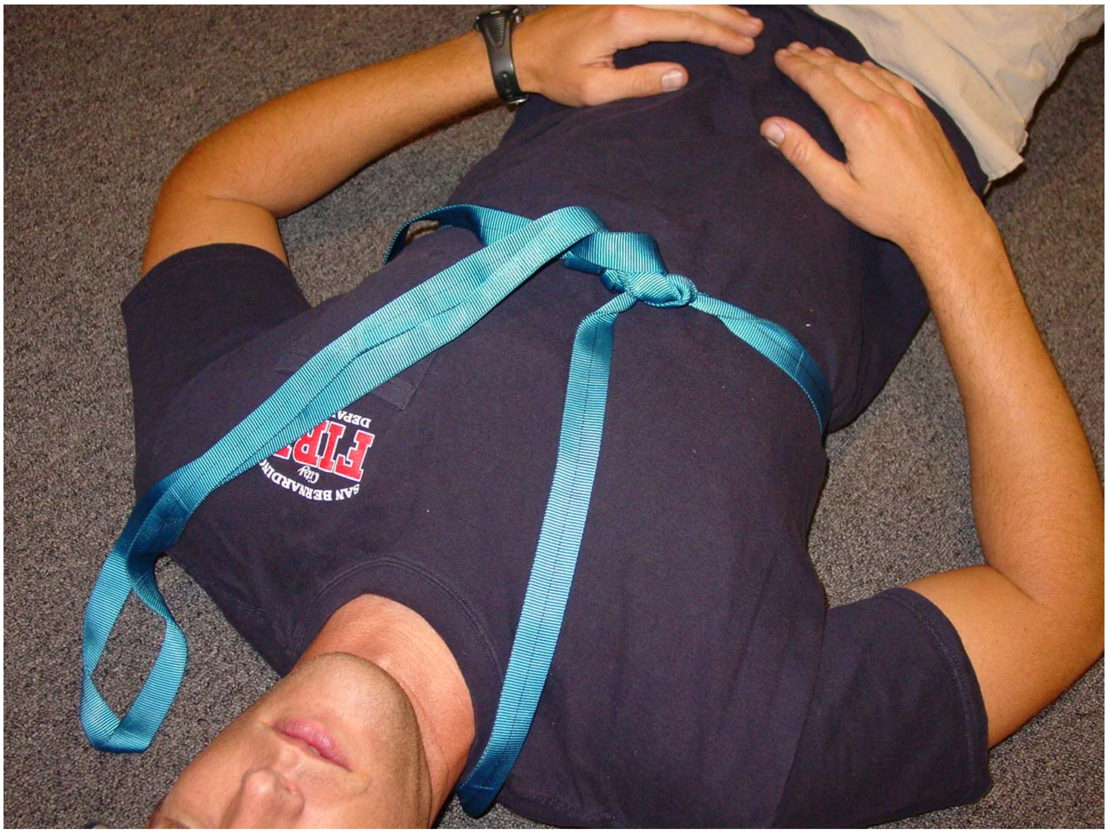
- Job breakdown
- 1 - 12'-15' length of 1" webbing
- 1 - length of ½" tie rope
- 1 carabiner

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.



OPERATIONS	KEY POINTS
1. Tie an overhand bend	1a. In the webbing 1b. Forming a sling
2. Place the webbing sling	2a. Place victim's left arm through sling
3. Place overhand bend	3a. Near rear of the left shoulder of the victim 3b. Allowing webbing sling to hang freely from the left shoulder of the victim
4. Use right hand to grasp webbing sling	4a. Pull all slack webbing to the rear of the victim's torso
5. Slide right hand	5a. Allowing webbing to slide through your hand 5b. Pass webbing under the right arm of victim 5c. Pulling all slack webbing to front of victim's body 5d. Causing webbing to tighten around victim's left shoulder
6. Wrap webbing	6a. Underneath portion of webbing sling pulled tight around victim's left shoulder 6b. Pulling all slack webbing through and pulling tight across the chest, back, and left shoulder of victim
7. Grasp bight of webbing	7a. Pass bight between the two horizontal pieces of webbing across victim's chest 7b. Pass bight behind vertical webbing located around victim's left shoulder/ chest
8. Pull tight	8a. Ensure all slack is removed from webbing sling

OPERATIONS	KEY POINTS
9. Secure free end of webbing sling	9a. Using a minimum of two half hitches around horizontal webbing across victim's chest
10. Attach carabiner	10a. To all horizontal lengths of webbing across victim's chest
11. Tie a figure eight on a bight	11a. Using tie rope
12. Attach rope to carabiner	
13. Lock carabiner	

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 Wristlets And Anklets
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given webbing, tie rope, appropriate PPE and a carabiner
Behavior:	The student will tie and attach wristlets/anklets to a simulated victim
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 - 12'-15' length of 1" webbing
- 1 - length of ½" tie rope
- 1 carabiner

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Tie an overhand bend	1a. In the webbing 1b. Forming a sling
2. Grasp webbing	2a. At either end of webbing sling
3. Form a small bight	3a. Approximately 8” – 12” 3b. At the end of either webbing sling
4. Hold bight in webbing	4a. Using one hand
5. Reach through bight	5a. With other hand
6. Grasp both strands of webbing	6a. Pull webbing back through the bight 6b. Approximately 12” – 18” or enough to fit over victim’s wrist or ankle 6c. Creating a Lark’s Foot (Girth Hitch)
7. Place newly created loop around victim’s limb	7a. Wrist or ankle, whichever is presenting or preferred
8. Pull tight	8a. Ensure all slack is removed from webbing sling
9. Hold secure	9a. To ensure that it does not slip off of victim
10. Grasp webbing	10a. At opposite end of webbing sling
11. Form a small bight	11a. Approximately 8” – 12” 11b. At the end of webbing sling
12. Hold bight in webbing	12a. Using one hand
13. Reach through bight	13a. With other hand

OPERATIONS	KEY POINTS
14. Grasp both strands of webbing	14a. Pull webbing back through the bight 14b. Approximately 12" – 18" or enough to fit over victim's remaining wrist or ankle 14c. Creating a Lark's Foot (Girth Hitch)
15. Place newly created loop around victim's limb	15a. Remaining wrist or ankle, whichever is presenting or preferred
16. Pull tight	16a. Ensure all slack is removed from webbing sling
17. Hold secure	17a. To ensure that it does not slip off of victim
18. Attach carabiner	18a. To all portions of webbing between victim's captured limbs
19. Tie a figure eight on a bight	19a. Using tie rope
20. Attach rope to carabiner	
21. Lock carabiner	

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 Secure A Victim To A Rescue Litter
TIME FRAME:	0:20
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given webbing, appropriate PPE and a rescue litter
Behavior:	The student will secure a victim to a rescue litter
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

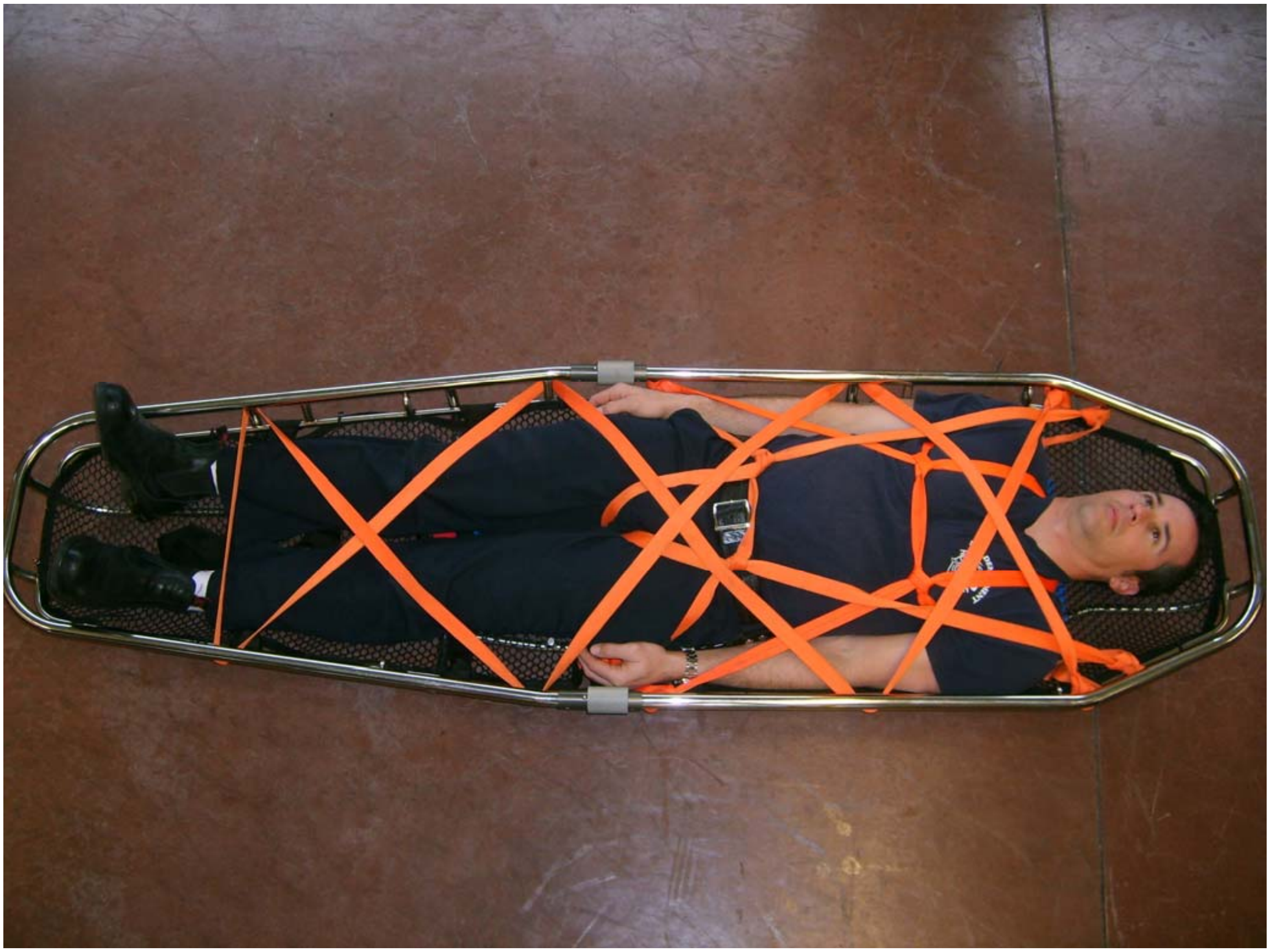
- Job breakdown
- 3 - 20' lengths of 1" webbing
- 1 rescue litter

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION:

To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.



OPERATIONS	KEY POINTS
1. Lay a length of webbing	1a. Across litter 1b. At level of victim's crotch 1c. Transverse to the litter 1d. With midpoint of webbing at the center of litter
2. Form an 18" loop	2a. In a length of webbing 2b. With the loop at the midpoint of the webbing
3. Lay loop in the litter	3a. At the location of the victim's head 3b. With cross at the location of the victim's shoulder blades 3c. With webbing ends laying over main frame 3d. One end on each side
NOTE: Have a student lie on their back in the rescue litter	
CHEST LASH	
4. Pass loop	4a. Over victim's head 4b. To nipple line
5. Wrap webbing ends	5a. Under each arm 5b. Through loop at chest
6. Remove slack	6a. Ensuring crossed webbing at victim's shoulder blades does not ride up on neck
7. Tie an overhand knot	7a. In the webbing around the loop 7b. At the point it passes over the nipples 7c. Both sides

OPERATIONS	KEY POINTS
8. Tie a round turn and two half hitches	8a. At the ends of the webbing 8b. Around a rib of litter below the victim's waist 8c. Where the rib meets the main frame 8d. Removing slack 8e. To secure the webbing
PELVIC LASH	
9. Pull midpoint of webbing	9a. Through legs 9b. Up to victim's waist 9c. Creating a 6" triangle
10. Wrap webbing	10a. Around the thighs
11. Pass ends of webbing	11a. Through the triangle 11b. Pulling up towards the shoulder 11c. Removing slack
12. Tie an overhand knot	12a. In the webbing 12b. At the point it passes through the triangle 12c. Both sides of triangle
13. Tie a round turn and two half hitches	13a. At the ends of the webbing 13b. Around a rib of litter near the victim's shoulders 13c. Where the rib meets the main frame 13d. Removing slack 13e. To secure the webbing

OPERATIONS	KEY POINTS
EXTERIOR LASH	
14. Place one length of webbing	14a. Across the victim's legs 14b. Below the knees 14c. Midpoint of the webbing between the victim's lower legs
15. Pass the ends of the webbing	15a. Around the rib 15b. Below the victim's knees 15c. Both sides 15d. Where the rib meets the main frame 15e. Removing slack 15f. Do not wrap the main frame
16. Cross the webbing	16a. At victim's knees
17. Pass the ends of the webbing	17a. Around the next rib 17b. Moving towards the head 17c. Both sides 17d. Where the rib meets the main frame 17e. Removing slack
18. Repeat Operations 16 and 17	18a. Crossing at victim's waist and chest 18b. Until webbing passes around the rib near the shoulder
19. Tie a round turn and two half hitches	19a. At one end of the webbing 19b. Around a rib 19c. Near the victim's shoulder 19d. Where the rib meets the main frame 19e. To secure the webbing

OPERATIONS	KEY POINTS
20. Pull slack	20a.From secured end 20b. Toward free end
21. Tie a round turn and two half hitches	21a. At the end of the webbing 21b. Around a rib 21c. Near the victim's shoulder 21d. Where the rib meets the main frame 21e. To secure the webbing

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 Rig A Litter For Vertical Rescue

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a rescue litter, webbing, carabiners, rescue rope, and appropriate personal protective equipment

Behavior: The student will rig a rescue litter for a vertical rescue

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 rescue litter
- 1 - 5' length of 1" webbing
- 2 carabiners
- 2 rescue ropes
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
SLING METHOD	
1. Wrap one end of 5' webbing	1a. Around the main frame 1b. At the head end of the litter 1c. One wrap starting outside of left skid 1d. In a spiral motion 1e. Two wraps between the skids 1f. Finishing one wrap outside of right skid 1g. Avoiding the weld on the main frame between the center struts
2. Tie an overhand bend	2a. In the webbing
3. Pull center wrap	3a. On main frame 3b. To meet center point of the slin 3c. Forming two bights
4. Adjust overhand bend	4a. So that it is between the main frame and the bights formed in the sling
5. Tie a figure eight on a bight	5a. In the end of the main line 5b. Leaving a 6" tail
6. Tie a figure eight on a bight	6a.In the end of the belay line 6b. Leaving a 6" tail 6c. Forming a 10" bight
7. Attach the main line	7a. To the sling 7b. With a carabiner
8. Lock the carabiner	

OPERATIONS	KEY POINTS
9. Attach the belay line	9a. To the sling 9b. With a carabiner 9c. Opposing carabiner gates
10. Lock the carabiner	
ROPE METHOD	
11. Attach the main line	
12. Tie a loose figure eight	12a. In the main line 12b. 8' from the end
13. Wrap the working end of the main line	13a. Around the head end of the main frame of the rescue litter 13b. One wrap starting outside the left skid 13c. In a spiral motion 13d. Two wraps between the skids 13e. Finishing one wrap outside the right skid 13f. Avoiding the weld on the main frame between the center struts
14. Pull the main line through	14a. Until the figure eight is 15" from the main frame of the rescue litter
15. Tie a figure eight follow through	15a. Using the working end of the main line and the original figure eight knot
16. Dress the knot	
17. Attach the belay line	
18. Tie a loose figure eight	18a. In the belay line 18b. 8' from the end

OPERATIONS	KEY POINTS
19. Wrap the working end of the belay line	19a. Around the head end of the main frame of the rescue litter 19b. Starting outside the left skid 19c. In a spiral motion 19d. Two wraps between the skids 19e. Finishing one wrap outside the right skid 19f. Avoiding the weld on the main frame between the center struts
20. Pull the belay line through	20a. Until the figure eight is 15" from the main frame of the rescue litter
21. Tie a figure eight follow through	21a. Using the working end of the belay line and the original figure eight knot
22. Dress the knot	

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 Rig A Victim In A SKED Litter

TIME FRAME: 0:20

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a SKED Litter and all included straps, ropes, etc., and appropriate personal protective equipment

Behavior: The student will rig a victim in a SKED Litter for a vertical lift

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 SKED Litter with attached straps
- 1 - 30' length of 3/8" static kernmantle rope to be used as a lifting bridle for vertical lifting operations
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Remove SKED Litter from bag	1a. Place on firm ground
2. Unfasten retainer strap	2a. Step on one end of SKED and unroll completely to opposite end
3. Bend the SKED backwards	3a. Bending the SKED Litter in half and “back rolling” it will allow it to lay flat 3b. Repeat several times
4. Lay SKED Litter in a warm area	4a. The SKED Litter will become more manageable and easier to handle after it is allowed to warm up
5. Place victim onto SKED Litter	5a. The technique used to place victim onto the SKED will be determined by the configuration of the confined space, hazards, and medical condition of the victim 5b. “Log Roll”, sliding, and lifting are all options for placing the victim onto the SKED 5c. The SKED does not provide cervical spine immobilization by itself. It may be used in conjunction with other devices (backboard, collar, etc.)
6. Center the victim on the SKED Litter	6a. Slide victim to the center of the stretcher
7. Secure cross straps	7a. Pull (4) cross straps from under the SKED and attach to corresponding buckles directly opposite the straps
8. Secure foot straps	8a. Pull the SKED up against the victim’s feet and secure straps 8b. Feed the foot straps through the unused grommets at the foot end of the SKED and fasten to buckles

OPERATIONS	KEY POINTS
9. Rig SKED for vertical lifting operation	9a. Tie a figure eight on a bight in the center of the provided 30’ length of 3/8” static kernmantle rope 9b. Pass each end of the rope through the grommets at the “head” end of the SKED, pull the knot up snug against the stretcher 9c. Continue feeding rope through unused grommets and carrying handles all the way to the “foot” end of stretcher, ensure that both ends of the rope are fairly even 9d. Pass the rope ends through the grommets at the “foot” end of the SKED from the inside outward. Tie the ends of the rope together with a square knot 9e. Bring the ends of the rope up over the “foot” end of the SKED, pass the rope ends through each carrying handle, secure the rope ends with another square knot, and place a overhand safety on each side
10. Attach main haul line to the SKED Litter for a vertical lifting operation	10a. Attach the main line to the figure eight on a bight located at the “head” end of the SKED Litter

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 Rig A Victim In A LSP Half Back

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a LSP Half Back, Vertical Lift Strap Assembly or Spreader Bar, and appropriate personal protective equipment

Behavior: The student will rig a victim in an LSP Half Back

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 LSP Half Back
- 1 Vertical Lift Strap Assembly or Spreader Bar
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
1. Apply cervical immobilization collar	1a. If applicable
2. Remove the attached head harness	2a. Place nearby
3. Gently place LSP Half Back behind victim	3a. Ensure that straps remain to the outside of victim 3b. Position the sides of the LSP Half Back under the victim's arms
4. Release the padded leg straps	4a. From the velcro retainer straps 4b. Exposing the (2) torso strap pockets on the victim's right side
5. Connect the torso straps	5a. Open the torso strap pockets 5b. Attach both torso straps to the color coded (silver) snaps on the opposite side of the victim's chest 5c. Leave the straps loose
6. Connect the shoulder straps	6a. Open the shoulder strap pockets 6b. Attach both shoulder straps to the color coded (grey) snaps on the victim's chest 6c. Leave the straps loose
7. Tighten the shoulder straps	7a. So that the sides of the vest are directly beneath the victim's underarms
8. Tighten the torso straps	8a. So that the LSP Half Back sits snug against the victim's back

OPERATIONS	KEY POINTS
9. Connect the leg straps	9a. Remove the leg straps from the storage pockets 9b. Start the strap under the victim's leg from the outside 9c. Pull the foam padded portion under the leg 9d. Connect the buckle to the color coded (gold) snap on the same side under the victim's arm 9e. Repeat 9a – 9d for the other leg
10. Tighten the leg straps	10a. So the padded straps are snug against victim's buttocks/ thighs
11. Secure the victim's head	11a. Ensure that the victim's head is resting in the foam "V" of the head portion 11b. Place the head harness around the victims head and secure with the velcro fasteners 11c. Utilize the forehead strap and chin strap to completely secure the victim's head and prevent it from moving
12. Attach vertical lifting device	12a. LSP Vertical Lift Strap or a Spreader Bar may be used 12b. Connect utilizing the silver "D" rings located near the shoulder strap snaps on the victim's chest 12c. Adjust lifting strap or spreader bar as required for vertical lift

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 Pre-Sewn Class III Rescue Harness

TIME FRAME: 0:15

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a Class III (Full-Body) Rescue Harness and appropriate PPE

Behavior: The student will don the harness

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1Class III (Full-Body) Rescue Harness (see note below)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

PREPARATION: To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

NOTE: This lesson plan applies to a specific brand/model of Class III (Full-Body) Rescue Harness. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Loosen the waist strap and the leg loops	1a. As far as possible 1b. Without pulling the web out of the buckles
2. Hold the harness	2a. In front of you 2b. D-ring loop and waist buckle facing front 2c. Straps of leg loops are not twisted
3. Lower the harness	3a. Until leg loops are lying on the ground
4. Step over the waist belt and into the leg loops	
5. Pull up the harness	5a. Waist high
6. Tighten the waist strap	
7. Adjust leg loops	7a. To desired tightness
8. Pull vest over your shoulders and adjust straps	8a. To desired tightness
9. Tie an overhand knot	9a. In the waist strap 9b. Just after it leaves the buckle
10. Tie an overhand knot	10a. In the free ends of the leg loop adjusting straps 10b. Just after they leave the buckles

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 And Operate A Self Contained Breathing Apparatus (Over the Head Method)

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a self contained breathing apparatus (SCBA) and SCBA mask and appropriate PPE

Behavior: The student will don and operate the SCBA using the over-the-head method

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- SCBA
- SCBA Mask

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7
- Manufacturer's Instruction Manual
- Title 8 CCR, G.I.S.O., § 5144

PREPARATION: Atmospheric hazards represent a tremendous threat to rescue personnel during confined space emergencies. Therefore, rescuers are often required to utilize respiratory protection during the course of the rescue.

NOTE: This lesson plan applies to a specific brand/model of SCBA. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Open cylinder valves	1a. Counter clockwise 1b. Open completely 1c. Listen for audible test alarm 1d. Check for full cylinder
2. Check gauge for proper reading	2a. Cylinder must be full
3. Grasp SCBA	3a. With SCBA lying on the ground 3b. Cylinder down, harness facing up 3c. Grasp with both hands 3d. One hand on each side of backing plate or cylinder 3e. No straps between hands 3f. Cylinder valve pointing away from you
4. Lift SCBA	4a. Over the head 4b. Hold elbows close to the body 4c. Let straps slide down arms 4d. Let SCBA slide onto back
5. Balance SCBA	5a. Lean forward at the waist 5b. Balance between shoulder blades
6. Pull down on both shoulder straps	6a. One with each hand 6b. Simultaneously 6c. Firmly
7. Fasten waist strap	7a. Snugly
8. Adjust shoulder and waist strap	8a. Let the weight of SCBA rest at lower back and shoulders

OPERATIONS	KEY POINTS
9. Set mask to face	9a. Chin to chin cup of mask 9b. Pull mask harness over back of head
10. Center mask	10a. On face
11. Center mask harness	11a. On back of the head
12. Tighten straps on mask harness	12a. Side straps 12b. Top strap 12c. According to manufacturers instructions
13. Check mask seal	13a. Cover regulator opening with hand 13b. Inhaling slowly 13c. Exhaling slowly 13d. Insuring proper seal
14. Attach regulator to mask	14a. Match regulator design to mask opening 14b. ¼ turn to right 14c. Latch will slide into locking slot
15. Inhale	15a. Demand valve will open 15b. Breath normally

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 And Operate A Supplied Air Respirator (SAR) And Escape Pack
TIME FRAME:	0:15
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006
BEHAVIORAL OBJECTIVE:	
Condition:	Given a SAR with escape pack and mask and appropriate PPE
Behavior:	The student will don and operate the SAR
Standard:	Completing all operations with 100% accuracy according to the job breakdown
MATERIALS NEEDED:	• Job breakdown • SAR • Mask
REFERENCES:	• Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7 • Manufacturer's Instruction Manual • Title 8 CCR, G.I.S.O., § 5144
PREPARATION:	Atmospheric hazards represent a tremendous threat to rescue personnel during confined space emergencies. Therefore, rescuers are often required to utilize respiratory protection during the course of the rescue operation
NOTE:	This lesson plan applies to a specific brand/mode of Supplied Air Respirator and Escape Pack. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Check for full cylinder	1a. Look at cylinder gauge
2. Attach waist belt around wais	2a. Buckle to front of body 2b. Cylinder will hang at the left hip
3. Guide shoulder strap over right shoulder	3a. Across the chest 3b. Over right shoulder 3c. Down and across the back
4. Adjust all straps and belt to a comfortable wearing position and tightness	4a. This proper fit will then leave regulator and hose hanging to front of right shoulder
5. Attach air supply hose from air source to air inlet hose on escape pack	5a. Rotate and retract locking collar on female fitting of air supply hose 5b. Insert male fitting of escape pack inlet hose 5c. Release locking collar 5d. Check that all fittings are securely locked
6. Grasp mask and prepare for placement on face	6a. With both hands 6b. Thumbs inside harness and straps 6c. Mask lens facing forward
7. Set mask to face	7a. Chin to chin cup of mask 7b. Pull mask harness over back of head
8. Center mask	8a. On face
9. Center mask harness	9a. On back of the head
10. Tighten straps on harness	10a. Side straps 10b. Top straps 10c. According to manufacturers instructions

OPERATIONS	KEY POINTS
11. Check mask seal	11a. Cover regulator opening with hand 11b. Inhaling slowly 11c. Exhaling slowly 11d. Insuring proper seal
12. Attach regulator to mask	12a. Match regulator design to mask opening 12b. ¼ turn to right 12c. Latch will slide into locking slot
13. Inhale	13a. Demand valve will open 13b. Breath normally 13c. Air supply from air source
14. Open escape cylinder only if air supply is interrupted	14a. Counter clockwise 14b. Open completely 14c. Only open if air from primary air source is lost

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 Supplied Air Respirator System
TIME FRAME:	0:15
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a supplied air respirator system, SAR and supplied air line and appropriate PPE
Behavior:	The student will assemble and operate all components of the supplied air respirator system
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Supplied air respirator system (SAR)
- Minimum of one supplied air line

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7
- Manufacturer's Instruction Manual
- Title 8 CCR, G.I.S.O., § 5144

PREPARATION:

To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these basic skills are learned will increase the speed and safety of the entire rescue operation.

NOTE:

This lesson plan applies to a specific brand/model of SAR. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Open cylinder valves	1a. Counter clockwise 1b. Open completely 1c. Listen for audible test alarm 1d. Check for full cylinders
2. Check gauges for proper readings	2a. In accordance with manufacturers instructions 2b. High pressure air 2c. Regulated air pressure
3. Turn cylinder selector valve toward one cylinder	3a. Valve handle will point in the direction of cylinder selected
4. Attach air lines to air supply outlet manifold	4a. Rotate and retract locking collar on female fitting of manifold 4b. Insert male fitting of air line 4c. Release locking collar 4d. Check that fittings are securely locked
5. Attach other end of air line to supplied air respirator	5a. See Lesson Plan # 2 (Module 8)
6. As air is consumed by rescuer, cylinder pressure will decrease	6a. Observe pressure gauge
7. Low pressure alarm will sound	7a. At 500 psi
8. Turn cylinder selector valve to other cylinder	8a. Alarm will automatically shut off
9. Close cylinder valve of used cylinder	9a. Turn clockwise 9b. Close completely
10. Open bleeder valve of used cylinder	10a. To bleed off pressure

OPERATIONS	KEY POINTS
11. Replace used cylinder with full cylinder	11a. Tighten all fittings 11b. Close bleeder valve
12. Open full cylinder	12a. Counter clockwise 12b. Open completely
13. Repeat all steps as air is consumed	

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 Lay Out And Deploy Supplied Air Lines

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a supplied air hose line, a supplied air respirator, air source and appropriate PPE

Behavior: The student will ayout and deploy supplied air lines utilizing both techniques

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Supplied air lines (SAR)
- Supplied air respiratory system

REFERENCES:

- Confined Space Entry and Rescue Manual, 2^{nd} ed (2007), CMC Rescue Inc., Chapter 7
- Manufacturer's Instruction Manual
- Title 8 CCR, G.I.S.O., § 5144

PREPARATION: To complete most rescue operations, a few basic skills must be mastered. The accuracy with which these skills are learned will increase the speed and safety of the entire rescue operation.

OPERATIONS	KEY POINTS
FIGURE EIGHT METHOD	
1. Attach male end of air line to air source.	
2. Using air line, make large figure eight shape on ground.	2a. Start at end of hose, near air source 2b. Approximately 6' – 8' in length
3. Finish figure eight with female fitting on top.	
4. Attach female end to supplied air respirator (SAR).	
5. Air line will deploy without twists as rescuer enters space.	5a. Air line may need to be managed by a line tender to control the amount of air line fed into space
STRAIGHT LINE METHOD	
6. Attach male end of air line to air source.	
7. From air source, stretch out air line in straight lines.	7a. Away from air source and entry point
8. Attach female end to supplied air respirator (SAR).	8a. Bring female end to rescuer

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 Provide Victim Respiratory Protection

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a Victim Respiratory device

Behavior: The student will provide respiratory protection to a victim

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- One Victim Respiratory device

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 7
- Manufacturer's Instruction Manual

PREPARATION: In Confined Space rescue, over 60% of deaths occur due to hazardous atmospheres. To increase the survival profile of the victim, ventilation is the first choice, since it can be performed from outside the space. After entry is made by the rescuer, the next step may be to provide respiratory protection for the victim.

NOTE: These instructions are written for a specific brand of respiratory protection. Instructor must provide student with procedures for the particular brand of device they are using.

OPERATIONS	KEY POINTS
SCBA DEVICE	
1. Using **SCBA** type device, turn on air supply to Victim Respiratory device	1a. Turn valve on bottle counter-clockwise
2. Place mask on victim	2a. Over head and face 2b. Tighten harness straps
3. Check for a good seal on face	3a. Listen and feel for air leaks around mask seal
4. Secure Victim Respiratory device to victim	4a. Using straps and belt
5. Assess victim's respiratory status	5a. Look, listen and feel
HARDLINE DEVICE	
6. Using **Hardline** type device, ensure air is flowing to victim mask	6a. Open purge valve on mask
7. Place mask on victim	7a. Over head and face 7b. Tighten straps on harness
8. Check for a good seal on face	8a. Listen and feel for air leaks around mask seal
9. Assess victims respiratory status	9a. Look, listen and feel

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 Verbal Communication System

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a sender and a receiver

Behavior: The student will demonstrate how tp communicate verbally

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 2 students (sender/receiver)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION: Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

OPERATIONS	KEY POINTS
1. Determine key words to use	1a. Raise 1b. Lower 1c. Stop 1d. OK 1e. Changeover 1f. Help
2. Raise	2a. In a loud and clear voice state the phrase “RAISE”
3. Lower	3a. In a loud and clear voice state the phrase “LOWER”
4. Stop	4a. In a loud and clear voice state the phrase “STOP”
5. OK	5a. In a loud and clear voice state the phrase “OK”
6. Changeover	6a. In a loud and clear voice state the phrase “CHANGEOVER”
7. Help	7a. In a loud and clear voice state the phrase “HELP” three times

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 Hand Signal Communication System
TIME FRAME:	0:05
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a sender and receiver
Behavior:	The student will demonstrate how to communicate using hand signals
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 2 students (sender/receiver)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION:

Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

OPERATIONS	KEY POINTS
1. Determine hand signals	1a. Raise 1b. Lower 1c. Stop 1d. Changeover 1e. Low on air 1f. Help 1g. OK
2. Raise	2a. Arm to side, elbow bent upward at a 90 degree angle 2b. Use hand to make a circular motion
3. Lower	3a. Arm to side, elbow bent downward at a 90 degree angle 3b. Use hand to make a circular motion
4. Stop	4a. Arm to side, elbow bent upward at a 90 degree angle 4b. Use hand to make a fist
5. Changeover	5a. Both arms raised in front of rescuer 5b. Form an “X” in front of your body
6. Low on air	6a. Arm to side, elbow bent at a 180 degree angle back toward rescuer 6b. Place hand in front of throat in a choking motion
7. Help	7a. Both arms to sides, both elbows bent upwards at a 90 degree angle 7b. Hands above head

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 Rope Signal Communication System

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a length of rope, sender and a receiver

Behavior: The student will demonstrate how to communicate with a rope.

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Section of rope
- 2 students

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION: Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

OPERATIONS	KEY POINTS
1. Attach signal rope to entrant (Belay line may be used)	1a. In an accessible location 1b. With a carabiner 1c. Lock the carabiner
2. Determine signal method prior to entry	2a. OATH most common acronym
3. Each letter of the word OATH dictates the number of pulls on the rope	3a. O-1 pull 3b. A-2 pulls 3c. T-3 pulls 3d. H-4 pulls
4. Number of pulls represents the corresponding letter which communicates status and/or needs	4a. O-OK 4b. A-Advance 4c. T-Take up slack 4d. H-Help

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 Light Signal Communication System

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a light source, a sender and a receiver

Behavior: The student will demonstrate how to communicate with a light source

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Flashlight
- Two students (sender & receiver)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION: Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

OPERATIONS	KEY POINTS
1. Obtain a flashlight	
2. Determine signal method prior to entry	2a. OATH most common acronym
3. Each letter of the word OATH dictates the number of flashes	3a. O-1 Flash 3b. A-2 Flashes 3c. T-3 Flashes 3d. H-4 Flashes
4. Number of flashes represents the corresponding letter, which communicates status and/or needs	4a. O-OK 4b. A-Advance 4c. T-Take up slack 4d. H-Help

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 Tapping And Rapping Communication System

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a tapping/rapping tool and a device to rap on, a sender and a receiver

Behavior: The student will demonstrate how to tap/rap to communicate in a confined space

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Tapping/rapping device (wrench, hammer, etc.)
- A source to tap/rap on
- Two students (sender and receiver)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION: Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

OPERATIONS	KEY POINTS
1. Obtain a tapping/rapping device	1a. Carabiner, hand tolls, etc.
2. Determine signal method prior to entry	2a. OATH most common acronym
3. Each letter of the word OATH dictates the number of taps/raps to send	3a. O-1 Tap 3b. A-2 Taps 3c. T-3 Taps 3d. H-4 Taps
4. Number of taps/raps represents the corresponding letter, which communicates entrant status and/or needs	4a. O-OK 4b. A-Advance 4c. T-Take up slack 4d. H-Help

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 Portable Radio Communication System

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given portable radios, sender, receiver

Behavior: The student will demonstrate how to communicate using portable radios

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 2 portable radios
- 2 personnel (sender/receiver)

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION:

Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

OPERATIONS	KEY POINTS
1. Obtain radios	1a. Turn them on 1b. Ensure radios are functional 1c. Change batteries if necessary
2. Select frequency	2a. Ensure all radios are on the same channel
3. Push button to talk	3a. Wait approximately 1 second then speak in a clear voice 3b. Keep transmissions short and to the point 3c. When finished transmitting release the push to talk button
4. Use plain text	4a. Avoid the use of codes and slang

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 Hardwire Communication System
TIME FRAME:	0:20
LEVEL OF INSTRUCTION:	Level II
AUTHORITY	Title 8 CCR, G.I.S.O., § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a hardwire, a sender and a receiver
Behavior:	The student will operate a hardwire communication system
Standard:	Completing all operations according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Con Space Kit 3 (includes)
- 1- CSI-1100 Mini-Command Module
- 1-Talk Box Module
- 1- Cable Splitter
- 1- Head Set with Boom Mic
- 2- Entrant throat mike/speaker sets
- 2- 100 Foot Cables with Connectors
- 1- 10 Foot Cable with Mic Mute Switch

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 11

PREPARATION:

Before a rescue team enters a permit-required confined space, a method of communication must be established. The method of communication used will vary depending on space size, complexity, hazards and availability of communication devices.

NOTE:

This lesson plan applies to the Con-Space Communications Kit III system. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS		KEY POINTS	
1.	Lay out contents of Kit 3		
2.	Locate mini-command module		
3.	Attach splitter to connection on mini-module labeled "Entrant"	3a.	Align orange lines
		3b.	Push and 1/8 turn clockwise to connect
4.	Attach necessary length of cable to one side of splitter for entrant #1	4a.	Align orange lines
		4b.	Push and 1/8 turn clockwise to connect
5.	Attach entrant throat mike\speaker set to other end of cable referenced in #4	5a.	Align orange lines
		5b.	Push and 1/8 turn clockwise to connect
		5c.	For use by entrant
6.	Attach necessary length of cable to second side of splitter for entrant #2	6a.	Align orange lines
		6b.	Push and 1/8 turn clockwise to connect
7.	Attach entrant throat mic/speaker set to other end of cable referenced in #6	7a.	Align orange lines
		7b.	Push and 1/8 turn clockwise to connect
		7c.	For use by second entrant
8.	Attach 10 foot cable with mic mute switch to connection on Mini-Module labeled "Attendant Headset"	8a.	Align orange lines
		8b.	Push and 1/8 turn clockwise to connect
9.	Attach attendant headset to the other end of the 10 foot cable with mic mute switch	9a.	Align orange lines
		9b.	Push and 1/8 turn clockwise to connect

OPERATIONS	KEY POINTS
10. Each entrant should now don their respective throat mic/speaker sets	10a. Throat mic to one side of Adam's apple 10b. Ear mic against ear 10c. Use con-space harness or attach to air system mask
11. Attendant dons attendant headset	11a. Adjust boom mic as needed
12. Attendant turns on mini-module	12a. On/off switch 12b. Adjust volume as needed
13. Attendant ensures Mini-Module is in "Normal" position.	
14. All users speak in a normal tone.	
Using Kit III with the Talk Box	
15. Attach necessary length of cable to connection on mini-module labeled "Entrant"	15a. Align orange lines 15b. Push and 1/8 turn clockwise to connect
16. Attach talk box to end of cable referenced in #15	16a. Align orange lines 16b. Push and 1/8 turn clockwise to connect
17. Repeat steps 8-9	17a.
18. Attendant ensures Mini-Module is in "Talk Box" position.	18a. "Normal/Talk Box switch
19. Perform communication system test	19a. All users speak in a normal tone

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 Lock-Out/ Tag-Out An Electrical Equipment Switch

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a electrical equipment switch, lockout hasp, tag-out tag, lock

Behavior: The student will lock-out and tag-out an electrical equipment switch

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Electrical equipment switch
- Lockout hasp
- Tag-out tag
- Lock
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: The Federal Occupational Safety and Health Administration estimates that failure to control hazardous energy sources accounts for 10% of the serious industrial accidents each year. This equates to approximately 28,000 lost workdays and approximately 120 deaths per year. Knowing how to properly control hazardous energy sources is vital to the success of a confined space rescue. Many times electrical equipment can be placed in a “zero mechanical state” by turning off and locking-out and tagging-out the electrical energy switch attached to the equipment itself. Locking out the switch is accomplished using a lockout hasp.

NOTE: This lesson plan applies to a Brady lockout hasp. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Determine equipment to be de-energized	1a. Equipment within confined space 1b. Equipment near confined space 1c. Equipment that could impact space and rescuers if it turns on or releases product 1d. Determine equipment has electrical cutoff switch attached to the equipment
2. Switch electrical switch off	2a. Consult with facility representative to make sure proper switch is being secured 2b. Determine securing switch will not have a negative impact on operations 2c. Secure power
3. Attach lockout device	3a. Open lockout hasp 3b. Place lockout hasp on switch through holes that line up between switch and housing 3c. Close lockout hasp so holes line up
4. Place tag-out tag	4a. On to lock 4b. Identify on tag the person performing lockout / tagout
5. Insert lock	5a. Through one of the holes on the hasp 5b. Lock the lock 5c. Give key to IC or safety officer

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 Local Supply Ventilation

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a ventilation fan, ducting, power source

Behavior: The student will perform local supply ventilation on a confined space

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

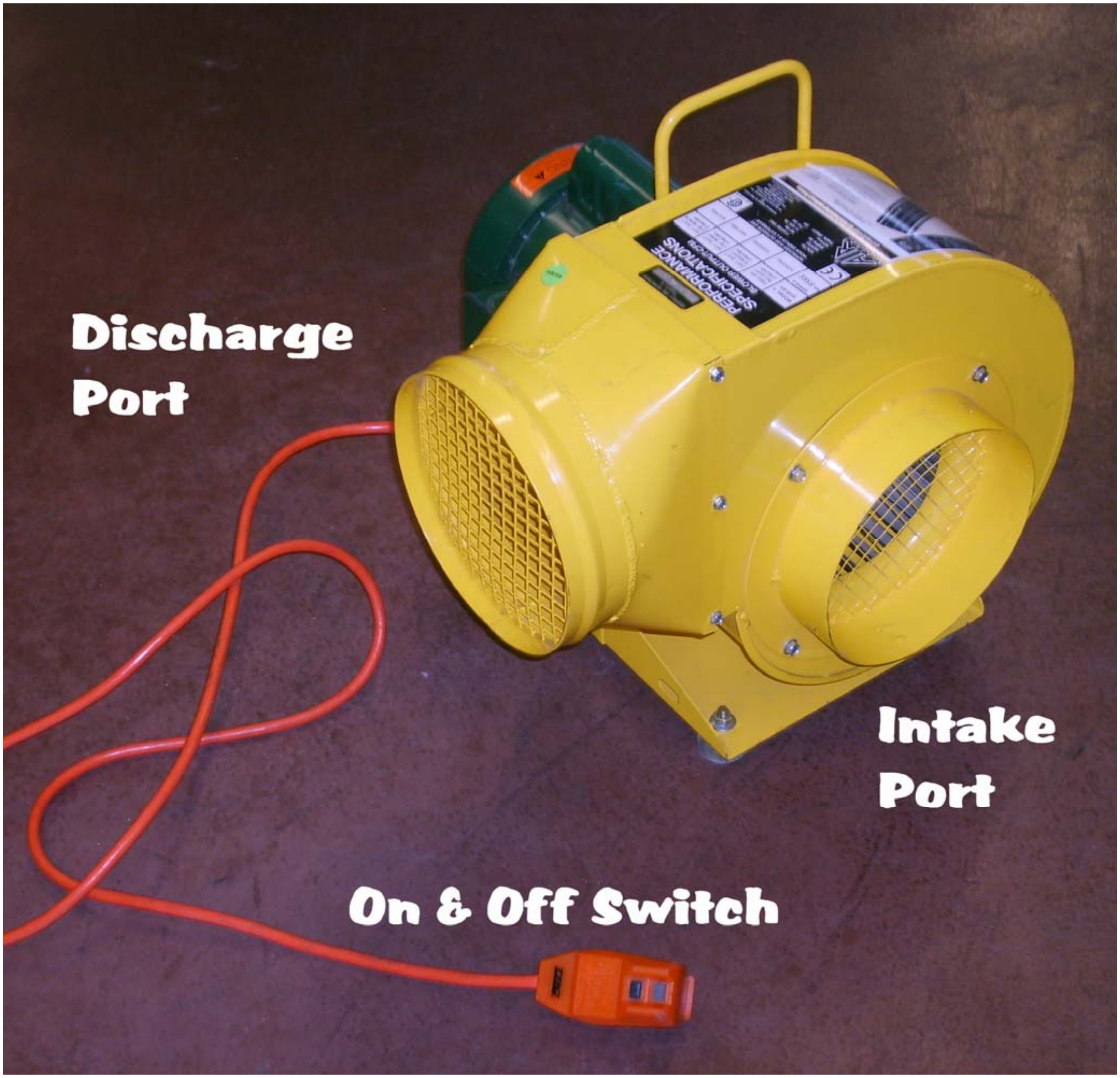
- Job breakdown
- Ventilation fan capable of supply ventilation
- 1 Section of ventilation fan ducting (rigid, wire reinforced, or collapsible)
- Power source
- Confined space
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: Local supply ventilation directs a supply of good air to a victim within a confined space to increase their survivability profile. Ductwork is usually placed just above the victims head with the intent of providing the victim a cone of clean air.

NOTE: This lesson plan applies to a specific centrifugal ventilation fan. You must develop a lesson plan that is specific to the particular brand/model you are using.


Discharge Port
Intake Port
On & Off Switch

OPERATIONS	KEY POINTS
1. Assess space	1a. Note type, size and location of openings
2. Gather and prepare ventilation equipment	2a. Ventilation fan, ducting 2b. Power source for ventilation fan 2c. Supply power to ventilation fan 2d. Test equipment for proper operation
3. Position ventilation fan	3a. Position ventilation fan at the location 3b. Exhaust side of ventilation fan should face the confined space portal
4. Attach ducting	4a. Place an end of the ducting over the exhaust side of the ventilation fan 4b. Secure the ducting by tightening the webbing through the buckle
5. Position ducting	5a. Place ducting into the confined space with the end placed just above the victims head
6. Turn ventilation fan on	6a. Using switch on front of ventilation fan
7. Assess effectiveness of ventilation	7a. Using atmospheric monitor

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 Calculate Ventilation Air Exchanges

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a confined space, tape measure, paper, pencil, ventilation fan, ductwork

Behavior: The student will calculate how long it will take to complete one air exchange within a confined space using a ventilation fan

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ventilation fan
- Ventilation fan ducting (rigid, wire reinforced or collapsible)
- Power source
- Tape measure
- Pencil
- Paper

REFERENCES:

- <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: One step in determining your ventilation plan is to calculate how long it will take to complete one air exchange using your particular ventilation fan. This time can then be multiplied out to figure out how long it will take to complete multiple air exchanges.

OPERATIONS	KEY POINTS
1. Determine the volume of a rectangular space	1a. Measure height, width, and length of space in feet 1b. Multiply measurements together (W x L x H) to determine total volume of space in cubic feet
2. Determine the volume of a cylindrical space	2a. Measure height (h) of space in feet 2b. Measure radius (r) of space in feet 2c. Use formula πr2h to determine volume of space in cubic feet (π= 3.14)
3. Determine time required for one air exchange	3a. Divide volume of space in cubic feet by the cubic feet per minute (CFM) air delivery of your ventilation fan
4. Build in margin of safety	4a. Round up on your space volume and round down on your ventilation fan CFM to make calculation easier and build in a margin of safety

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 Lock-Out/ Tag-Out An Electrical Circuit Breaker

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a circuit breaker panel, circuit breaker, breaker lockout device, tag-out tag, lock

Behavior: The student will lock-out and tag-out a circuit breaker

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Circuit breaker panel
- Circuit breaker
- Breaker lock-out device
- Tag-out tag
- Lock
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: The Federal Occupational Safety and Health Administration estimates that failure to control hazardous energy sources accounts for 10% of the serious industrial accidents each year. This equates to approximately 28,000 lost workdays and approximately 120 deaths per year. Knowing how to properly control hazardous energy sources is vital to the success of a confined space rescue. Many times electrical equipment will have to be placed in a "zero mechanical state" by turning off, locking-out and tagging-out the electrical energy source at the circuit breaker panel. This can be accomplished using a circuit breaker lockout.

NOTE: This lesson plan applies to a Brady "No Hole" breaker lockout. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Determine equipment to be de-energized	1a. Equipment within confined space 1b. Equipment near confined space 1c. Equipment that could impact space and rescuers if it turns on or releases product 1d. Determine equipment needs to be de-energized at circuit breaker panel
2. Locate circuit breaker panel	2a. Utilize facility representatives 2b. Utilize pre-plans if available
3. Switch circuit breaker off	3a. Consult with facility representative to make sure proper breaker is being secured 3b. Determine securing power will not have a negative impact on operations
4. Attach lockout device	4a. Open breaker lockout 4b. Place breaker lockout over secured circuit breaker 4c. Twist lockout thumb wheel to secure lockout device to circuit breaker 4d. Close lid on lockout device
5. Place tag-out tag	5a. On to lock 5b. Identify on tag the person performing lockout/ tagout
6. Insert lock	6a. Through hole on lockout device to prevent device from being opened 6b. Lock the lock 6c. Give key to IC or safety officer

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 Lock-Out/ Tag-Out A Gate Valve
TIME FRAME:	0:05
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a gate valve, gate valve cover, tag-out tag, lock
Behavior:	The student will lock-out and tag-out a gate valve
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Gate valve
- Gate valve cover
- Tag-out tag
- Lock
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION:

The Federal Occupational Safety and Health Administration estimates that failure to control hazardous energy sources accounts for 10% of the serious industrial accidents each year. This equates to approximately 28,000 lost workdays and approximately 120 deaths per year. Knowing how to properly control hazardous energy sources is vital to the success of a confined space rescue. Many times fluid systems or pneumatic or steam systems will have to be placed in a “zero mechanical state” by turning off, locking-out and tagging-out gate valves within the distribution system. This can be accomplished using a gate valve cover.

NOTE:

This lesson plan applies to a North gate valve cover. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Determine distribution systems to be de-energized	1a. Equipment within confined space 1b. Equipment near confined space 1c. Equipment that could impact space and rescuers if it turns on or releases product
2. Locate gate valve(s)	2a. Utilize facility representatives 2b. Utilize pre-plans if available
3. Turn gate valve(s) off	3a. Consult with facility representative to make sure proper valve is being secured 3b. Determine securing system will not have a negative impact on operations 3c. Turn valve off
4. Attach lockout device	4a. Secure proper size gate valve cover 4b. Open gate valve cover and place on valve handle 4c. Cover should rotate freely and not allow valve to be opened back up
5. Place tag-out tag on lock	5a.Identify person performing lockout / tagout on the tag
6. Insert lock	6a. Though holes on gate valve cover 6b. Lock the lock 6c. Give key to IC or safety officer

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 Ventilation Fan
TIME FRAME:	0:05
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a ventilator, ducting work, power source
Behavior:	The student will operate a ventilation fan
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ventilation fan
- 1 Section of ventilator ducting (rigid, wire reinforced or collapsible)
- Power source
- Appropriate personal protective equipment

REFERENCES:

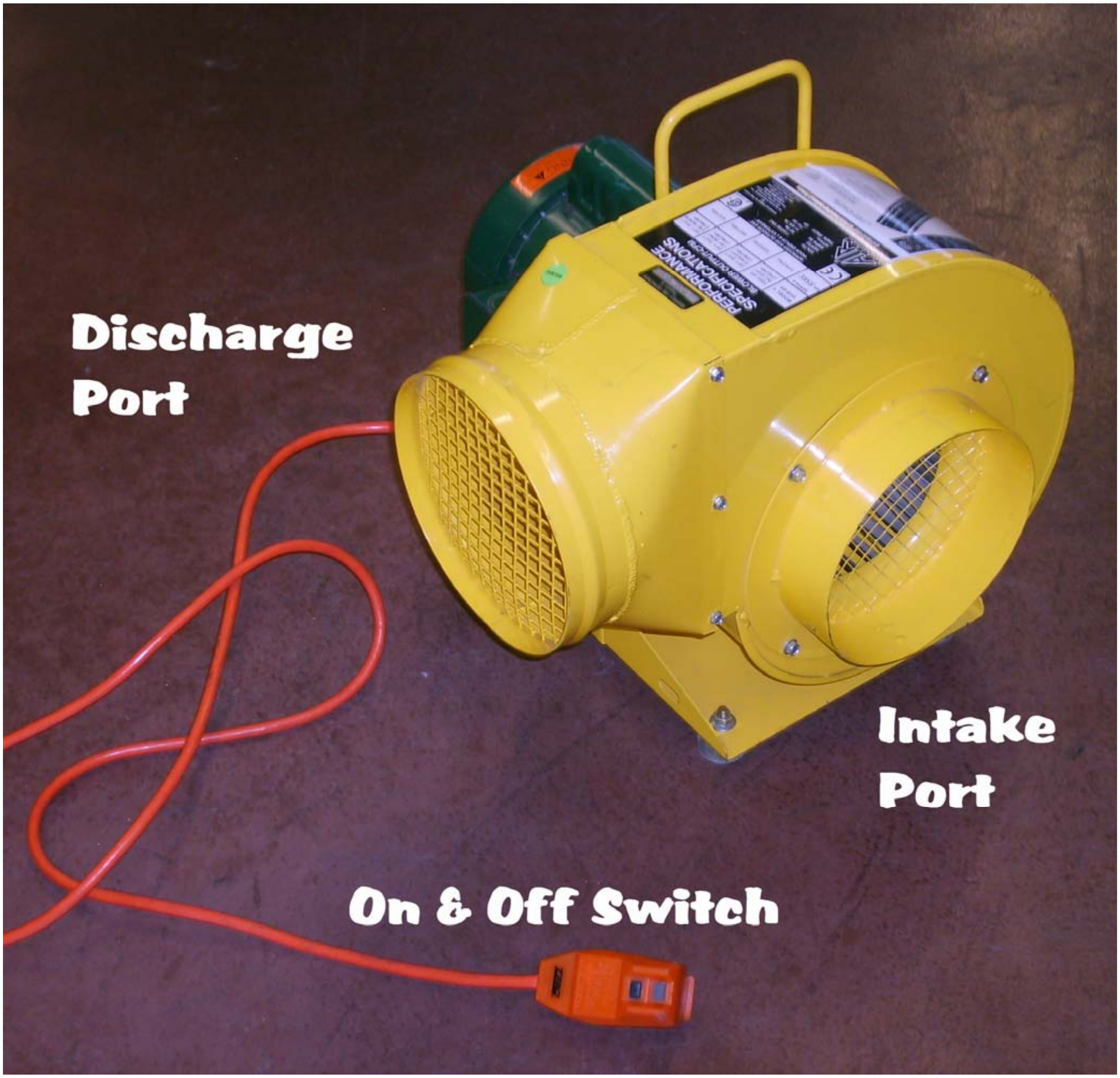
- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION:

The vast majority confined space injuries and fatalities result from a hazardous atmosphere. The best way to prevent or eliminate a hazardous atmosphere is through proper ventilation. There are a variety of ways to ventilate a confined space, however, the most efficient ways utilize some type of mechanical ventilator. The ability to operate a ventilation fan is paramount to providing effective ventilation.

NOTE:

This lesson plan applies to a specific centrifugal ventilation fan. You must develop a lesson plan that is specific to the particular brand/model you are using.


Discharge Port
Intake Port
On & Off Switch
PERFORMANCE SPECIFICATIONS

OPERATIONS	KEY POINTS
1. Chose ventilation fan	1a. Determine type of ventilation required (supply, exhaust, local supply, local exhaust) 1b. Determine type of hazard in space and make sure the ventilator is suited for this type of hazard
2. Position ventilator	2a.Near the confined space portal
3. Supply ventilator with power	3a. Using suitable extension cord
4. Attach ventilation ducting	4a. Place one end of the ducting over the supply or exhaust ports on the ventilator depending on type of ventilation required 4b. Secure webbing through buckle to hold ducting secure 4c. Direct ducting into confined space portal
5. Turn on ventilation fan	5a. Using switch located on front of fan 5b. Move switch in upward direction
6. Assess effectiveness of ventilation	6a. Using atmospheric monitor

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 Ventilation Ducting

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a ventilator, ducting work and power source

Behavior: The student will demonstrate the ability to deploy ventilation ductwork

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ventilator capable of supply and exhaust ventilation
- Minimum 1 Section of ventilator ducting (rigid, wire reinforced, or collapsible)
- Power source
- Confined space
- Appropriate personal protective equipment

REFERENCES:

- <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: The vast majority confined space injuries and fatalities result from a hazardous atmosphere. The best way to prevent or eliminate a hazardous atmosphere is through proper ventilation. Proper ventilation requires use of duct work to direct the air from the ventilator into the confined space and direct it to the most effective location.

OPERATIONS	KEY POINTS
1. Gather and prepare ventilation equipment	1a. Ventilation fan and ducting 1b. Power source for ventilation 1c. Supply power to ventilation 1d. Test equipment for proper operation
2. Position ventilator	2a. Position ventilation at the location
3. Attach duct work (supply ventilation)	3a. Place an end of the duct work over the exhaust side of the ventilation 3b. Secure the ducting by tightening the webbing through the buckle
4. Attach duct work (exhaust ventilation)	4a. Place an end of the ducting over the suction side of the ventilator 4b. Secure the ducting by tightening the webbing through the buckle
5. Position duct work	5a. Place duct work into the confined space to provide optimal ventilation
6. Turn ventilation fan on	6a. Using switch on front of ventilation fan
7. Assess effectiveness of ventilation	7a. Using atmospheric monitor

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 Manhole Saddle Vent

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given ventilation, ducting, saddle vent, 90 degree duct bend, power source

Behavior: The student will Ventilation, ducting, saddle vent, 90 degree duct bend, power source

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ventilation fan
- (2) sections of ventilation ducting (rigid, wire reinforced or collapsible)
- (1) 90^{o} duct bend
- Saddle vent
- Power source
- Confined space
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION:

Ventilation ducting can become a barrier to rescuers entering and exiting a confined space especially when they are confronted with small openings like those typically found on manholes. Saddle vents are designed to conform to the rounded nature of manholes. They are much thinner than the ductwork that attaches to them and can greatly aid in allowing rescuers to enter and exit the space with still providing for efficient ventilation. While saddle vents are designed to be much thinner than ductwork they are also designed so they do not reduce the air delivery of the ventilation

NOTE: This lesson plan applies to an Air Systems International saddle vent. You must develop a lesson plan that is specific to the particular brand/model you are using.

OPERATIONS	KEY POINTS
1. Gather and prepare ventilation equipment	1a. Ventilation fan, ducting, saddle vent, 90 degree bend 1b. Power source for ventilation 1c. Supply power to ventilation 1d. Test equipment for proper operation
2. Position ventilation fan	2a. Position ventilation fan at the location 2b. Exhaust side of ventilation fan should face the confined space portal
3. Attach ducting to ventilation fan	3a. Place one end of the ducting over the exhaust port of the ventilation fan 3b. Secure the ducting by tightening the webbing through the buckle
4. Attach 90 degree bend to saddle vent	4a. Position bend at top of saddle vent 4b. Snap together until bend is securely seated 4c. Bend may be rotated to most optimal position
5. Attach ducting to 90 degree bend	5a. Attach ducting from exhaust side of ventilation fan to 90 degree bend 5b. Secure ducting by tightening the webbing through the buckle
6. Attach ducting to saddle vent	6a. Place second section of ducting on the other end of the saddle vent 6b. Secure the ducting by tightening the webbing through the buckle

OPERATIONS	KEY POINTS
7. Position saddle vent	7a. Place saddle vent onto confined space portal 7b. Secure with rope or webbing to prevent saddle vent from falling into space 7c. Position ducting for optimal ventilation
8. Turn ventilation fan on	8a. Using switch on front of ventilation fan
9. Assess effectiveness of ventilation	9a. Using atmospheric monitor

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 Positive Pressure (Supply) Ventilation

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a ventilation fan, ducting, power source,

Behavior: The student will perform supply ventilation on a confined space

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

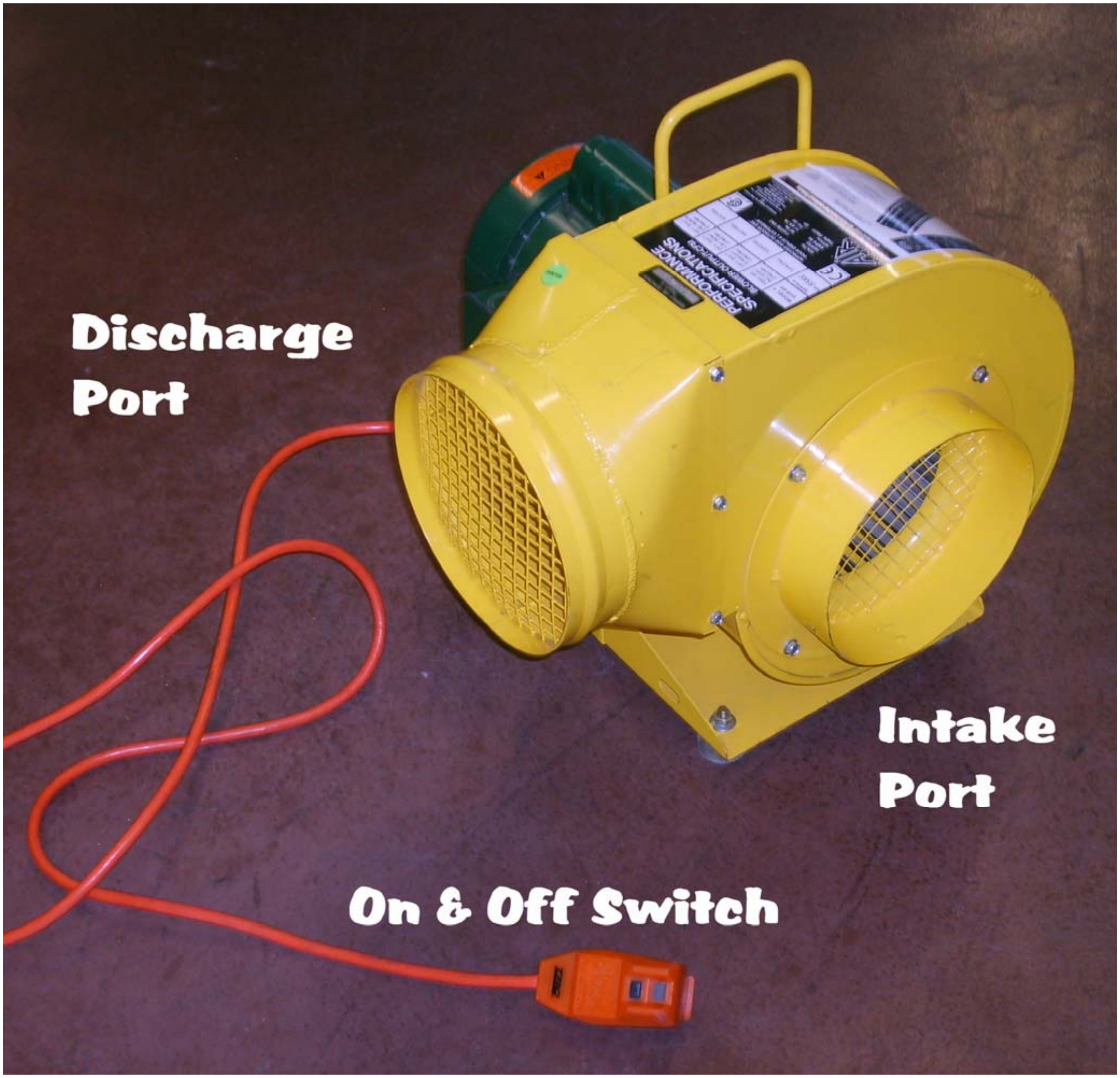
- Job breakdown
- Ventilation fan capable of supply (positive pressure) ventilation
- 1 section of ventilation fan ducting (rigid, wire reinforced, or collapsible)
- Power source
- Confined space
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: Positive pressure or supply ventilation works well when you have a space with relatively low contaminate levels and where the air you displace will not pose a hazard to others.

NOTE: This lesson plan applies to a specific centrifugal ventilation fan. You must develop a lesson plan that is specific to the particular brand/model you are using.


Discharge
Port
Intake
Port
On & Off Switch
PERFORMANCE
SPECIFICATIONS

OPERATIONS	KEY POINTS
1. Assess space	1a. Note the type size and location of space 1b. Determine length of time to ventilate the space considering the volume of the space and the air delivery of the ventilation fan
2. Gather and prepare ventilation equipment	2a. Ventilation fan and ducting 2b. Power source for ventilation fan 2c. Supply power to ventilation fan 2d. Test equipment for proper operation
3. Position ventilation fan	3a. Position the ventilation fan at the location 3b. Exhaust side of ventilation fan should face the confined space portal
4. Attach ducting	4a. Place an end of the ducting over the exhaust port of the ventilation fan 4b. Secure the ducting by tightening the webbing through the buckle
5. Position ducting	5a.Place ducting into the confined space to allow for optimal ventilation
6. Turn ventilation fan on	6a. Using switch on front of ventilation fan
7. Assess effectiveness of ventilation	7a. Using atmospheric monitor

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 Negative Pressure (Exhaust) Ventilation
TIME FRAME:	0:05
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a Ventilation fan, ducting, power source
Behavior:	The student will perform exhaust ventilation on a confined space
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- Ventilation fan capable of exhaust ventilation
- One section of ventilation fan ducting (rigid or wire reinforced)
- Power source
- Confined space
- Appropriate personal protective equipment

REFERENCES:

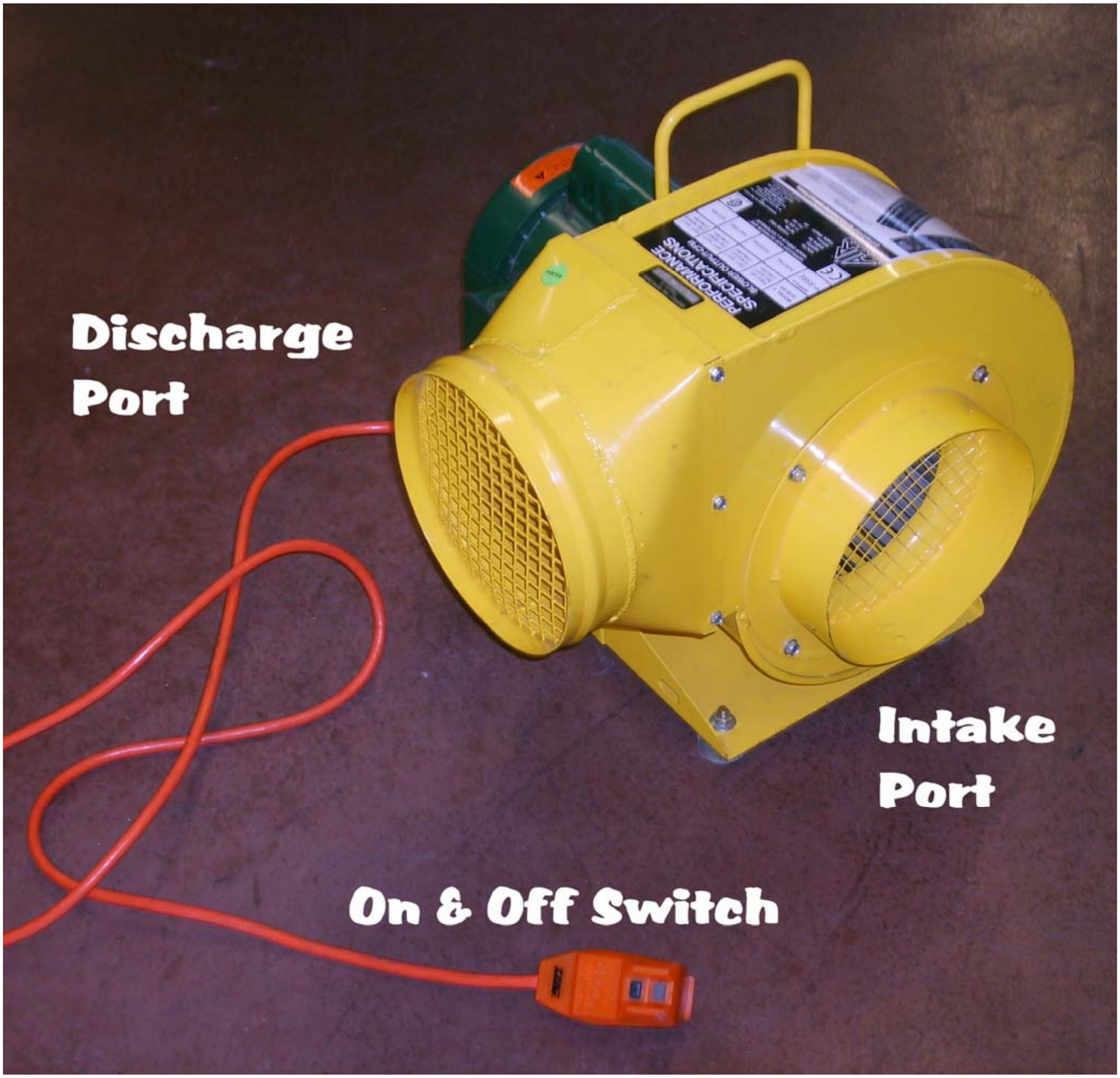
- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION:

Exhaust ventilation works well when you have a space with a point source of contamination that you can capture at the source. You can also use exhaust ventilation on conjunction with supply ventilation to enhance ventilation in a variety of conditions.

NOTE:

This lesson plan applies to a specific centrifugal ventilation fan. You must develop a lesson plan that is specific to the particular brand/model you are using.


Discharge Port
Intake Port
On & Off Switch

OPERATIONS	KEY POINTS
1. Assess space	1a. Note type size and location of openings of space 1b. Determine length of time to ventilate the space considering the volume of the space and the air delivery of the ventilation fan
2. Gather and prepare ventilation equipment	2a. Ventilation fan and ducting 2b. Power source for ventilation fan 2c. Supply power to ventilation fan 2d. Test equipment for proper operation
3. Position ventilation fan	3a. Position ventilation fan at the location 3b. Suction side of ventilation fan should face the confined space portal
4. Attach ducting	4a. Place an end of the ducting over the suction side of the ventilation fan 4b. Secure the ducting by tightening the webbing through the buckle
5. Position ducting	5a. Place suction side ducting into the confined space to allow for optimal ventilation 5b. Direct exhaust side of ventilation fan to appropriate location
6. Turn ventilation fan on	6a. Using switch on front of ventilation fan
7. Assess effectiveness of ventilation	7a. Using atmospheric monitor

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 Combination Ventilation

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given ventilation fans, ducting, power source

Behavior: The student will perform combination ventilation in a confined space

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

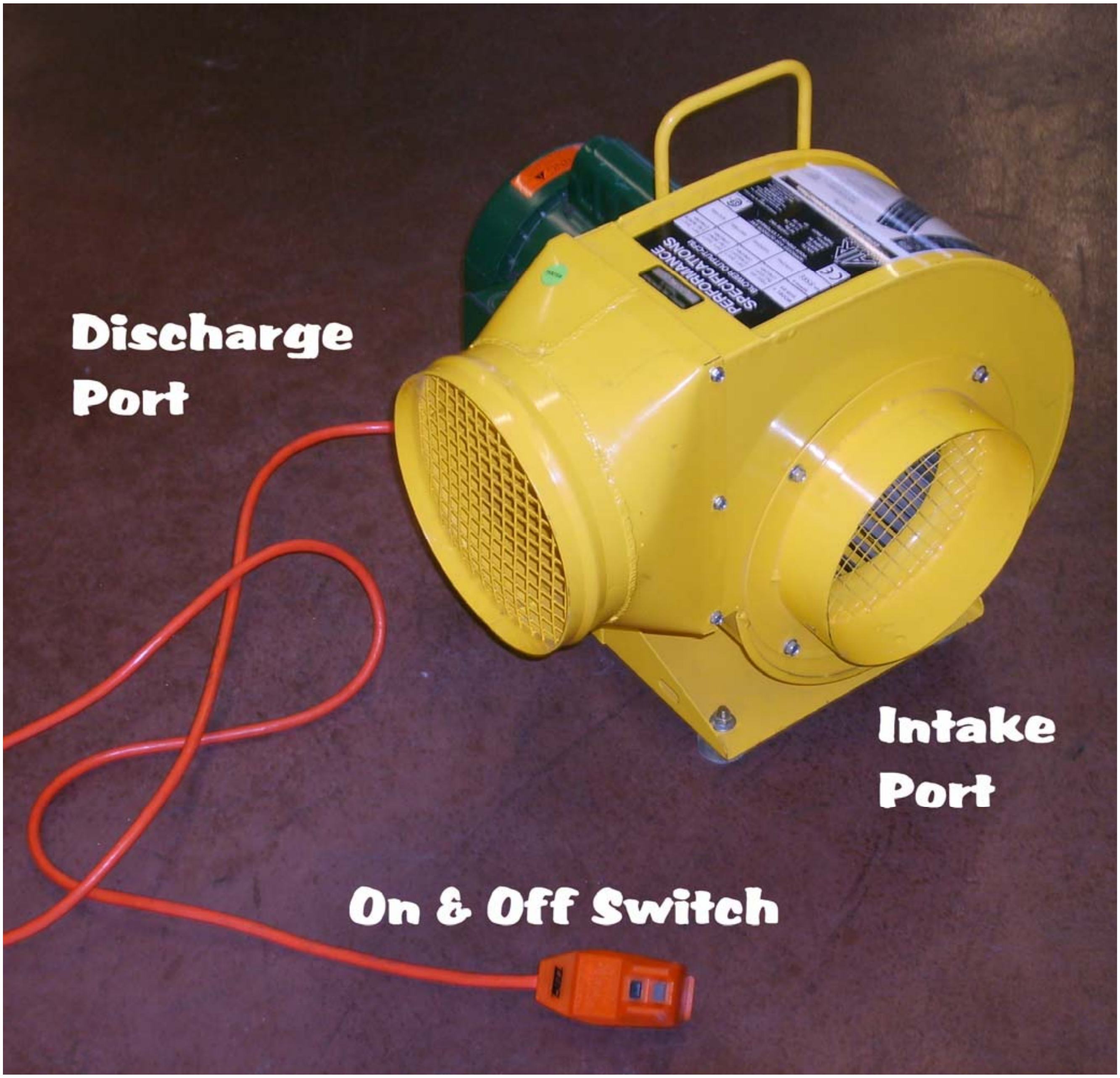
- Job breakdown
- (2) Ventilation fan capable of exhaust and supply ventilation
- (2) Sections of ventilation fan ducting (rigid, wire reinforced or collapsible)
- Power source
- Confined space
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 6

PREPARATION: Combination ventilation uses two or more ventilation fans. Typically, one or more ventilation fans are supply (positive pressure) ventilating the space while one or more ventilation fans are exhaust (negative pressure) ventilating the space.

NOTE: This lesson plan applies to a specific centrifugal ventilation fan. You must develop a lesson plan that is specific to the particular brand/model you are using.


Discharge Port
Intake Port
On & Off Switch
PERFORMANCE SPECIFICATIONS

OPERATIONS	KEY POINTS
1. Assess space	1a. Note type, size and location of openings 1b. Determine length of time to ventilate the space considering the volume of the space and the air delivery of the ventilation fans
2. Gather and prepare ventilation equipment	2a. Ventilation fans, ducting 2b. Power source for ventilation fans 2c. Test equipment for proper operation
3. Position ventilation fans	3a. Position ventilation fans at the various portals 3b. Suction side of one or more ventilation fans should face the confined space portal(s) 3c. Exhaust side of one or more ventilation fans should face the other confined space portal(s)
4. Attach ducting	4a. Place an end of the ducting over the suction side of the ventilation fan(s) 4b. Secure the ducting by tightening the webbing through the buckle 4c. Place an end of the of the ducting over the exhaust side of the ventilation fan(s) 4d. Secure the ducting by tightening the webbing through the buckle
5. Position ducting	5a. Place suction side ducting into the confined space to allow for optimal ventilation 5b. Place exhaust side ducting into the confined space to allow for optimal ventilation
6. Turn ventilation fans on	6a.Using switch on front of ventilation fans

OPERATIONS	KEY POINTS
7. Assess effectiveness of ventilation	7a. Using atmospheric monitor

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 Instrument Start Up

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a TMX 412 Industrial Scientific atmospheric monitor in a clean atmosphere

Behavior: The student will perform instrument start up

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

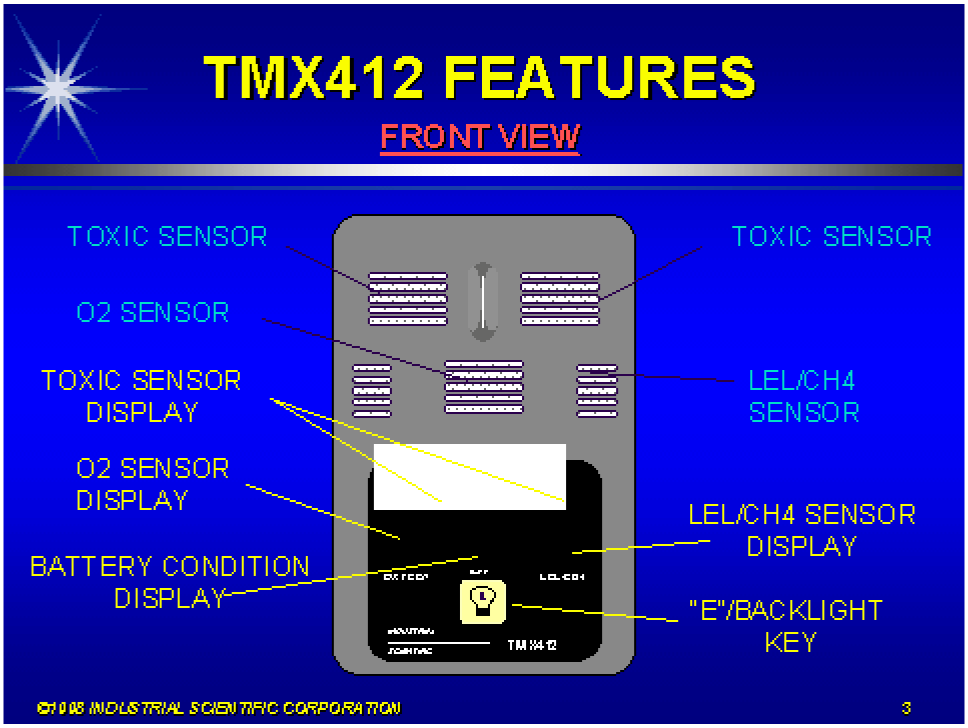
- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412, Operating Manual

PREPARATION: Atmospheric monitoring is a mandatory component of confined space rescue operations. It is imperative that personnel are trained on the proper start-up procedures in order to assure accurate and reliable readings.

NOTE: This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.


TMX412 FEATURES
FRONT VIEW
TOXIC SENSOR
O2 SENSOR
TOXIC SENSOR DISPLAY
O2 SENSOR DISPLAY
BATTERY CONDITION DISPLAY
TOXIC SENSOR
LEL/CH4 SENSOR
LEL/CH4 SENSOR DISPLAY
"E"/BACKLIGHT KEY
TMX412
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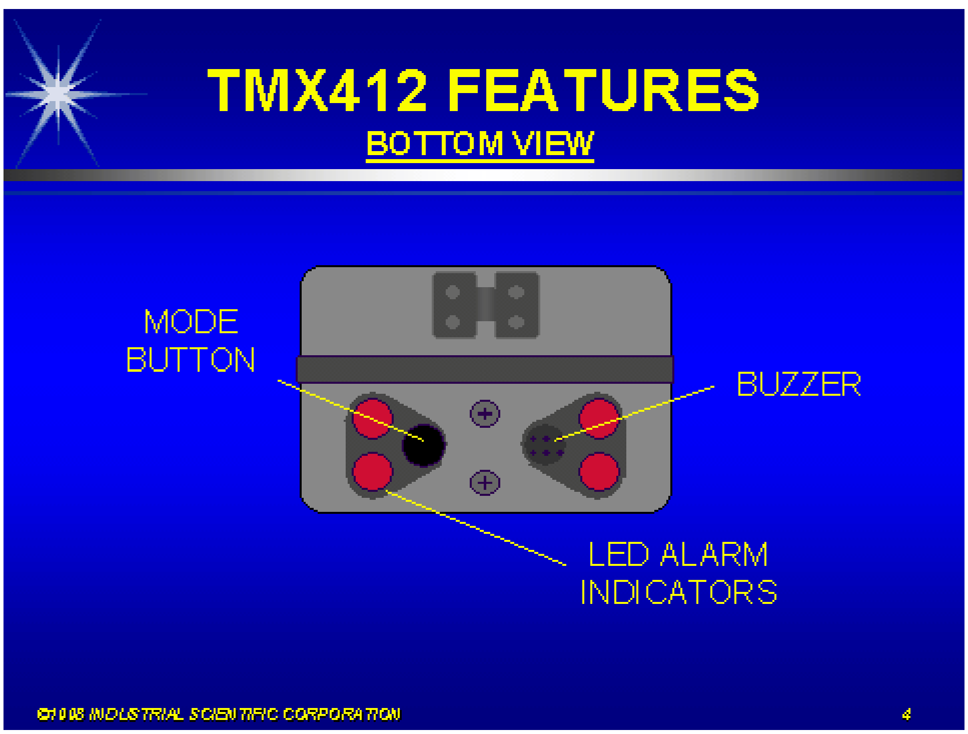
TMX412 FEATURES
BOTTOM VIEW
MODE BUTTON
BUZZER
LED ALARM INDICATORS
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OPERATIONS	KEY POINTS
1. Confirm that you are in a clean atmosphere	1a. By observation of the general area
2. Press and hold Mode Button	2a. Until screen reads “Release”
3. Release Mode Button	3a. Confirm all LCD lights are lit
4. Confirm location of toxic sensors	4a. CO upper left 4b. H2S upper right 4c. 02 lower left 4d. LEL lower right
5. Wait for count down to normal operation screen (direct read of ambient atmosphere)	5a. Normally 10 to 30 seconds
6. Zero instrument if needed	6a. If sensors are showing an inaccurate reading for the clean atmosphere you are in
7. Bump Test instrument	7a. To confirm instrument is operating as designed

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 Determine The Instrument Target Gases
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a TMX 412 Industrial Scientific atmospheric monitor that is turned on in a clean atmosphere
Behavior:	The student will confirm/determine the gases that the instrument is programmed to detect
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor

REFERENCES:

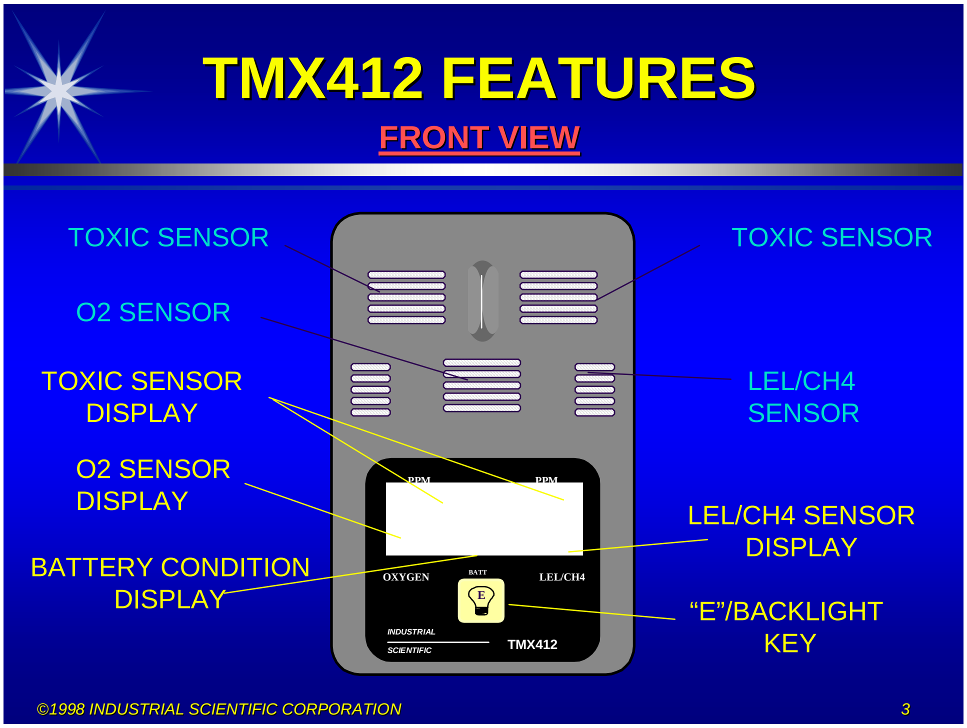
- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412 Operators Manual, Industrial Scientific Corp.

PREPARATION:

Atmospheric Monitoring is a mandatory component of confined space rescue operations. It is imperative that personnel are trained to determine or confirm the gases the instrument is programmed to detect.

NOTE:

This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.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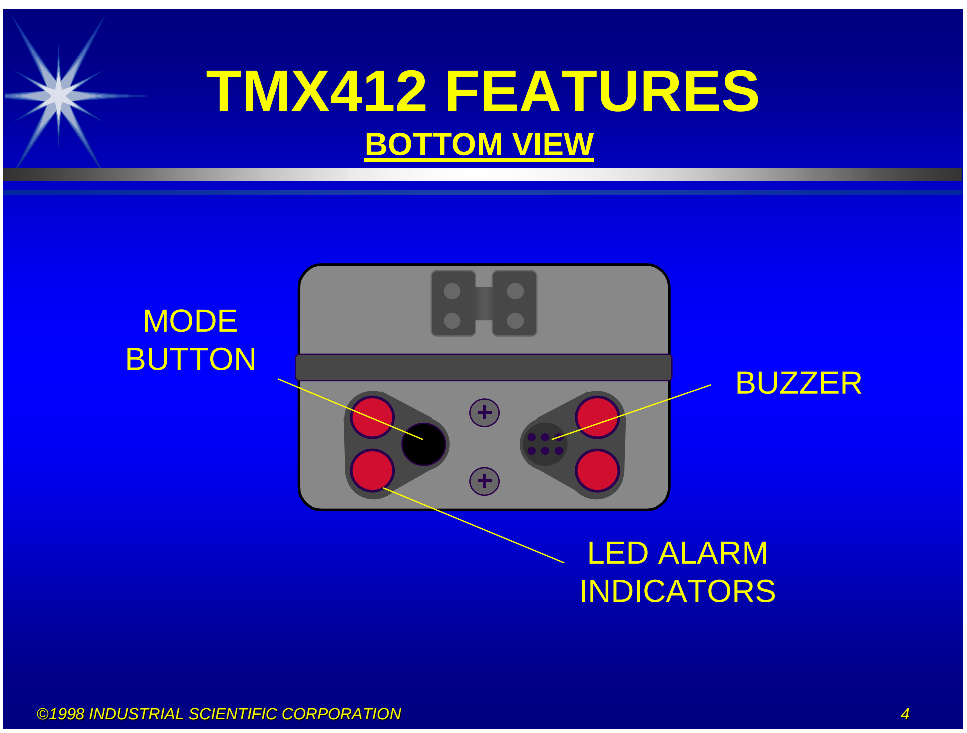
TMX412 FEATURES
BOTTOM VIEW
MODE BUTTON
BUZZER
LED ALARM INDICATORS
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OPERATIONS	KEY POINTS
1. Confirm that you are in a clean atmosphere	1a. By observation of general area
2. Press and release the Mode button	2a. Note the specific sensors and location of the sensors by viewing the sensor display area 2b. CO upper left 2c. H2S upper right 2d. 02 lower left 2e. LEL lower righ
3. Press and release the Mode button until the screen returns to the direct read, current atmospheric conditions, or wait approximately 25 seconds. **Note:** This procedure may be used on an instrument that is already on, if the instrument is off, hold the mode button down until the LCD read-out states “release” and then read the target gases in the instrument after warm-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 Bump Test The Instrument
TIME FRAME:	0:10
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a TMX 412 Industrial Scientific atmospheric monitor that is turned on in a clean atmosphere
Behavior:	The student will perform instrument bump test
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor
- Bump gas cylinder or Calibration gas cylinder
- Regulator (if using calibration gas)
- Calibration Cup (if using calibration gas)
- Tygon Tubing

REFERENCES:

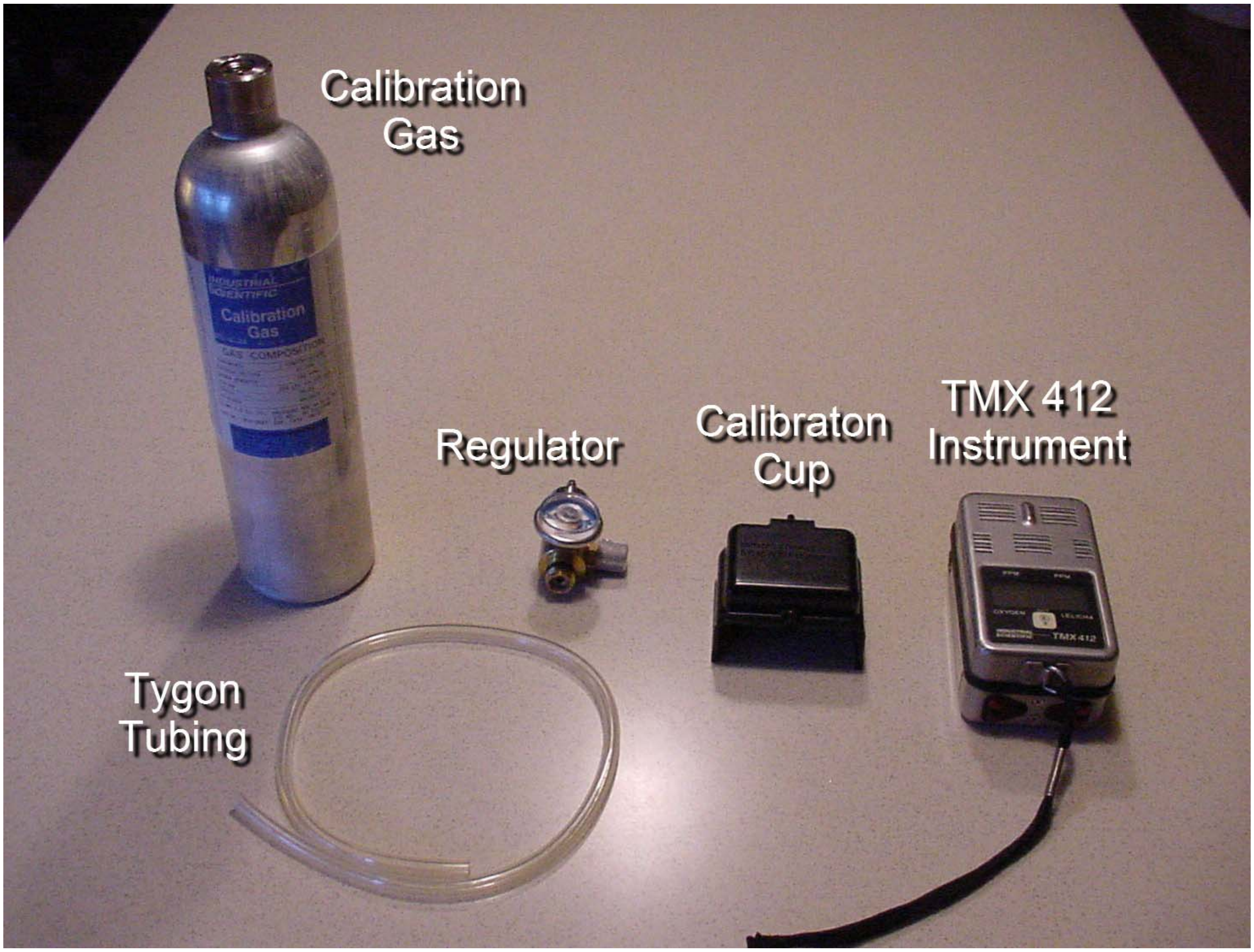
- <u>Confined Space Entry and Rescue Manual,</u> 2nd ed (2007), CMC Rescue Inc., Chapter 5
- <u>Industrial Scientific TMX 412,</u> Operating Manual

PREPARATION:

Atmospheric monitoring is a mandatory component of confined space rescue operations. It is imperative that personnel are trained on the proper bump test procedures in order to assure the instrument is operating appropriately

NOTE:

This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.


Calibration Gas
Regulator
Calibraton Cup
TMX 412 Instrument
Tygon Tubing
Calibration Gas
TMX 412

OPERATIONS	KEY POINTS
1. Confirm that you are in a clean atmosphere	1a. By observation of the general area
2. Apply regulator to calibration cylinder	2a. Thread on to top of cylinder 2b. Turning to right
3. Apply calibration cup to TMX 412 monitor	3a. Pushing calibration cup over sensor screen area
4. Apply tygon tubing to regulator nipple	4a. Pushing tubing on with twisting motion
5. Apply tygon tubing to calibration cup nipple	5a. Pushing tubing on with twisting motion
6. Apply calibration gas to sensors	6a. Turning on regulator 6b. Twisting regulator to the right
7. Confirm audible alarm is functioning	7a. Listen for audible alarm
8. Confirm visual alarm is functioning	8a. Visualizing red warning lights
9. Confirm relative sensor accuracy	9a. Checking specific gas concentrations on calibration gas cylinder 9b. Checking gas concentration read-out on TMX 412 monitor

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 Check The Peaks On The Instrument
TIME FRAME:	0:05
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a TMX 412 Industrial Scientific atmospheric monitor that is turned on in a clean atmosphere
Behavior:	The student will confirm/determine the peaks of the gases that the instrument has detected or been exposed to
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

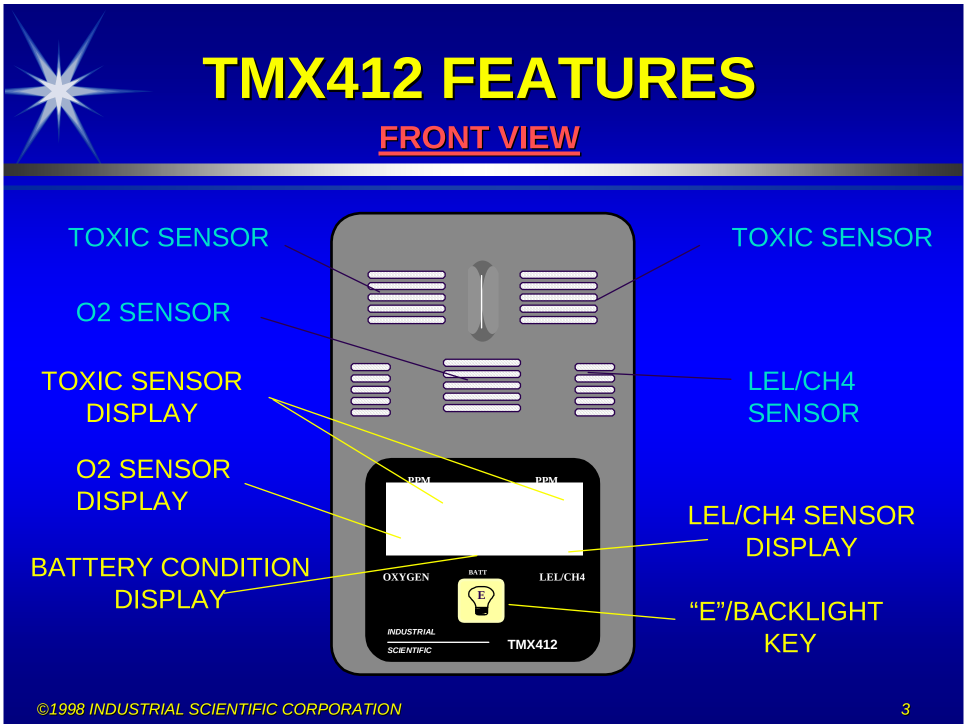
- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412 Operators Manual, Industrial Scientific Corp.

PREPARATION: Atmospheric Monitoring is a mandatory component of confined space rescue operations. It is very important that personnel are trained to determine or confirm the gases that the instrument has detected.

NOTE: This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.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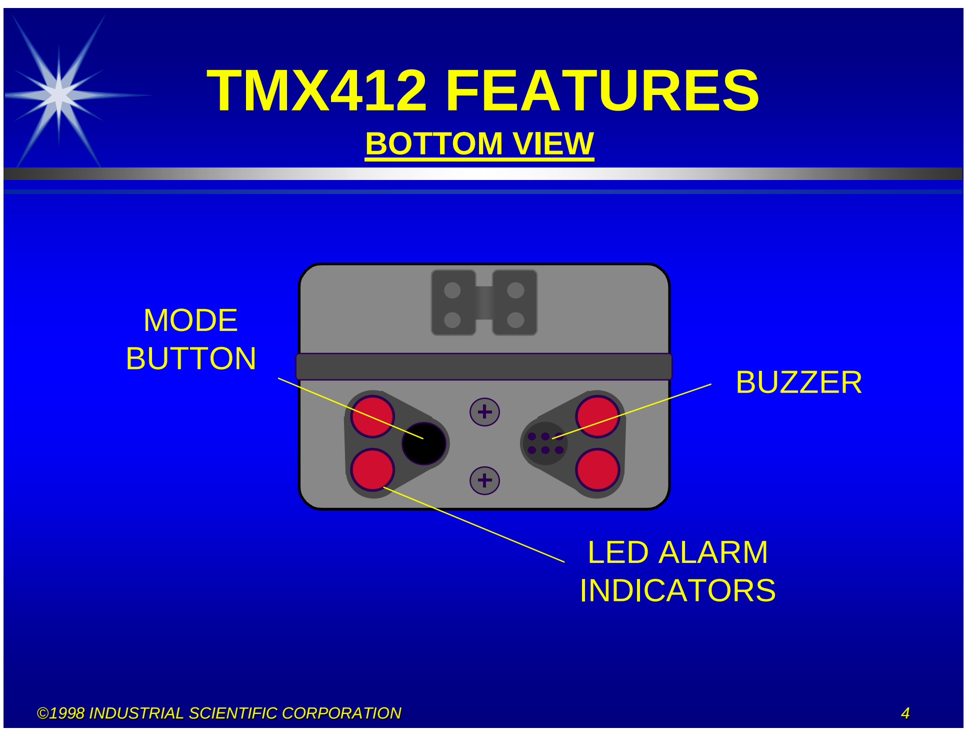
TMX412 FEATURES
BOTTOM VIEW
MODE BUTTON
BUZZER
LED ALARM INDICATORS
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OPERATIONS	KEY POINTS
1. Confirm that you are in a clean atmosphere	1a. By observation of general area
2. Press and release the Mode button	2a. Note the specific sensors and location of the sensors by viewing the sensor display area 2b. CO upper left 2c. H2S upper right 2d. 02 lower left 2e. LEL lower right
3. Press and release the Mode button until the screen reads "P" in the top center and "K" in the bottom center	3a. Note the specific concentrations detected on each sensor 3b. CO upper left 3c. H2S upper right 3d. 02 lower right 3e. LEL lower right
4. Press and release the Mode button until the screen returns to the direct read, current atmospheric conditions, or wait approximately 25 seconds	

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 Clear The Peaks On The Instrument
TIME FRAME:	0:05
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a TMX 412 Industrial Scientific atmospheric monitor that is turned on in a clean atmosphere
Behavior:	The student will clear the peaks of the gases that the instrument has detected or been exposed to
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor

REFERENCES:

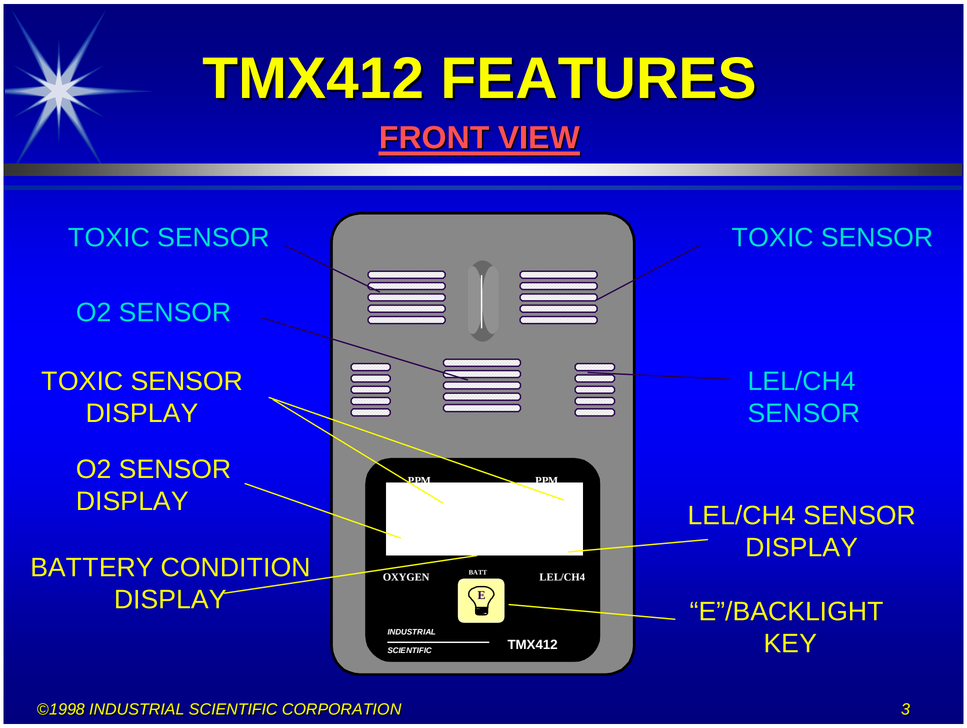
- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412 Operators Manual, Industrial Scientific Corp.

PREPARATION:

Atmospheric Monitoring is a mandatory component of confined space rescue operations. It is very important that personnel are trained to clear the peak concentrations of gases that the instrument has detected.

NOTE:

This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.


TMX412 FEATURES
FRONT VIEW
TOXIC SENSOR
TOXIC SENSOR
O2 SENSOR
TOXIC SENSOR DISPLAY
LEL/CH4 SENSOR
O2 SENSOR DISPLAY
LEL/CH4 SENSOR DISPLAY
BATTERY CONDITION DISPLAY
"E"/BACKLIGHT KEY
PPM
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OXYGEN
LEL/CH4
E
INDUSTRIAL SCIENTIFIC
TMX412
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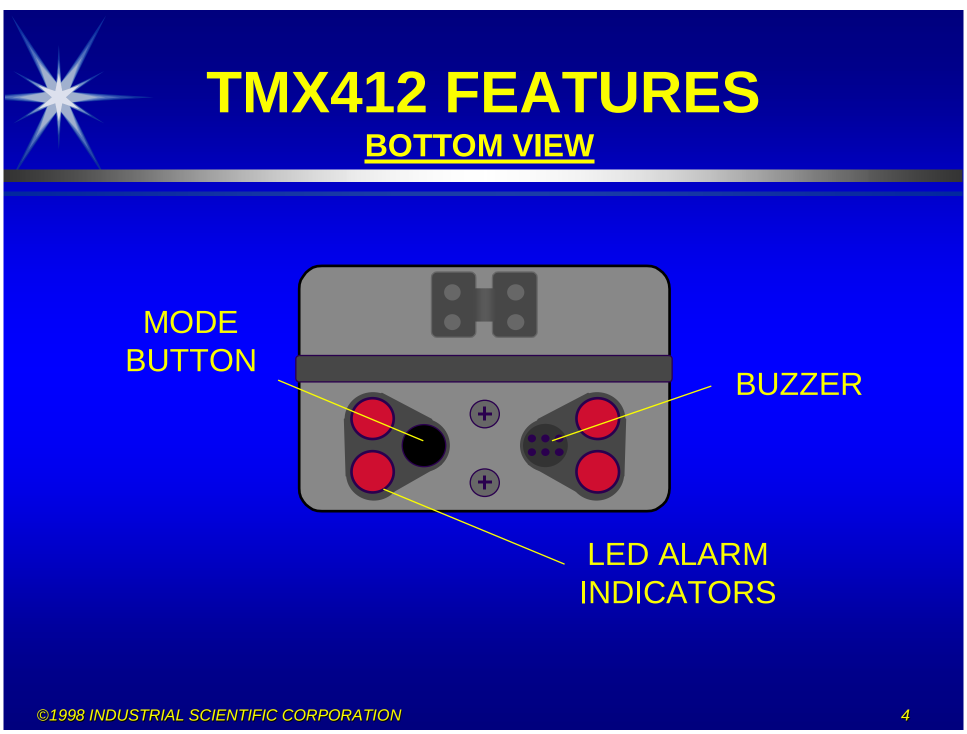
TMX412 FEATURES
BOTTOM VIEW
MODE BUTTON
BUZZER
LED ALARM INDICATORS
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OPERATIONS	KEY POINTS
1. Confirm that you are in a clean atmosphere	1a. By observation of general area
2. Press and release the Mode button	2a. Note the specific sensors and location of the sensors by viewing the sensor display area 2b. CO upper left 2c. H2S upper right 2d. 02 lower left 2e. LEL lower right
3. Press and release the Mode button until the screen reads "P" in the top center and "K" in the bottom center	3a. Note the specific concentrations detected on each sensor 3b. CO upper left 3c. 2S upper right 3d. 02 lower right 3e. LEL lower right
4. Press and release the Mode button until the screen reads "peaks" press E to reset	4a. Confirm peaks have cleared
5. Press and release the Mode button until the screen returns to the direct read, current atmospheric conditions, or wait approximately 25 seconds	

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 Remote Sampling

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a TMX 412 Industrial Scientific atmospheric monitor that is turned on in a clean atmosphere

Behavior: The student will perform remote sampling procedure

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

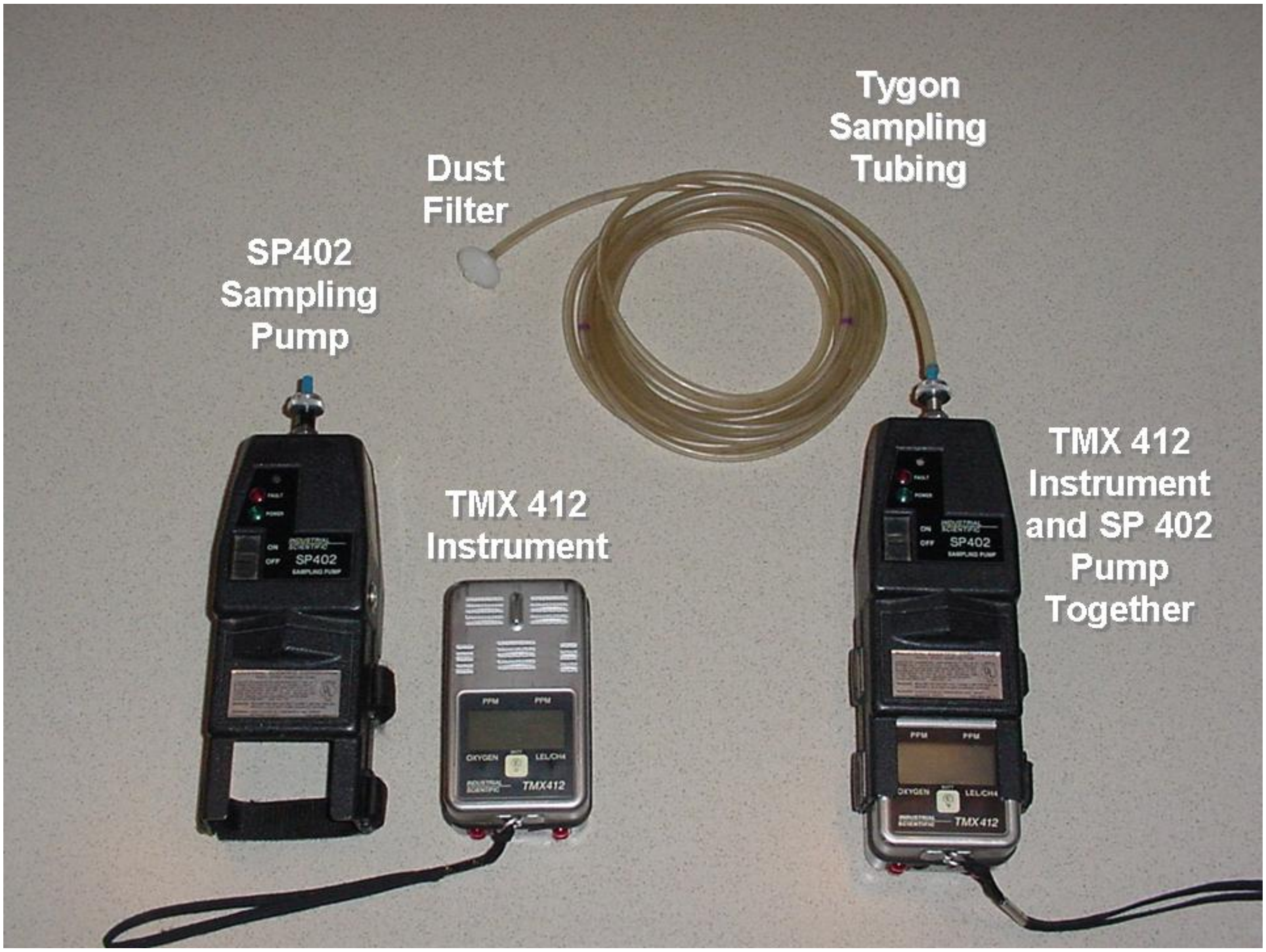
- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor
- SP402 Sampling Pump
- Tygon Tubing
- Dust Filter

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412, Operating Manual

PREPARATION: Atmospheric monitoring is a mandatory component of confined space rescue operations. It is imperative that personnel are trained to check samples of the atmosphere remotely in order to determine the atmosphere that rescuers may be entering, as well as the atmosphere the victim is being exposed to.

NOTE: This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.


Tygon
Sampling
Tubing
Dust
Filter
SP402
Sampling
Pump
TMX 412
Instrument
TMX 412
Instrument
and SP 402
Pump
Together

OPERATIONS	KEY POINTS
1. Confirm that you are in a clean atmosphere	1a. By observation of the general area
2. Insert turned on TMX 412 instrument into turned on SP 402 Pump	2a. Push TMX 412 instrument into open end of SP 402 pump 2b. Tighten Velcro straps
3. Apply tygon tubing to SP 402 pump	3a. Pushing tygon tubing over blue tipped water filter on SP 402 pump with twisting motion
4. Determine length of tygon tubing	4a. By measuring 4b. If not pre-measured and marked in increments
5. Apply dust filter to end of tygon tubing	5a. Pushing tubing on with twisting motion
6. Place tubing in space	6a. At opening
7. Wait two seconds per foot of tygon tubing being used	7a. By multiplying two times the length of the tygon tubing for pump response time
8. Determine the monitoring readings for each gas programmed in the instrument	8a. By visualizing the LCD display
9. Document the readings at that level or distance	9a. By writing the readings visualized on the LCD display on the monitoring log 9b. Noting the respective level or distance
10. Lower or insert tubing to next level	10a. Approximately 4 feet
11. Wait two seconds per foot of tygon tubing being used	11a. By multiplying two times the length of the tygon tubing for pump response time

OPERATIONS	KEY POINTS
12. Determine the monitoring readings for each gas programmed in the instrument	12a. By visualizing the LCD display
13. Document the readings at that level or distance	13a. By writing the readings visualized on the LCD display on the monitoring log 13b. Noting the respective level or distance
14. Lower or insert tubing to next level	14a. Approximately 4 feet
15. Wait two seconds per foot of tygon tubing being used	15a. By multiplying two times the length of the tygon tubing for pump response
16. Determine the monitoring readings for each gas programmed in the instrument	16a. By visualizing the LCD display
17. Document the reading at that level or distance	17a. By writing the readings visualized on the LCD display on the monitoring log 17b. Noting the respective level or distance
18. Continue process **Note:** Following confirming atmospheric readings at the top, personnel may start readings at the bottom and work up in four-foot increments. In this way, determination of survival profile of the victim will be expedited.	18a. Until reaching the bottom

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 Conversion Chart To Assess Flammability

TIME FRAME: 0:10

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a TMX 412 Industrial Scientific atmospheric monitor that is turned on in a clean atmosphere

Behavior: The student will perform calculations to determine actual flammability in the space being monitored based on simulated readings provided by the instructor

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor
- SP402 Sampling Pump
- Tygon Tubing
- Dust Filter
- LEL Conversion Chart

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412, Operating Manual

PREPARATION: Atmospheric monitoring is a mandatory component of confined space rescue operations. It is important that when personnel can identify the target gas that they are trained to calculate actual flammability in the space to determine the hazard level posed to rescuers and survival profile of victims.

NOTE: This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.

Gas Being Sampled	Acetone	Acetylene	Butane	Hexane	Hydrogen	Methane	Pentane	Propane
Acetone	1.0	1.3	1.0	0.7	1.7	1.7	0.9	1.1
Acetylene	0.8	1.0	0.7	0.6	1.3	1.3	0.7	0.8
Benzene	1.1	1.5	1.1	0.8	1.9	1.9	1.0	1.2
Butane	1.0	1.4	1.0	0.8	1.8	1.7	0.9	1.1
Ethane	0.8	1.0	0.8	0.6	1.3	1.3	0.7	0.8
Ethanol	0.9	1.1	0.8	0.6	1.5	1.5	0.8	0.9
Ethylene	0.8	1.1	0.8	0.6	1.4	1.3	0.7	0.9
Hexane	1.4	1.8	1.3	1.0	2.4	2.3	1.2	1.4
Hydrogen	0.6	0.8	0.6	0.4	1.0	1.0	0.5	0.6
Isopropanol	1.2	1.5	1.1	0.9	2.0	1.9	1.0	1.2
Methane	0.6	0.8	0.6	0.4	1.0	1.0	0.5	0.6
Methanol	0.6	0.8	0.6	0.5	1.1	1.1	0.6	0.7
Pentane	1.2	1.5	1.1	0.9	2.0	1.9	1.0	1.2
Propane	1.0	1.2	0.9	0.7	1.6	1.6	0.8	1.0
Styrene	1.3	1.7	1.3	1.0	2.2	2.2	1.1	1.4
Toluene	1.3	1.6	1.2	0.9	2.1	2.1	1.1	1.3
Xylene	1.5	2.0	1.5	1.1	2.6	2.5	1.3	1.6

OPERATIONS	KEY POINTS
1. While monitoring atmosphere with known flammable or simulated vapor in space	
2. Determine LEL concentration in the space	2a. Visually checking the LCD read-out screen 2b. Noting LEL concentration on LCD screen
3. Determine actual target gas in the space	3a. Questioning facility contacts, checking placards, labels or shipping papers
4. Identify known target gas in the space on the LEL conversion chart	4a. By reviewing the chart 4b. Checking “Gas Being Sampled” Column
5. Determine Calibration Gas being used	5a. By reviewing calibration records, or checking instrument documentation
6. Identify Calibration Gas on the LEL conversion chart	6a. By reviewing the chart 6b. Checking the top column for the calibration gas
7. Determine the correlation factor	7a. By reviewing the chart 7b. Looking down the column under the calibration gas 7c. Until it lines up with the calibration gas 7d. The number at the intersection of the calibration gas and gas being sampled is the correlation factor
8. Determine actual LEL concentration in the space	8a. Multiply LEL reading on instrument by correlation factor 8b. The product of the two is the actual LEL concentration
9. Document the actual LEL concentration on the monitoring log	

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 Instrument Shut-Down

TIME FRAME: 0:05

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a TMX 412 Industrial Scientific atmospheric monitor in a clean atmosphere

Behavior: The student will perform instrument shut down

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

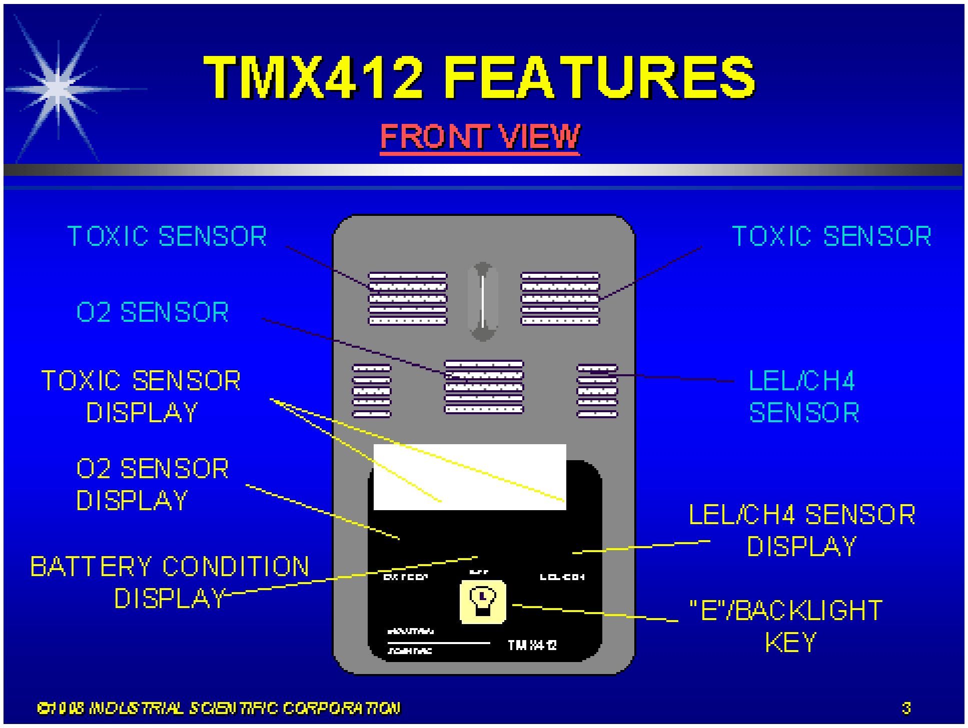
- Job breakdown
- TMX 412 Industrial Scientific atmospheric monitor

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 5
- Industrial Scientific TMX 412, Operating Manual

PREPARATION: Atmospheric monitoring is a mandatory component of confined space rescue operations. It is imperative that personnel are trained on the proper shut down procedure in order to assure that the instrument will be ready for use the next time it is needed.

NOTE: This lesson plan applies to a specific brand/model of atmospheric monitor. You must develop a lesson plan that is specific to the particular brand/model you are using.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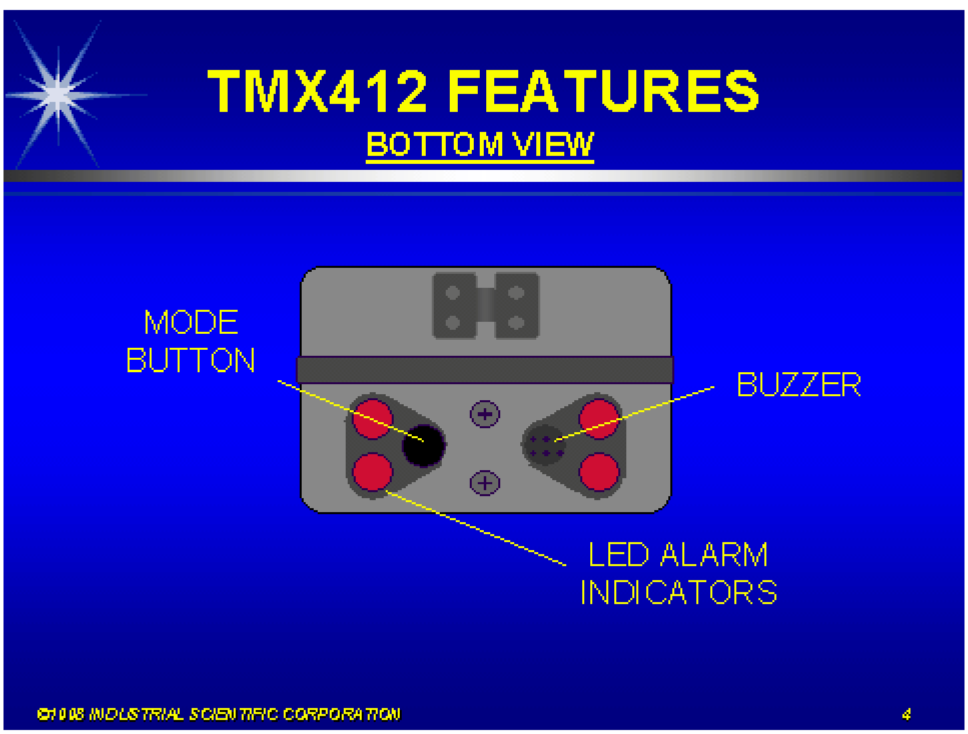
TMX412 FEATURES
BOTTOM VIEW
MODE BUTTON
BUZZER
LED ALARM INDICATORS
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OPERATIONS	KEY POINTS
1. With an operating atmospheric monitor	1a. By observation of LCD screen showing a reading
2. Press and hold Mode Button	2a. Until screen reads "Release"
3. Release Mode Button	3a. Confirm all LCD lights 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 Construct And Operate A Ladder Gin

TIME FRAME: 0:40

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a fire service ladder, rescue rope, pulleys, prusik loops, webbing, carabiners, anchor points, and appropriate personal protective equipment

Behavior: As a team member, the student will construct and operate a ladder gin in an open field environment

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 14'-24' fire service ladder
- 3 150' rescue ropes
- 2 pulleys
- 2 prusik loops
- 1 20' length of 1" webbing
- 3 12' lengths of 1" webbing
- 3 5' lengths of 1" webbing
- 8 carabiners
- 2 anchor points
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 10
- NFPA 1006, 2000

PREPARATION: The ladder gin is a versatile system that allows a fire service ladder to be utilized as a high anchor point. By attaching a mechanical advantage system to the ladder and secondary belay line, rescuers can raise and lower rescuers and victims vertically below the working surface of the ladder. This may be out of a manhole, well, shaftway, up and down the side of a cliff, or between one or more levels in a building.

The ladder gin can be constructed with a roof, wall, or extension ladder. Regardless of which type of ladder is utilized, a major concern is that the students have an unobstructed tip to work with. In the case of the extension ladder, extend the tip at least two rungs and securely tie off the halyard. In the case of the roof ladder, invert the ladder so that the hooks are down. By inverting the ladder, the spring housings will not interfere with the rigging of the guy lines. In the open field application, the base of the ladder must be secured by either digging a small hole for each beam, or by lashing each beam of the ladder to a picket.

In this station the students are introduced to the 1-1 and 1-1-1 picket system.

OPERATIONS	KEY POINTS
1. Position the ladder	1a. At the work area 1b. Base of the ladder near the object it will butt against when raised into position (picket, hole) 1c. Ladder flat on the ground
2. Extend ladder (if necessary)	2a. Ladder on beam 2b. To desired height 2c. At least two rungs 2d. Ensure dogs are locked 2e. Halyard tied off 2f. Ladder back in flat position
3. Select guy line anchor points	3a. No more than 45° to the side of each ladder beam 3b. Approximately three times the ladder working length away from the base
4. Anchor webbing	4a. To anchor points 4b. Anchor sling and carabiner on each anchor point
5. Locate center	5a. Of 150' rescue rope 5b. Remove entire rope from bag 5c. Center of the rope stays at the tip of ladder 5d. Bitter ends away from the ladder

OPERATIONS	KEY POINTS
6. Tie two figure eights on a bight	6a. The first figure eight approximately 12"-18" off center 6b. Bight is 8"-12" in length 6c. The second figure eight on a bight approximately 12"-18" to the opposite side of center 6d. Bight is 8"-12" in length
7. Attach both figure eight bights	7a. To the ladder tip 7b. Ladder lying flat on the ground 7c. Figure eight bights are placed through ladder between 1st and 2nd rungs 7d. Left bight over the left tip 7e. Right bight over the right tip
8. Position the guy lines	8a. One end of the guy line at each anchor point 8b. Rope through each anchor carabiner
9. Form a modified truckers hitch	9a. On each guy line 9b. Figure eight on a bight 9c. On each guy line 9d. At a point equal to the foot of the ladder 9e. Carabiner in each figure eight 9f. Bitter end of each line through carabiner
10. Build a ladder rig	10a. Using one of the 150' rescue ropes
11. Attach ladder rig	11a. To short section of rope between figure eight 11b. Between the figure eight bights at the ladder tip 11c. Keep ladder rig attachment under ladder

OPERATIONS	KEY POINTS
LOW METHOD OF BELAY LINE ATTACHMENT	
12. Establish the belay line system	12a. Using another 150' rescue rope 12b. Independent anchor 12c. Webbing and carabiner on anchor point 12d. Tandem prusiks for belay system
13. Raise ladder	13a. Into position 13b. Base of ladder secured against stabilizing system (hole or pickets) 13c. One student at the base of the ladder 13d. One student at the tip 13e. One student to tend each guy line 13f. Remove the slack from the guy lines 13g. Ladder rig remains between beams under ladder 13h. Ladder raised to climbing angle
14. Tension modified trucker's hitch	14a. DO NOT over tension guy lines
15. Safety test ladder	15a. Load the ladder by pulling down on M/A system 15b. Ladder should remain at climbing angle when loaded 15c. Check for ladder twist 15d. Guy lines adjusted as necessary
16. Tie off guy lines	16a. At modified truckers hitch 16b. With two half hitches
17. Package one student	17a. To be raised with the system 17b. Class 3 harness with carabiner

OPERATIONS	KEY POINTS
18. Tend belay line	18a. One student with gloved hands
19. Tend the ladder rig	19a. Two students with gloved hands
20. Attach the student	20a. To the ladder rig and belay line 20b. At dorsal “D” ring on class III harness 20c. Lock all carabiners
21. Operate system	21a. Packaged student stands directly under tip of ladder 21b. Ladder rig team pulls straight down 21c. Pull of system and weight of load MUST remain between ladder rails 21d. Belay line is tended with minimal slack 21e. Raise and lower student

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 Construct And Operate A Ladder A-Frame

TIME FRAME: 0:50

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given fire service ladders, rescue rope, pulleys, webbing, carabiners, pickets, edge protection, and appropriate personal protective equipment

Behavior: The student will construct and operate a ladder "A" frame

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 14' fire service ladder
- 1 24' extension ladder
- 4 150' rescue ropes
- 2 2" pulleys
- 2 20' lengths of 1" webbing
- 4 12' lengths of 1" webbing
- 7 5' lengths of 1" webbing
- 12 carabiners
- 2 anchor points
- Edge protection
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 10
- NFPA 1006, 2000

PREPARATION: The ladder "A" frame is a stable and versatile system that allows fire service ladders on an apparatus to be utilized to create a high anchor point. By attaching a mechanical advantage system to the ladder and a belay line, rescuers can raise and lower rescuers and victims vertically below the working surface of the ladder system. This may be out of a manhole, up the side of a cliff, or between one or more floors.

OPERATIONS	KEY POINTS
1. Identify anchor location	1a. Distance three times the working height of the ladders
2. Place ladders	2a. Side-by-side 2b. Near area they will be used
3. Invert roof ladder	3a. Tip down
4. Place both ladders	4a. On beam 4b. In line with anchors
5. Extend ladder (if using an extension ladder)	5a. To desired height 5b. Adjust for uneven ground if needed 5c. Lock dogs 5d. Halyard tied off 5e. Lash fly section to bed section using webbing
6. Interlock ladder beams	6a. Base of both ladders equal
7. Spread ladder butts	7a. Approximately 70°
8. Align top ladder rungs	8a. Interlocking or offsetting beams as needed 8b. Beams of ladders level
9. Lash the top ladder rungs	9a. With round turns 9b. Using 20' webbing
10. Remove rescue rope	10a. From rope bag
11. Locate center	11a. Of rescue rope
12. Move bitter ends of rescue rope	12a. To anchor locations

OPERATIONS	KEY POINTS
13. Tie two figure eights on a bight	13a. Each figure eight 12" off center of rope 13b. Each figure eight bight 12" in length
14. Attach figure eight on a bight	14a. To ladder tips 14b. Between the inverted "V" of the ladders 14c. Under lashed rungs 14d. Top figure eight over top tips 14e. Bottom figure eight over bottom tips 14f. The left side bight around the beam and attached to the left tip 14g. The right side bight around the beam and attached to the right tip
NOTE: Make sure both beam tips are captured by each figure eight on a bight on each side.	
15. Attach mechanical advantage	15a. Between inverted "V" of the ladders 15b. Using a rescue rope 15c. To short section of rope between figure eights
16. Prepare anchors	16a. Picket system or other suitable anchors
17. Position guy lines	17a. At anchor points
18. Attach webbing and carabiner	18a. To each anchor
19. Tie figure eight on a bight	19a. On each guy line 19b. Towards anchors
20. Attach carabiners	20a. To each figure eight on a bight

OPERATIONS	KEY POINTS
21. Form a modified trucker's hitch	21a. Guy line through carabiner on and anchor webbing and carabiner on figure eight on a bight
22. Prepare to raise ladder "A" frame	22a. One student at the base of each ladder 22b. One student at top of ladders 22c. One student at each guy line
23. Raise ladder "A" frame	23a. Beam raise aligning “A” frame with anchors 23b. Tension guy lines
24. Secure guy lines	24a. Tying off one guy line 24b. Adjusting ladder "A" frame as necessary 24c. Tying off other guy line
25. Stabilize ladder base	25a. With 20' webbing 25b. Round turn with half hitches 25c. Waist height above base of ladders 25d. Beam to beam across “A” frame 25e. Picket beams as needed
METHOD 1: **ON THE GROUND OF BELAY LINE ATTACHMENT**	
26. Attach belay line	26a. Using a rescue rope 26b. Independent anchor away from “A” frame 26c. Webbing and carabiner on anchor point 26d. Tandem prusiks for belay system

OPERATIONS	KEY POINTS
METHOD 2: **HIGH POINT OF BELAY LINE ATTACHMENT**	
27. Attach belay line	27a. Independent anchor if possible 27b. Webbing and carabiner on anchor point 27c. Tandem prusiks for belay system 27d. High directional change 27e. Top of ladder 27f. Low directional change (if needed)
28. Prepare rescuer	28a. Class III harness with carabiner
29. Attach rescuer	29a. To mechanical advantage and belay line 29b. To dorsal “D” ring on class III harness
30. Raise and/or lower rescuer	30a. Two students on main line 30b. One student on belay line 30c. One student on each guy line
31. Operate mechanical advantage	31a. Two students on main line 31b. One student on belay line 31c. One student on each guy 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 Set-Up And Operate A Tripod System

TIME FRAME: 0:45

LEVEL OF INSTRUCTION: Level II

AUTHORITY: Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition: Given a tripod, a safety chain, webbing, carabiners, pulleys, and appropriate personal protective equipment

Behavior: The student will set-up and operate a tripod system

Standard: Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 Skedco-Evac tripod
- 1 safety chain
- 2 green webbing
- 3 carabiners
- 1 swivel (if used)
- 2 single sheave pulleys
- 2 150' rescue rope
- 1 edge protection
- 1 3:1 or 4:1 mechanical advantage
- 1 picket
- 1 12-lb sledge hammer
- 1 cable winch
- Appropriate personal protective equipment

REFERENCES:

- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 10

PREPARATION: A tripod system is a temporary, high point anchor used to provide a degree of safety and efficiency to rescuers who enter vertical confined spaces to conduct rescue operations. Tripods systems can be set-up quickly, with minimal equipment that allows rescuers to safely enter and be retrieved from, vertical entry confined spaces. Tripods allow loads to be raised to a point where they may completely clear the opening of a confined space.

NOTE: This lesson plan applies to a specific brand/model of tripod. You must develop a lesson plan that is specific to the operation of the particular brand/model you are using.

Confined Space rescue tripod with rope rescue system attached through a series of directional pulleys

OPERATIONS	KEY POINTS
1. Safety considerations	1a. Always wear appropriate personal protective equipment 1b. Only use equipment that is in good condition and has been inspected and tested 1c. Tripods should only be deployed by people who have been properly trained and are aware of equipment limitations 1d. The safe and efficient operation of rescue equipment is dependent on the knowledge, skill and ability of the person(s) deploying and operating the equipment 1e. Always follow the manufacturer's recommendations for set-up and safety
2. Assemble the tools and equipment necessary to set-up and operate a tripod system	2a. In a safe, flat area 2b. Away from the opening of the confined space
3. Extend the tripod legs	3a. Extend to the desired height 3b. Lock into position with a hitch pin 3c. Place a cotter pin through the end of hitch pin
4. Attach the haul system and belay line	4a. Utilizing the top anchor plates 4b. Webbing, swivels (if used), carabiner and rope pulley when using rope rescue system 4c. Webbing, carabiner and cable pulley when using a cable winch system 4d. Secure rope or cable to prevent the rope or cable from pulling back through pulley when standing tripod up

OPERATIONS	KEY POINTS
Note: Use caution when running belay systems through high directionals	
5. Attach guy lines	5a. If necessary
6. Stand the tripod up	6a. Minimum of two people 6b. Be aware of a "fall hazard" when working near the confined space opening 6c. Spread the legs outward to the maximum distance allowed by the tripod head 6d. Then move each leg inward about 2 inches 6e. Use the haul line as a "plumb line" to center the tripod over the opening
7. Secure the tripod feet	7a. If on dirt or other soft surface 7b. Rotate the tripod feet "point down"
8. Install the safety chain	8a. Safety Note: The chain must be used on the tripod unless the feet are properly bolted down or secured 8b. Thread through the holes in the sides of the tripod feet 8c. Secure ends with a screw link 8d. Forming a triangle between the three legs
9. Lash or back-tie tripod feet if the safety chain is not used	9a. Lash legs to pickets (if necessary) 9b. Back-tie legs to anchor points (if necessary)
10. Attach cable winch (if using)	10a. Attach to anchor plate on leg 10b. Lock into position with hitch pins 10c. Place the cotter pin through the end of hitch pin

OPERATIONS	KEY POINTS
11. Perform a safety check of the tripod system	11a. Check hitch pins and cotter pins 11b. Check carabiner locks 11c. Check knots/lashing 11d. Check cable winch operation (if used) 11e. Check the operation of the rope rescue system (if used) 11f. Ensure the tripod will be loaded properly 11g. Check tripod stability
12. Attaching loads	12a. Ensure the tripod is loaded vertically 12b. Ensure loads are raised and lowered “plumb” from the top of the tripod 12c. Directional pulleys must load the tripod vertically from within the triangular footed area 12d. DO NOT side load the tripod 12e. DO NOT load the tripod with weight in excess of the safe working load specified by the manufacturer

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 Cable And Winch Systems
TIME FRAME:	0:45
LEVEL OF INSTRUCTION:	Level II
AUTHORITY:	Title 8 CCR, G.I.S.O, § 5157 & NFPA 1006

BEHAVIORAL OBJECTIVE:

Condition:	Given a winch, a tripod, tripod chain, and appropriate personal protective equipment
Behavior:	The student will set-up and operate a cable and winch system
Standard:	Completing all operations with 100% accuracy according to the job breakdown

MATERIALS NEEDED:

- Job breakdown
- 1 tripod with a DBI/SALA quick mount bracket
- 1 tripod safety chain
- 1 DBI/SALA, SALALIFT II cable winch
- 1 green webbing
- 1 carabiner
- 1 cable pulley
- 1 swivel (if used)
- Appropriate personal protective equipment

REFERENCES:

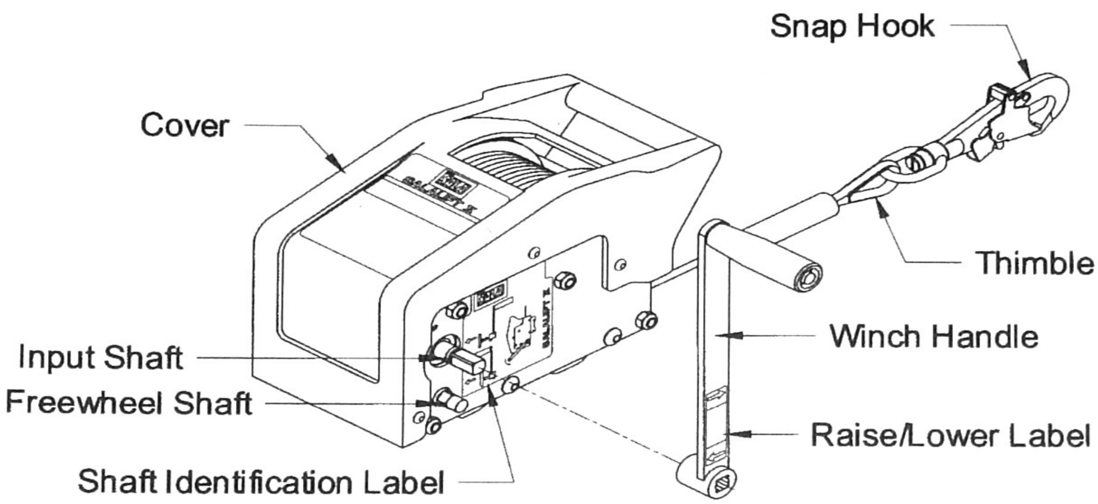
- Confined Space Entry and Rescue Manual, 2nd ed (2007), CMC Rescue Inc., Chapter 9

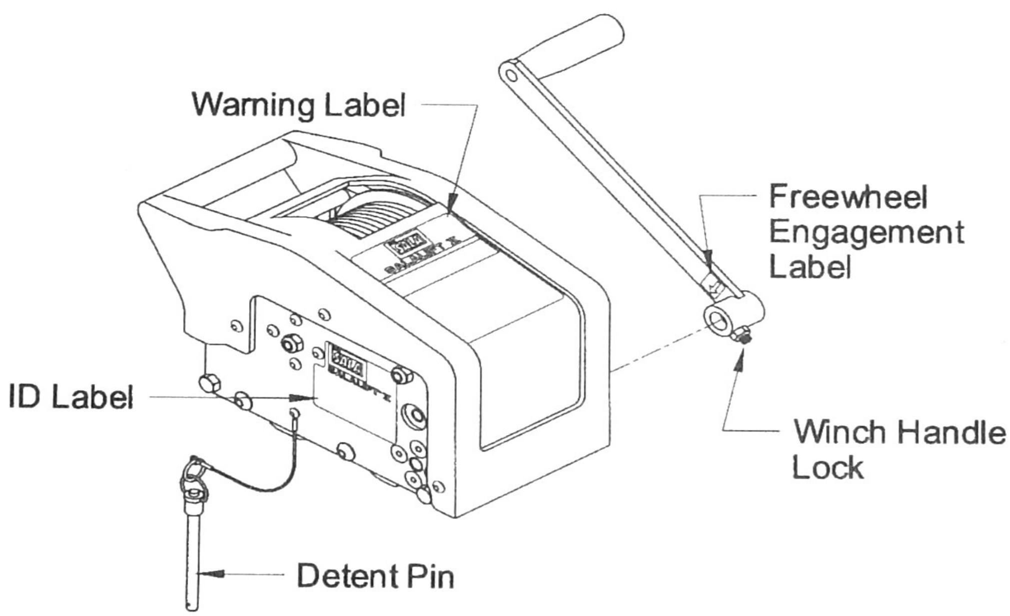
PREPARATION:

Cable and winch systems are used to safely and efficiently raise and lower loads through vertical confined spaces. Cable and winch systems can be operated by one person and have braking devices that prevent loads from falling. Only use equipment that is in good condition and has been properly inspected and tested. Follow the manufacturer's recommendations for set-up and safety.

NOTE:

This lesson plan applies to a specific brand/model of cable winch. You must develop a lesson plan that is specific to the operation of the particular brand/model you are using.





DBI/SALA - SALALIFT II WINCH - MODEL 8102001

OPERATIONS	KEY POINTS
Note: Begin with a properly erected tripod with webbing, carabiner, cable pulley and cable attached to the top anchor plate of the tripod	
1. Safety considerations	1a. Wear appropriate personal protective equipment 1b. ALWAYS wear gloves when handling cable 1c. Only use equipment that is in good condition and has been inspected and tested 1d. Cable winches should only be deployed by people who have been properly trained and are aware of equipment limitations 1e. The safe and efficient operation of rescue equipment is dependent on the knowledge, skill and ability of the person(s) deploying and operating the equipment 1f. Always follow the manufacturer’s recommendations for set-up and safety
2. Inspect before each use	2a. Check for worn or damaged parts 2b. Ensure that all parts are present and secure 2c. Check operation of winch 2d. Ensure that the winch will lift, lower, and hold a load under normal operation 2e. Check winch and cable system for damage and corrosion
3. Attach the cable winch to the tripod	3a. Utilizing the quick-mount bracket on the tripod

OPERATIONS	KEY POINTS
4. Lift the winch into place	4a. Position the slot in the bracket over the fixed pin on the tripod bracket 4b. Push the top of the winch in toward the tripod while the bottom rotates on the fixed pin 4c. Align the holes and push the detent pin through until it stops 4d. Ensure the pin locks into place
5. Slowly pull out the winch line	5a. Through the cable pulley 5b. To a height for rescuer harness attachment
6. Install the winch crank handle	6a. Onto the output shaft 6b. Align the hub of the crank handle with the square drive marked “winch shaft” 6c. Push firmly inward until the handle snaps into place 6d. The grip on the handle should face outward
7. Feed the cable off the winch drum	7a. By rotating the crank handle in the lowering direction (counterclockwise) 7b. Apply slight tension to the cable while feeding it off the drum

OPERATIONS	KEY POINTS
8. To lower a load	8a. ALWAYS wear gloves when handling cable 8b. Rotate the winch crank handle in the lower direction (counterclockwise) 8c. Without a load, maintain slight tension on the cable 8d. WARNING: One complete layer of cable must remain on the drum at all times 8e. DO NOT attempt to reverse wind the cable onto the drum 8f. DO NOT exceed the rated capacity of 350 lbs 8g. DO NOT use the winch to raise or lower more than one person, except for emergency situations 8h. ALWAYS keep the cable tension firm. Slack cable could cause a free fall
9. To hold or momentarily suspend the load	9a. Stop cranking 9b. The automatic clutch/brake will hold the load if the handle is released 9c. The overload clutch limits the lifting force to approximately 700 lbs

OPERATIONS	KEY POINTS
10. To raise a load	10a. ALWAYS wear gloves when handling cable 10b. Rotate the winch crank handle in the raise direction (clockwise) 10c. DO NOT exceed the rated capacity of 350 lbs 10d. DO NOT use the winch to raise or lower more than one person, except for emergency situations 10e. ALWAYS keep the cable tension firm. Slack cable could cause a free fall 10f. ALWAYS check periodically to see that cable is winding evenly on the drum
11. Free-wheel mode	11a. Remove the crank handle from the input shaft 11b. Reverse the crank handle and install it onto the square drive marked “freewheel shaft” 11c. Align the handle hub with the shaft
12. To engage the freewheel mode	12a. Rotate the handle counterclockwise until it stops and hold 12b. Pull cable off the winch drum slowly
13. Impact indicator	13a. Part of the swiveling hook 13b. Red band is exposed in the event of a severe impact load 13c. Red band is exposed if lifting capacity is exceeded

OPERATIONS	KEY POINTS
14. Cable reserve and shear pin	14a. Ensures that the shock absorbing feature is available throughout the working range of the winch 14b. With a single layer of cable remaining on the drum the shear pin is visible 14c. If shock loaded, the shear pin will shear allowing the shock absorber to function properly
15. Inspecting the winch	15a. Before each use 15b. All screws, bolts and nuts 15c. Crank handle must lock positively onto the shaft 15d. Crank handle must be free of cracks, bends, or other damage
16. Connecting hook inspection	16a. Before each use 16b. Breaks and distortion 16c. Sharp edges, burrs, cracks, worn parts, corrosion 16d. Hook must move freely and lock upon closing 16e. Hook must swivel freely 16f. Remove from service if the red impact indicator is visible
17. Cable inspection	17a. Before each use 17b. Broken wires 17c. Signs of corrosion 17d. Kinks 17e. Birdcaging

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.

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX A

STUDENT TASK BOOK

STUDENT TASK BOOK

The Confined Space Rescue Technician Student Trainee Task Book lists every requirement that will be evaluated. Each student's performance will be observed and recorded by the Instructors. Grades will then be evaluated and the instructor will determine if the student has successfully met the performance standards for this course and should be issued a course completion certificate.

RESPONSIBILITIES

(A) State Fire Training is responsible for:

Ensuring the Confined Space Rescue Technician training site meets all site requirements

Ensuring the course instructor(s) are registered for the level and subject of instruction to be taught

Issuing certificates for successful course completion

(B) The student is responsible for:

Reading and understanding information in the student text and supporting materials

Satisfactorily completing all course requirements

Ensuring their Confined Space Rescue Technician Student Task Book is accurately recorded and maintained

(C) The evaluating Instructor(s) is responsible for:

Being qualified and proficient

Explaining to the students the purpose of and process for completing the Confined Space Rescue Technician Student Task Book

Explaining to the students their responsibilities

Accurately evaluating and recording on the Confined Space Rescue Technician Student Task Book all course requirements by the students

INSTRUCTIONS FOR COMPLETING THE TASK BOOK

The Confined Space Rescue Technician Student Task Book allows the instructor to record a student's performance for both technical and manipulative jobs. These evaluations are made by observing the student's participation in the classroom, manipulative performance in individual or group skills stations, and performance during confined space rescue scenarios.

Task Book Headings

Student:	Enter your name
Class Dates:	Enter the beginning and ending date of the class
Module:	Lists the module name and the technical and manipulative performance requirements by topic
Time Frame:	Lists the estimated time frame for teaching the job
Reference:	Lists the corresponding chapter(s) from the student's text and supporting materials
Instructor #:	The evaluating Instructor(s) enter their State Fire Training registration number
Instructor Initials:	The evaluating Instructor enters their initials
Date:	The evaluating Instructor(s) enters the date the Primary student was evaluated

Grade Codes

"P" The student successfully completed the performance standard

"N/P" The student did not satisfy certain portions of the performance standard and additional guidance is required

Evaluator Recommendation

At the completion of the Student Task Book, the evaluator(s) shall complete the Evaluator Recommendation (Page 7)

STUDENT:			**CLASS DATES:**	
ORIENTATION MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Introduction To Confined Space Rescue				
Course Introduction	0:15	Preface		
Confined Space Identification	1:30	Chapter 1		
OSHA Regulation	1:00	Chapter 2		
Confined Space Hazards	1:30	Chapter 4		
Atmospheric Monitoring	1:00	Chapter 5		
Hazard Control	1:00	Chapter 6		
Personal Protective Equipment	0:45	Chapter 7		
Phases of Confined Space Rescue	0:30	Chapter 8		
Rescue Rope and Related Equipment	1:00	Chapter 9		
High Point Anchor Systems	0:30	Chapter 10		
Communications	0:30	Chapter 11		
Permitting Confined Spaces	0:30	Chapter 12		
Total Hours:	**10:00**			

Comments:

STUDENT:			CLASS DATES:	
SKILLS MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Knots				
How To Tie A Figure Eight Stopper	0:10	Chapter 9		
How To Tie A Figure Eight On A Bight	0:10			
How To Tie A Figure Eight Follow Through	0:10			
How To Tie A Figure Eight Bend	0:10			
How To Tie A Square Knot	0:10			
How To Tie An Overhand Bend	0:10			
How To Tie A Double Overhand Bend (Double Fisherman Knot)	0:10			
How To Attach A 3-Wrap Prusik To A Rescue Rope	0:10			
How To Construct A Modified Trucker's Hitch	0:10			
Anchor Systems				
How To Tie A Single Loop Anchor Sling	0:10	Chapter 9		
How To Tie A Basket Sling	0:10			
How To Tie A Multi-Loop Anchor Sling (Wrap Three, Pull Two)	0:10			
How To Tie A Tensionless Hitch	0:10			
How To Construct A Back-Tied Anchor System	0:10			
Rpm				
How To Attach And Operate A Brake Bar Rack As Part Of The RPM	0:15	Chapter 9		
How To Construct And Operate A Load Release Hitch As Part Of The RPM	0:20			
How To Attach A Prusik Loop To The RPM For Use In A Haul System	0:10			
How To Construct And Operate The RPM	0:30			
Belay Systems				
How To Construct And Operate A Tandem Prusik Belay System	0:15	Chapter 9		
How To Convert A Tandem Prusik Belay System To A Retrieval Line	0:15			

Comments:

STUDENT:			CLASS DATES:	
SKILLS MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Raising Systems				
How To Construct And Operate A 2:1 Ladder Rig Mechanical Advantage System	0:15	Chapter 9		
How To Construct And Operate A 3:1 Z-Rig Mechanical Advantage System Through A High Point Anchor	0:15			
How To Construct And Operate A 3:1 Piggyback Mechanical Advantage System Through A High Point Anchor	0:15			
How To Construct And Operate A 4:1 Mechanical Advantage System	0:15			
How To Construct And Operate A 4:1 Pre-Rig Mechanical Advantage System	0:15			
Rescuer and Victim Packaging				
How To Tie Two Half Hitches	0:10	Chapter 9		
How To Tie A Round Turn And Two Half Hitches	0:10			
How To Tie And Attach A Hasty Chest Harness (Double Locking Lark's Foot) To A Victim	0:10			
How To Tie And Attach Wristlets and Anklets	0:10			
How To Secure A Victim To A Rescue Litter	0:20			
How To Rig A Litter For Vertical Rescue	0:10			
How To Rig A Victim In A SKED Litter	0:20			
How To Rig A Victim In A LSP Half Back or Equivalent	0:15			
How To Don A Pre-Sewn Class III Rescue Harness	0:15			
Respiratory Equipment				
How To Don And Operate A Self-Contained Breathing Apparatus (SCBA)	0:10	Chapter 7		
How To Don And Operate A Supplied Air Respirator (SAR) And Escape Pack	0:15			
How To Operate A Supplied Air Respiratory System	0:15			
How To Lay Out And Deploy Supplied Air Lines	0:10			
How to Provide Victim Respiratory Protection	0:10			
Communication Systems				
How To Perform A Verbal Communication System	0:05	Chapter 11		
How To Perform A Hand Signal Communication System	0:10			
How To Operate A Rope Signal Communication System	0:05			
How To Operate A Light Signal Communication System	0:05			
How To Operate A Tapping And Rapping Communication System	0:05			

STUDENT:			CLASS DATES:	
SKILLS MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
How To Operate A Portable Radio Communication System	0:10			
How to Operate A Hardwire Communication System	0:20	Chapter 11		
Hazard Control				
How to Lock-Out / Tag-Out An Electrical Equipment Switch	0:10	Chapter 6		
How To Lock-Out / Tag-Out An Electrical Circuit Switch	0:10			
How To Lock-Out / Tag-Out A Gate Valve	0:05			
How To Operate A Ventilation Ducting	0:05			
How To Deploy Ventilation Ducting	0:05			
How To Deploy A Manhole Saddle Vent	0:05			
How To Perform Positive Pressure (Supply) Ventilation	0:05			
How To Perform Negative Pressure (Exhaust) Ventilation	0:05			
How To Perform Combination Ventilation	0:05			
How To Perform Local Supply Ventilation	0:05			
How To Calculate Ventilation Air Exchanges	0:05			
Atmospheric Monitoring				
How To Perform Instrument Start-Up	0:05	Chapter 5		
How To Determine The Instrument Target Gases	0:10			
How To Bump Test The Instrument	0:05			
How To Check The Peaks On The Instrument	0:05			
How To Clear The Peaks On The Instrument	0:05			
How To Perform Remote Sampling	0:10			
How To Use A Conversion Chart To Assess Flammability	0:10			
How To Perform Instrument Shut-Down	0:05			
High Point Anchor Systems				
How To Construct And Operate A Ladder Gin System	0:40	Chapter 10		
How To Construct And Operate A Ladder “A” Frame System	0:50			
How To Set-Up And Operate A Tripod System	0:45			
How to Operate Cable And Winch Systems	0:15			

Total Hours: 14:00

Comments:

STUDENT:			**CLASS DATES:**	
CONFINED SPACE ENTRY MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Confined Space Entry				
Confined Space Rescue – Vertical Entry	16:00	N/A		
Confined Space Rescue – Horizontal Entry				
Confined Space Rescue – Tapered Cross Section				
Confined Space Rescue – In-Pipe				
Confined Space Rescue – Non-Entry				
Written Exam				
Successful Completion Of Written Exam(s)	N/A	N/A		

Total Hours: 16:00

Comments:

EVALUATOR RECOMMENDATION

Evaluator: ________________________ Evaluator's #: ________________

Department: ________________________

Phone: ________________________

The above named student performed and/or demonstrated proficiency in all tasks initialed and dated.

Evaluator's Signature: ________________________ Date: ________________

Comments:

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX A

PRIMARY INSTRUCTOR TRAINEE TASK BOOK

PRIMARY INSTRUCTOR TRAINEE TASK BOOK

The Confined Space Rescue Technician Primary Instructor Trainee Task Book lists every requirement that will be evaluated. Each Primary Instructor Trainee's performance will be observed and recorded by the evaluating Senior Instructors. The evaluating Senior Instructor will determine if the Primary Instructor Trainee has successfully met the performance standards and should be recommended for Senior Instructor status.

RESPONSIBILITIES

(A) The Primary Instructor Trainee is responsible for:

Reading and understanding material in the instructor guide, student text, site requirements, equipment standards, and other supporting materials.

Satisfactorily completing all Senior Instructor requirements

Ensuring their Confined Space Rescue Technician Primary Instructor Trainee Task Book is accurately recorded, maintained and completed within 24 months of task book initiation by an evaluating Senior Instructor.

Filing and keeping their Confined Space Rescue Technician Primary Instructor Trainee Task Book with their other personal or career records

(B) The evaluating Senior Instructor is responsible for:

Being qualified and proficient

Initiating and explaining to the Primary Instructor Trainee the purpose of and process for completing the Confined Space Rescue Technician Primary Instructor Trainee Task Book

Explaining to the Primary Instructor Trainee their responsibilities

Accurately evaluating and recording on the Confined Space Rescue Technician Primary Instructor Trainee Task Book all requirements completed by the Primary Instructor Trainee

REQUIREMENTS

To qualify as a Confined Space Rescue Technician Primary Instructor, the applicant shall satisfy all requirements for Confined Space Rescue Technician Instructor as outlined in State Fire Training Policy and Procedures Manual.

INSTRUCTIONS FOR COMPLETING THE TASK BOOK

The Confined Space Rescue Technician Primary Instructor Trainee Task Book allows the evaluating Senior Instructors to record a Primary Instructor Trainee's performance for teaching both technical and manipulative lesson plans. These evaluations are made by observing the Primary Instructor Trainee’s presentations in a classroom setting and their instruction of manipulative performance techniques for each skill station. <u>The Primary Instructor Trainee must demonstrate proficiency in the instruction of each module.</u>

Task Book Headings

Task Book Initiated By:	Name of Senior Instructor Initiating the Task Book and Date
Primary Trainee:	Enter the trainee's name
Module:	Lists the module name and the technical and manipulative performance requirements by topic
Time Frame:	Lists the estimated time frame for teaching the lesson plan
Reference:	Lists the corresponding chapters from the student text and supporting materials
Instructor #:	The evaluating Senior Instructor(s) enters their State Fire Training registration number
Instructor Initials:	The evaluating Senior Instructor(s) enters their initials
Date:	The evaluating Senior Instructor(s) enters the date the Primary Instructor Trainee was evaluated

Evaluator Recommendation

At the completion of the Primary Instructor Trainee Task Book, the evaluator(s) shall complete the Evaluator Recommendation (Page 7)

Task Book Initiated by:__________________________________ Date:________________

PRIMARY INSTRUCTOR TRAINEE:

ORIENTATION MODULE	Time Frame	Reference	Evaluating Instructor # and Initials	Date
Introduction To Confined Space Rescue				
Course Introduction	0:15	Preface		
Confined Space Identification	1:30	Chapter 1		
OSHA Regulation	1:00	Chapter 2		
Confined Space Hazards	1:30	Chapter 4		
Atmospheric Monitoring	1:00	Chapter 5		
Hazard Control	1:00	Chapter 6		
Personal Protective Equipment	0:45	Chapter 7		
Phases of Confined Space Rescue	0:30	Chapter 8		
Rescue Rope and Related Equipment	1:00	Chapter 9		
High Point Anchor Systems	0:30	Chapter 10		
Communications	0:30	Chapter 11		
Permitting Confined Spaces	0:30	Chapter 12		

Total Hours: 10:00

Comments:

PRIMARY INSTRUCTOR TRAINEE:				
SKILLS MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Knots				
How to Tie A Figure Eight Stopper	0:10	Chapter 9		
How to Tie A Figure Eight On A Bight	0:10			
How to Tie A Figure Eight Follow Through	0:10			
How to Tie A Figure Eight Bend	0:10			
How to Tie A Square Knot	0:10			
How to Tie An Overhand Bend	0:10			
How to Tie A Double Overhand Bend (Double Fisherman Knot)	0:10			
How to Attach A 3-Wrap Prusik To A Rescue Rope	0:10			
How To Construct A Modified Trucker's Hitch	0:10			
Anchor Systems				
How To Tie A Single Loop Anchor Sling	0:10	Chapter 9		
How To Tie A Basket Sling	0:10			
How To Tie A Multi-Loop Anchor Sling (Wrap Three, Pull Two)	0:10			
How To Tie A Tensionless Hitch	0:10			
How To Construct A Back-Tied Anchor System	0:10			
RPM				
How To Attach and Operate A Brake Bar Rack As Part Of the RPM	0:15	Chapter 9		
How To Construct and Operate A Load Releasing Hitch As Part Of The RPM	0:20			
How To Attach A Prusik Loop To The RPM For Use In a Haul System	0:10			
How To Construct and Operate The RPM	0:30			
Belay Systems				
How To Construct And Operate A Belay System	0:15	Chapter 9		
How To Operate A Belay System As A Retrieval Line	0:15			

Comments:

PRIMARY INSTRUCTOR TRAINEE:				
SKILLS MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Raising Systems				
How to Construct And Operate A 2:1 Ladder Rig Mechanical Advantage System	0:15	Chapter 9		
How to Construct And Operate A 3:1 Z-Rig Mechanical Advantage System Through A High Point Anchor	0:15			
How to Construct And Operate A 3:1 Piggyback Mechanical Advantage System Through A High Point Anchor	0:15			
How to Construct And Operate A 4:1 Mechanical Advantage System	0:15			
How to Construct And Operate A 4:1 Pre-Rig Mechanical Advantage System	0:15			
Rescuer and Victim Packaging				
How To Tie Two Half Hitches	0:10	Chapter 9		
How To Tie A Round Turn And Two Half Hitches	0:10			
How To Tie And Attach A Hasty Chest Harness (Double Locking Lark's Foot) To A Victim	0:10			
How To Tie And Attach Wristlets and Anklets	0:10			
How To Secure A Victim To A Rescue Litter	0:20			
How To Rig A Litter For Vertical Rescue	0:10			
How To Rig A Victim In A SKED Litter	0:20			
How To Rig A Victim In A LSP Half Back or Equivalent	0:15			
How To Don A Pre-Sewn Class III Rescue Harness	0:15			
Respiratory Equipment				
How To Don And Operate A Self-Contained Breathing Apparatus (SCBA)	0:10	Chapter 7		
How To Don And Operate A Supplied Air Respirator (SAR) And Escape Pack	0:15			
How To Operate A Supplied Air Respiratory System	0:15			
How To Lay Out And Deploy Supplied Air Lines	0:10			
How to Provide Victim Respiratory Protection	0:10			
Communication Systems				
How To Perform A Verbal Communication System	0:05	Chapter 11		
How To Perform A Hand Signal Communication System	0:10			
How To Operate A Rope Signal Communication System	0:05			
How To Operate A Light Signal Communication System	0:05			
How To Operate A Tapping And Rapping Communication System	0:05			

PRIMARY INSTRUCTOR TRAINEE:				
SKILLS MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
How To Operate A Portable Radio Communication System	0:10	Chapter 11		
How To Operate A Hardwire Communication System	0:20			
Hazard Control				
How To Identify Types Of Energy Sources	0:05	Chapter 6		
How To Isolate Energy Sources	0:05			
How To Perform Lock-Out/Tag-Out/Block-Out	0:15			
How To Operate A Ventilation Fan	0:05			
How To Deploy Ventilation Ducting	0:05			
How To Deploy A Manhole Saddle Vent	0:05			
How To Perform Positive Pressure (Supply) Ventilation	0:05			
How To Perform Negative Pressure (Exhaust) Ventilation	0:05			
How To Perform Combination Ventilation	0:05			
How To Perform Local Supply Ventilation	0:05			
How To Calculate Ventilation Air Exchanges	0:05			
Atmospheric Monitoring				
How To Perform Instrument Start-Up	0:05	Chapter 5		
How To Determine The Instrument Target Gases	0:10			
How To Bump Test The Instrument	0:05			
How To Check The Peaks On The Instrument	0:05			
How To Clear The Peaks On The Instrument	0:05			
How To Perform Remote Sampling	0:10			
How To Use A Conversion Chart To Assess Flammability	0:10			
How To Perform Instrument Shut-Down	0:05			
High Point Anchor Systems				
How To Construct And Operate A Ladder Gin System	0:40	Chapter 10		
How To Construct And Operate A Ladder “A” Frame System	0:50			
How To Set-Up And Operate A Tripod System	0:45			
How to Operate Cable And Winch Systems	0:15			

Total Hours: 14:00

Comments:

PRIMARY INSTRUCTOR TRAINEE:				
CONFINED SPACE ENTRY MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Confined Space Entry				
Confined Space Rescue – Vertical Entry	16:00	N/A		
Confined Space Rescue – Horizontal Entry				
Confined Space Rescue – Tapered Cross Section				
Confined Space Rescue – In-Pipe				
Confined Space Rescue – Non-Entry				
Able To Develop, Proctor And Evaluate Confined Space Entry Scenarios				
Written Exam				
Successful Completion Of Written Exam(s) - Optional	N/A	N/A		

Total Hours: 16:00

Comments:

EVALUATOR RECOMMENDATION

Evaluator: ______________________________ Evaluator's #: ___________________

Department: ________________________________

Phone: ________________________________

The above named Primary Instructor Trainee performed and/or demonstrated proficiency in all tasks initialed and dated. As a result, it is proposed that the Primary Instructor Trainee be considered for Primary Instructor registration.

Senior Inst. Evaluator's Signature: ________________________________ Date: ____________________

Comments:

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX A

SENIOR INSTRUCTOR TRAINEE TASK BOOK

SENIOR INSTRUCTOR TRAINEE TASK BOOK

The Confined Space Rescue Technician Senior Instructor Trainee Task Book lists every requirement that will be evaluated. Each Senior Instructor Trainee's performance will be observed and recorded by the evaluating Senior Instructors. The evaluating Senior Instructors will determine if the Senior Instructor Trainee has successfully met the performance standards and should be recommended for Senior Instructor status.

RESPONSIBILITIES

(A) The Senior Instructor Trainee is responsible for:

Reading and understanding material in the instructor guide, student text, site requirements, equipment standards, and other supporting materials

Satisfactorily completing all Senior Instructor requirements

Ensuring their Confined Space Rescue Technician Senior Instructor Trainee Task Book is accurately recorded, maintained and completed within 24 months of task book initiation by an evaluating Senior Instructor.

Filing and keeping their Confined Space Rescue Technician Senior Instructor Trainee Task Book with their other personal or career records

(B) The evaluating Senior Instructor is responsible for:

Being qualified and proficient

Initiating and explaining to the Senior Instructor Trainee the purpose of and process for completing the Confined Space Rescue Technician Senior Instructor Trainee Task Book

Explaining to the Senior Instructor Trainee their responsibilities

Accurately evaluating and recording on the Confined Space Rescue Technician Senior Instructor Trainee Task Book all requirements completed by the Senior Instructor Trainee

REQUIREMENTS

To qualify as a Confined Space Rescue Technician Senior Instructor, the applicant shall satisfy all requirements for Confined Space Rescue Technician Senior Instructor as outlined in State Fire Training Policy and Procedures Manual.

INSTRUCTIONS FOR COMPLETING THE TASK BOOK

The Confined Space Rescue Technician Senior Instructor Trainee Task Book allows the evaluating Senior Instructors to record a Senior Instructor Trainee's performance for teaching both technical and manipulative lesson plans, preparing for the class, organizing the class, managing other instructors, development of scenarios, filing of paperwork and other Senior Instructor tasks. These evaluations are made by observing the Senior Instructor Trainee's performance before class, during classroom presentations, manipulative instruction, as well as after course completion. <u>The Senior Instructor Trainee must possess proficiency in the instruction of each module.</u>

Task Book Headings

Task Book Initiated By:	Name of Senior Instructor Initiating the Task Book and Date
Senior Instructor Trainee:	Enter the trainee's name
Module:	Lists the module name and the technical and manipulative performance requirements by topic
Time Frame:	Lists the estimated time frame for teaching the lesson plan
Reference:	Lists the corresponding chapters from the student text and supporting materials
Instructor #:	The evaluating Senior Instructor(s) enters their State Fire Training registration number
Instructor Initials:	The evaluating Senior Instructor(s) enters their initials
Date:	The evaluating Senior Instructor(s) enters the date the Senior Instructor Trainee was evaluated

Evaluator Recommendation

At the completion of the Senior Instructor Trainee Task Book, the evaluator(s) shall complete the Evaluator Recommendation (Page 7)

Task Book Initiated by:___________________________________ **Date:**_________________

SENIOR INSTRUCTOR TRAINEE:				
ORIENTATION MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Introduction To Confined Space Rescue				
Course Introduction	0:15	Preface		
Confined Space Identification	1:30	Chapter 1		
OSHA Regulation	1:00	Chapter 2		
Confined Space Hazards	1:30	Chapter 4		
Atmospheric Monitoring	1:00	Chapter 5		
Hazard Control	1:00	Chapter 6		
Personal Protective Equipment	0:45	Chapter 7		
Phases of Confined Space Rescue	0:30	Chapter 8		
Rescue Rope and Related Equipment	1:00	Chapter 9		
High Point Anchors	0:30	Chapter 10		
Communications	0:30	Chapter 11		
Permitting Confined Spaces	0:30	Chapter 12		
Total Hours:	**10:00**			

Comments:

SENIOR INSTRUCTOR TRAINEE:		
SKILLS MODULE	**Evaluating Instructor # and Initials**	**Date**
Class Preparation		
Confirm/Review Adequate Props		
Confirm/Review Adequate Facilities		
Develop/Submit Site Approval Application in accordance with SFT P & P		
Complete/Submit Course Scheduling Request		
Order Student Text Books		
Confirm Equipment Based on Number of Squads		
Complete Instructor Assignments		
Complete Pre-class Instructor Meeting		
Develop/Complete Class Safety Plan (ICS 208)		
Develop/Complete Medical Plan (ICS 206)		
Prop and Scenario Organization		
Organize Scenarios from Simple to Complex		
Provide Appropriate Equipment for Given Scenarios		
Consider Timing of Simultaneous Scenarios		
Scenario Atmospheric Monitoring Readings		
Reports Target Gases Appropriate to Evolution		
Reports Target Gases Appropriate to Vapor Density		
Reports O2 Displacement Appropriate to Target Gas		
Reports LEL Reading Appropriate to Target Gas		
Reports Improved Reading Appropriate to Ventilation		
Alternate Entry/C5		
Explain / Develop C5 Procedure for Eligible Training Space		

Comments:

SENIOR INSTRUCTOR TRAINEE:		
SKILLS MODULE	**Evaluating Instructor # and Initials**	**Date**
Student/Victim Considerations in Actual PRCS		
Insures Completion of Entry Permit		
Insure Appropriate Harness		
Demonstrate Retrieval System		
Develops and Maintains Communications Plan		
Confirms Hazard Control (Lock-Out/Tag-Out)		
Confirms Atmospheric Monitoring/Ventilation		
Class Paperwork/Documentation		
Completion of Scantrons		
Completion of Class Rosters		
Completion and Filing of Entry Permits		
Completion of Written Exam		
Completion and Filing of Rope Logs		
Completion of Course Evaluations		
Completion and Submission of State Fire Training Paperwork		
Class Logistics		
Provide/Confirm Appropriate Mask Decontamination		
Provide/Confirm Breathing Air Refill		
Provide/Confirm Student Facilities for Off-Site Instruction		
Knowledge of Other Related Standards and Regulations		
OSHA (Fall Protection, Respiratory, Lock-Out/Tag-Out, Tunneling, IIPP)		
ASTM		
ANSI		
NIOSH		
NFPA		

Comments:

SENIOR INSTRUCTOR TRAINEE:				
CONFINED SPACE ENTRY MODULE	**Time Frame**	**Reference**	**Evaluating Instructor # and Initials**	**Date**
Confined Space Entry				
Confined Space Rescue – Vertical Entry	16:00	N/A		
Confined Space Rescue – Horizontal Entry				
Confined Space Rescue – Tapered Cross Section				
Confined Space Rescue – In-Pipe				
Confined Space Rescue – Non-Entry				
Able To Develop, Proctor, And Evaluate Confined Space Entry Scenarios				
Written Exam				
Successful Completion Of Written Exam(s) – Optional	N/A	N/A		
TOTAL HOURS:	**16:00**			

COMMENTS:

EVALUATOR RECOMMENDATION

Senior. Inst. Evaluator: ____________________________________ Senior. Inst. Evaluator's #: __________________
Department: ______________________________________
Phone: ______________________________________

The above named Senior Instructor Trainee performed and/or demonstrated proficiency in all tasks initialed and dated. As a result, it is proposed that the Senior Instructor Trainee be considered for Senior Instructor registration.

Senior Inst. Evaluator's Signature: _______________________________________ Date: ________________________

EVALUATOR RECOMMENDATION

Senior. Inst. Evaluator: ____________________________________ Senior. Inst. Evaluator's #: __________________
Department: ______________________________________
Phone: ______________________________________

The above named Senior Instructor Trainee performed and/or demonstrated proficiency in all tasks initialed and dated. As a result, it is proposed that the Senior Instructor Trainee be considered for Senior Instructor registration.

Senior Inst. Evaluator's Signature: _______________________________________ Date: ________________________

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX B

FINAL EXAM

CONFINED SPACE RESCUE TECHNICIAN
FINAL EXAM

INSTRUCTIONS: This is a multiple-choice test. For each of the following questions or statements, choose the best answer and fill in that letter on the answer sheet provided. Erase completely to change. **Do not write on this test!**

---

1. The phases of a confined space rescue are:

    a. Preparation, pre-entry, entry, rescue
    b. Preparation, assessment, pre-entry, entry and rescue, termination
    c. Assessment, pre-entry, entry and rescue, termination, critique
    d. Assessment, pre-entry, entry, rescue, critique

2. Which of the following statements is **not** a part Cal-OSHA's definition of a confined space?

    a. Large enough and so configured that an employee can bodily enter and perform assigned work.
    b. A space that requires purging prior to entry
    c. Has limited or restricted means of entry or exit
    d. Is not designed for continuous employee occupancy

3. How often does the confined space regulation require rescue team members to practice making permit space rescues?

    a. Once every 12 months
    b. Once a month
    c. Twice a year
    d. Quarterly

4. Entry into a permit-required confined space occurs when:

    a. The cover, door or hatch to the space is opened
    b. The entry permit is signed by the supervisor
    c. The entrant begins work in the space
    d. Any portion of the entrant's body breaks the plane of an opening into the space

5. Fire Departments in California who respond to confined space rescue incidents:

    a. Are exempted from compliance with CCR Title 8, Sec. 5157
    b. Must comply with the requirements of CCR Title 8, Sec. 5157
    c. Must comply with CFR part 1910 only
    d. Do not need to comply with any federal or state regulations governing confined space operations

6. Which of the following gases has a “rotten egg” odor in low concentrations?

    a. Carbon Monoxide
    b. Sulfur Dioxide
    c. Carbon Dioxide
    d. Hydrogen Sulfide

7. CCR Title 8, Section 5157 (c), provides alternative procedures to permit entries when the only hazard is atmospheric and can be made safe with continuous forced air ventilation. The above is an example of what type of classification?

    a. C2
    b. C4
    c. C5
    d. None of the above

8. OSHA standards state that a “hazardous atmosphere” exists when:

    a. The temperature of the space exceeds 95°F
    b. The noise level exceeds 85 decibels
    c. The LEL is above 10%
    d. The oxygen content is at 21%

9. One percent (%) by volume in air is equal to:

    a. 100 ppm
    b. 1,000 ppm
    c. 10,000 ppm
    d. 100,000 ppm

10. IDLH means:

a. Immediately dangerous life hazard
b. Immediately dangerous to life or health
c. Instant deployment of light hazard
d. Imminent degeneration of life & health

11. Oxygen below ____% in a confined space is considered to be oxygen deficient.

a. 16%
b. 18.5%
c. 20.8%
d. 19.5%

12. By law, lockout/tagout procedures are to be performed by an:

a. Entry supervisor
b. Attendant
c. Affected employee
d. Authorized employee

13. What are some key considerations when ventilating?

a. Type of atmosphere
b. Shape of the space
c. Power requirements
d. All of the above

14. Which type of respiratory protection is best suited for an IDLH atmosphere in a confined space with a restricted opening?

a. APR's (Air Purifying Respirators)
b. SCBA's (Self Contained Breathing Apparatus)
c. SAR's (Supplied Air Respirators)
d. N-95 particulate dusk mask

15. A pre-entry briefing should contain the following information:

a. Expected task(s)
b. Emergency procedures
c. Site plan review of the space
d. All of the above

16. The analysis of a rope rescue system should consist of a:

a. Critical point analysis
b. Whistle test
c. White board analysis
d. All of the above

17. During which phase of a confined space rescue does a pre-entry briefing take place?

a. Preparation
b. Assessment
c. Pre-entry
d. Entry and rescue

18. Medical monitoring of entry personnel is recommended:

a. Prior to entry only
b. After entry termination only
c. Prior to entry and after entry termination
d. Is not important, therefore not recommended

19. A NIOSH study (1980-1989) concluded that as many as ____ deaths occurred in confined spaces due to engulfment.

a. 60
b. 468
c. 227
d. 159

20. A common cause of engulfment accidents is when unstable material above a void area collapses under an entrant. This is referred to as:

   a. Breakaway
   b. Bridging
   c. Hidden collapse
   d. Sinking floor

21. Which one of the following is **<u>not</u>** a defining characteristic of a permit-required confined space?

   a. Oxygen level at 21%
   b. Contains material that can engulf the entrant
   c. Has the potential to contain a hazardous atmosphere
   d. Contains any recognized serious health or safety hazard

22. <u>Acceptable</u> accuracy of monitor readings is assured by:

   a. Bump testing
   b. Replacing monitors regularly
   c. Calibrating regularly
   d. Nothing, there is no way to insure accuracy

23. A NIOSH study found ___________to be a leading cause of fatalities in confined spaces.

   a. Flash fires
   b. Hazardous atmospheres
   c. Heat stress
   d. Struck by falling objects

24. An energy isolation program provides a means for controlling which one of the following?

   a. Electricity
   b. Pressure
   c. Stored energy
   d. All of the above

25. Claustrophobia is:

   a. A common reaction in confined spaces
   b. Can be a hazard to entrants and victims
   c. Can be controlled to a degree with training and practice
   d. All of the above

26. Which one of the following is **not** an example of lock-out/tag-out procedures?

   a. Electrical switch turned off
   b. Drive mechanisms disassembled/disabled
   c. Hydraulic lines blocked and bled
   d. Valves chained and locked

27. Entry permits must be filed and retained for a minimum of:

   a. 1 year
   b. 2 years
   c. 5 years
   d. 6 months

28. What type of ventilation would be best for an oxygen deficient atmosphere?

   a. Balance draft
   b. General ventilation
   c. Natural
   d. Local exhaust

29. What does the term "re-circulation" refer to?

   a. Contaminated air being drawn back into the fan and blown back into the space
   b. Air moving from the inlet directly to the outlet without removing contaminants
   c. Moving fresh air through a space until all contaminants are removed
   d. The spreading of contaminants into a clean area

30. Common ventilation plan(s) include forced:

a. Supply
b. Exhaust
c. Combination systems
d. All of the above

31. A directional pulley that makes the rope take a 90 degree turn has what affect on the anchor?

a. 1 times the load
b. 1.4 times the load
c. 2 times the load
d. There is no affect on the anchor

32. Self-contained breathing apparatus (SCBA) has the following limitation(s):

a. Larger rescuer profile
b. Finite air supply
c. Greater weight
d. All of the above

33. The respiratory protection type **not** recommended unless conditions are known and can be maintained is:

a. Air purifying respirator
b. Self contained breathing apparatus
c. Dual purpose SCBA
d. Supplied air respirator

34. The biggest disadvantage(s) to supplied air respiratory systems is:

a. Air line limitation of 300 feet
b. Continuous supply of air
c. Umbilical air line
d. Both a and c

35. Supplied air respirators worn in IDLH atmospheres are required to have?

a. Victim air supply
b. Quick fill capabilities
c. An emergency escape air bottle
d. Negative pressure capability

36. When performing confined space entry, communication between the____________ must be maintained:

a. Attendant and entrant
b. Entrant and entry supervisor
c. Attendant and industrial hygienist
d. Attendant and back-up entrants

37. In confined space operations, communications equipment:

a. Is optional
b. Can consist of rope to communicate using rope signals
c. Can consist of hard wire systems
d. Both b and c

38. A confined space permit serves what purpose

a. It serves as legal documentation for the entry
b. It serves as a safety checklist
c. It serves as a tactical log
d. All of the above

39. What is the most common objection of hardwire communications systems:

a. Clear communications
b. The wire
c. Their popularity
d. The price

40. The Cal-OSHA permit-required confined space standard requires a mechanical device be available to retrieve personnel when entering vertical type spaces deeper than:

a. 4 feet
b. 5 feet
c. 10 feet
d. 15 feet

41. To facilitate non-entry rescue, retrieval systems shall be used whenever an entry is made into a permit space unless;

a. The retrieval system would increase the overall risk of the entry
b. The retrieval system would not contribute to the rescue of the entrant
c. You don’t have enough line
d. Both a and b

42. Most tripods are strongest when they are:

a. Fully extended
b. Not extended at all
c. At a mid position
d. There is no difference

43. In extremely tight openings, Cal-OSHA allows _______ to be used in lieu of a chest or full body harness

a. Wristlets
b. Class I harnesses
c. Pelvic harnesses
d. Boatswains chairs

44. An exact count and identities of all entrants in the confined space must be maintained by the:

a. Entry supervisor
b. Employee representative
c. Back-up entrants
d. Attendant

45. Who is responsible for approving and canceling all entry permits?

a. The entrant
b. The entry supervisor
c. The attendant
d. The employee representative

46. Who is charged with removing or dealing with unauthorized persons around the site:

a. The entrant
b. The entry supervisor
c. The attendant
d. Both b and c

47. The person charged with confirming that conditions remain consistent with the entry permit is the:

a. Attendant
b. Entrant
c. Back-up entrant
d. Entry Supervisor

48. The three main positions identified by CCR Title 8, section 5157 to handle confined space operations are:

a. Attendant, entrant, perimeter control officer
b. Medical officer, rescue officer, triage officer
c. Entry supervisor, entrant, attendant
d. Back-up entrants, back-up supervisor, back-up attendants

49. A toxic gas with a vapor density of 1.67 is:

a. Heavier than air
b. Lighter than air
c. Equal to air
d. None of the above

50. To facilitate non-entry rescue, the Cal-OSHA confined space regulation states that each authorized entrant shall wear a chest or full body harness with a retrieval line attached

a. Only as needed
b. At the waist of the entrant
c. So the entrant presents in the smallest possible profile
d. None of the above

Confined Space Rescue Technician Written Exam

ANSWER SHEET

NAME: ____ DATE:__________

1. a. b. c. d.
2. a. b. c. d.
3. a. b. c. d.
4. a. b. c. d.
5. a. b. c. d
6. a. b. c. d.
7. a. b. c. d.
8. a. b. c. d.
9. a. b. c. d.
10. a. b. c. d.
11. a. b. c. d.
12. a. b. c. d.
13. a. b. c. d.
14. a. b. c. d.
15. a. b. c. d.
16. a. b. c. d.
17. a. b. c. d.
18. a. b. c. d.
19. a. b. c. d.
20. a. b. c. d.
21. a. b. c. d.
22. a. b. c. d.
23. a. b. c. d.
24. a. b. c. d.
25. a. b. c. d.
26. a. b. c. d.
27. a. b. c. d.
28. a. b. c. d.
29. a. b. c. d.
30. a. b. c. d.
31. a. b. c. d.
32. a. b. c. d.
33. a. b. c. d.
34. a. b. c. d.
35. a. b. c. d.
36. a. b. c. d.
37. a. b. c. d.
38. a. b. c. d.
39. a. b. c. d.
40. a. b. c. d.
41. a. b. c. d.
42. a. b. c. d.
43. a. b. c. d.
44. a. b. c. d.
45. a. b. c. d.
46. a. b. c. d.
47. a. b. c. d.
48. a. b. c. d.
49. a. b. c. d.
50. a. b. c. d.

CONFINED SPACE RESCUE TECHNICIAN
FINAL EXAM
ANSWER KEY

1. b – Chapter 1-11
2. b – Chapter 2-13
3. a – Chapter 2-18
4. d – Chapter 2-5
5. b – Chapter 2-2
6. d - Chapter 4-9
7. c – Chapter 2-7
8. c – Chapter 4-2
9. c – Chapter 5-17
10. b – Chapter 4-3
11. d – Chapter 4-4
12. d – Chapter 6-21
13. d – Chapter 6 -7 to 10
14. c – Chapter 7-9
15. d – Chapter 8-15
16. d – Chapter 9-43
17. c – Chapter 8-15
18. c – Chapter 6-24
19. c – Chapter 4-13
20. b – Chapter 4-13
21. a – Chapter 1-10
22. c – Chapter 5-4
23. b – Chapter 4-13
24. b – Chapter 4-2
25. d – Chapter 6-23
26. a – Chapter 6-19
27. a – Chapter 2-13
28. b – Chapter 6-4
29. a – Chapter 6-11
30. d – Chapter 6-4
31. b - Chapter 10-12
32. d – Chapter 7-8
33. a – Chapter 7-10
34. d – Chapter 7-10
35. c – Chapter 7-10
36. a – Chapter 2-16 & 17
37. d – Chapter 11-2 & 3
38. d – Chapter 12-2
39. b – Chapter 11-6
40. b - Chapter 2-19
41. d - Chapter 2-19
42. b – Chapter 10-3
43. a – Chapter 2-19
44. d – Chapter 2-16
45. b – Chapter 2-17
46. d – Chapter 2-17&18
47. d – Chapter 2-18
48. c – Chapter 2-14 to 17
49. a- Chapter 5-18
50. c – Chapter 2-19

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX C

TRAINING SITE GUIDELINES

CONFINED SPACE RESCUE TECHNICIAN TRAINING SITE

A Confined Space Rescue Technician (CSRT) Training Site must have facilities, structures, work areas, materials, props, tools, and equipment of adequate size, type, and quantity to fully and safely support the technical and manipulative training required to deliver the CSRT curriculum.

(A) GOALS

- (1) Set minimum performance training objectives for CSRT training programs.
- (2) Identify those performance objectives a CSRT Training Site must be capable of supporting.
- (3) Provide the means to ensure proper curriculum delivery.
- (4) CSRT Training Sites will meet the minimum requirements to support curriculum delivery.
  - (a) A completed "Request for CSRT Course Scheduling" providing the dates and location of the upcoming course.
  - (b) The names of all CSRT instructors must be included with the request to support class size.

(B) SITE CAPACITY

A CSRT Training Site is evaluated on its ability to deliver the required training. A One-squad Site is the minimum and is capable of delivering training to twelve (12) students or one (1) squad. Additional sites may be capable of delivering training to twenty-four (24), and up to a maximum of thirty-six (36) students simultaneously. Each capacity level represents the maximum number of students or squads that may be taught on the site at any given time. This maximum number will be determined based on the suitability of the site to safely train (12), twenty four (24), or thirty six (36) students.

- (1) One-squad site.
  - (a) Supports the instruction for teaching one (1) squad, a maximum of twelve (12) students on the site.
  - (b) One (1) CSRT Senior Instructor is required for a student instructor ratio of 12:1.
- (2) Two-squad site.
  - (a) Supports the instruction for teaching two (2) squads, a maximum of twenty-four (24) students on the site.
  - (b) One (1) CSRT Primary Instructor and one (1) CSRT Senior Instructor are required for a student instructor ratio of 12:1.
- (3) Three-squad site.
  - (a) Supports the instruction for teaching three (3) squads, a maximum of thirty-six (36) students on the site.
  - (b) Three (3) CSRT Primary Instructors are required for a student instructor ratio of 12:1.
  - (c) One (1) CSRT Senior Instructor is required.

(C) SITE ACCREDITATION

- (1) CSRT Sites will be inspected for compliance with the CSRT Site Requirements and Equipment Standards.

(2) Application Process and Site Inspection

(a) A CSRT Training Site representative submits to the Chief of State Fire Training a written request for accreditation as a Conditional or Permanent CSRT Training Site. This request shall include:

1. A detailed description of the site that lists the facilities, structures, work areas, materials, props, tools, and equipment available and ready for delivering a CSRT course.

2. A CSRT Site Evaluation form completed by a registered CSRT Senior Instructor.

(b) State Fire Training staff, representative and/or a registered Senior Instructor, not affiliated with the site nor the delivery of the class, operating under the direction of the Chief of State Fire Training, will conduct an inspection of the CSRT Training Site.

(c) Any discrepancies or deficiencies will be documented and discussed with the site representative at the time of the inspection.

(d) Once all discrepancies and deficiencies (if any) have been completed, validated and verified by State Fire Training staff, or a representative for State Fire Training, the Chief of State Fire Training will notify the CSRT representative of their status as either an approved Conditional or Permanent site.

(D) SITE REQUIREMENTS

The following are minimum requirements for a CSRT Training Site:

(1) The requesting agency assumes all responsibility, liability, and maintenance for the engineering design, strength, stability, and adequacy of all props including anchor points and tie offs.

(2) The requesting agency further assumes all responsibility, liability, and maintenance for all tools, equipment, and supplies used at the site for the delivery of CSRT classes. This includes, but is not limited to, ladders, ropes, rescue hardware and software.

(E) FACILITIES

(1) Classroom of adequate size and capability (audio/visual aids) to support classroom technical training.

(2) Wash areas.

(3) Bathrooms.

(4) Rehabilitation area.

(5) Safe and adequate parking.

(F) CSRT TRAINING PROPS

(1) <u>Above Ground Tank</u>. Above ground tank (minimum 8’ height) with vertical (top) entry through a portal of 18” to 30”, and a horizontal (side) entry through a portal of 18” to 30”

(2) <u>Underground Vault.</u> While below ground vaults are preferred, it will be acceptable to place vaults at ground level and provide platforms to simulate ground level for placing tripods or other equipment on. Vertical drop from the entry point must be greater than 5’.

(3) Tapered Cross Section. One prop shall be provided that provides an internal configuration of inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section. Entry into this prop may be vertical or horizontal, but must be above the section which tapers downward.

(4) Horizontal Pipe. To consist of below grade or above ground pipes between 18" to 36" in diameter. A minimum of 25' of continuous pipe shall be provided with at least one 45 degree or 90 degree bend.

(5) Lock-Out/Tag-Out. One or more of the above listed spaces shall include a Lock-Out/Tag-Out prop as part of the evolution.

(6) Permit Required Confined Spaces. Minimum training prop requirements can be fulfilled by using actual permit-required confined spaces or representative spaces.

(7) Opening Size. One portal of entry, on any of the above props, shall be 24 inches or less. Opening size is determined by measuring the shorter side of the opening.

(G) EQUIPMENT STANDARDS

(1) The following is a list of the minimum equipment that is required to conduct a Confined Space Rescue Technician course. It is recommended that scenarios be limited to 8-12 students. As the class size increases, the amount of equipment must increase. Refer to ENDNOTES for additional information.

DISCLAIMER

The Policy and Procedures in this document are current at the time of printing. Refer to the current State Fire Training Procedures Manual for updated requirements.

CSRT EQUIPMENT STANDARDS

Description	Up to 12 Students – One scenario at a time	Each additional scenario to run concurrently
Generator with fuel can	1	See Endnote A
Extension cord	1	See Endnote B
Atmospheric monitor	1 See Endnote C	1 See Endnote C
Ventilation fan with duct	1	1
Saddle vent with 90 degree elbow	1	N/A
SCBA	2	See Endnote D
Supplied air manifold	1	See Endnote E
Airline	200’ See Endnote F	See Endnote F
Supplied air respirator with escape cylinder	2	See Endnote G
Victim respirator	1 See Endnote H	N/A
Breathing Air	See Endnote I	See Endnote I
Hardline communication system	1 See Endnote J	N/A
Portable radio	2	N/A
Commercially available tripod	1 See Endnote K	See Endnote L
Commercially available cable winch	1	See Endnote M
Commercially available 4:1 Pre-Rig	1	N/A
SKED stretcher or equivalent	1	N/A
Backboard	1	N/A
LSP Half-Back or equivalent	1	N/A
Spreader bar	1	N/A
Basket stretcher	1	N/A
Wristlets	1 set	N/A
Class III harness	2	2

Entrant light source	2	2
Personal alert device	2	N/A
Edge protection	1 See Endnote N	See Endnote N
Pulley (one or more must be prusik-minding)	6	2
Double sheave pulley	2	N/A
Friction device (i.e. brake bar rack, figure 8 descender)	1	N/A
½" static kernmantle rope with rope bag, 150' minimum	3 See Endnote O	3 See Endnote O
8mm prusik loop, short, 57"	5	5
8mm prusik loop, long, 70"	5	5
1" tubular webbing, 5' – Green	10	10
1" tubular webbing, 12' – Yellow	10	10
1" tubular webbing, 15' – Blue	10	10
1" tubular webbing, 20' – Orange	10	10
Carabiners, (NFPA "G" Rated) large locking	20	20
Fire service ground ladder	2	N/A
Mask cleaning materials	See end note (P)	N/A
Clipboard	1	1
Sample entry permit forms for each scenario	1	1
Lock-Out/Tag-Out Kit	1	N/A

ENDNOTES

A. A generator is required for each scenario. If there is a readily available power supply, an additional generator would not be needed.

B. As needed to supply power to necessary equipment.

C. A minimum of one atmospheric monitor is required for each scenario. Four gas monitors are recommended, but separate monitors that detect O2 levels, flammable gases, and toxic gases that would be expected in the spaces to be entered would suffice. One monitor should have a pump and extension hose for pre-entry assessment. A second monitor can be a diffusion type for the entry team.

D. Students can be required to supply their own.

E. Two scenario course - one supplied air manifold and 2 SCBA's.

Three scenario course - two supplied air manifolds and 2 SCBA's.

F. 200' is a minimum. Additional airlines of sufficient length for the entry team and back-up team may be required for additional scenarios.

G. None needed if SCBA's are used for the second or third scenario.

H. This can be a supplied air system, emergency escape breathing apparatus (EEBA), or an SCBA.

I. Enough Grade "D" Breathing Air must be available to run the required scenarios. This can be supplied by a compressor with back-up cylinders, or by having enough air cylinders and/or a refill capability.

J. The hardline communication system should accommodate the attendant and entrants.

K. The tripod shall have a minimum breaking strength of 5000 pounds to meet OSHA requirements. To better prepare the students for what they may encounter in the field, as many different high point anchors as possible should be available.

L. If the second scenario is a vertical entry, a second high point anchor is required. A ladder system, a second tripod or davit, or other anchor point will work. If the second scenario is a horizontal entry, nothing is required.

M. A rope retrieval system can be used for a second vertical entry.

N. More may be required as situations warrant.

O. Other lengths may be required by the scenarios. Low stretch kernmantle is also acceptable in place of static kernmantle.

P. Mask cleaning materials must comply with Cal-OSHA GISO Section 5144.

CONFINED SPACE RESCUE TECHNICIAN
SITE EVALUATION FORM

SITE LOCATION ____________________ EVALUATOR ________________________

ADDRESS __________________________ DATE OF EVALUATION _____________

CONFINED SPACE	DESCRIPTION	YES	NO
Above Ground Tank	Above ground tank (minimum 8' height)with a vertical (top) entry through a portal(s) of 18" to 30", and a horizontal (side) entry through a portal(s) of 18" to 30"		
	☐ On-Site ☐ Off-Site Name of Location:		
Underground Vault	Below grade vault with a vertical (top) entry portal between 18" and 30". Portal covers should have weep holes. (<u>Note</u>: While below grade vaults are preferred, it will be acceptable to place vaults at ground level and provide platforms to simulate the ground level for placing tripods or other equipment on. The vertical drop from the entry point shall be greater than 5'.)		
	☐ On-Site ☐ Off-Site Name of Location:		
Tapered Cross Section	One prop shall be provided that provides an internal configuration of inwardly converging walls or a floor which slopes downward and tapers to a smaller cross-section. Entry into this prop may be vertical or horizontal, but must be above the section which tapers downward.		
	☐ On-Site ☐ Off-Site Name of Location:		
Horizontal Pipe	Below grade or above ground pipes between 18" to 36" in diameter. A minimum of 25' of continuous pipe shall be provided with at least one 45 degree or 90 degree bend.		
	☐ On-Site ☐ Off-Site Name of Location:		
Lock-Out/Tag-Out	One or more of the props must include a		

	Lock-Out/Tag-Out evolution.		
Entry Portal	One portal of entry, on any of the above props, shall be less than 24 inches. Opening size is determined by measuring the shortest side of the opening.		
Classroom	Provide a classroom of adequate size and capability (audio/visual aids) to support technical skills training.		
Equipment	Satisfies minimum equipment requirements		

Evaluator Comments: ____

____

□ Approved □ Pending

________________________________ __________________

Signature of Evaluator Date

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX D

STATE FIRE TRAINING POLICIES AND PROCEDURES

CONFINED SPACE RESCUE TECHNICIAN INSTRUCTOR LEVELS

(A) PRIMARY INSTRUCTOR TRAINEE

(1) The Primary Instructor Trainee is the entry level for becoming a Primary Instructor for the Confined Space Rescue Technician (CSRT) course.

(a) This position is valid for two (2) years after beginning the Instructor Trainee Task Book process.

(2) Primary Instructor Trainees are not registered with SFT.

(B) PRIMARY INSTRUCTOR

(1) A Confined Space Rescue Technician Primary Instructor is qualified to teach a squad (up to 12 students) in a Confined Space Rescue Technician class with two or three squads.

(C) SENIOR INSTRUCTOR TRAINEE

(1) The Senior Instructor Trainee is entry level for becoming a CSRT Senior Instructor.

(a) This position is valid for two (2) years after beginning the Senior Instructor Trainee Task Book process.

(D) SENIOR INSTRUCTOR

(1) A Confined Space Rescue Technician Senior Instructor is required for any delivery of a Confined Space Rescue Technician course.

(2) For courses with only one or two squads, the CSRT Senior Instructor may also function as the Primary Instructor for a squad.

CSRT PRIMARY INSTRUCTOR TRAINEE

(A) QUALIFICATIONS

(1) Course work.

(a) Have attended and passed a SFT Rescue Systems 1 course

(b) Have attended and passed a SFT Confined Space Rescue Technician course.

(2) Instructor requirements [one (1) of the following five (5) options]:

(a) Have attended and passed Fire Instructor 1A and 1B.

(b) Have a valid community college teaching credential.

(c) Completed the UC/CSU 60-hour Techniques of Teaching course.

(d) Completed the NFA's Fire Service Instructional Methodology course.

(e) Completed four semester units of upper division credit in educational materials, methods, and curriculum development.

(3) Teaching experience.

(a) None.

(4) Rank and experience.
(Performing in an "acting" capacity does not qualify.)

(a) Have a minimum of three (3) years experience within a California fire department in the field of rescue.

1. For example, being a member of an identifiable rescue team.

(B) APPLICATION

Submit the following to the CSRT Senior Instructor who will be evaluating you:

(1) Resume.

(a) A current resume of education, position/rank, and experience.

(2) Course work.

(a) Copies of your SFT course completion certificates.

(3) Instructor requirements.

(a) Instructor training.

1. Copies of your SFT Fire Instructor 1A and 1B certificates or qualifying equivalents.

(4) Rank and experience *(performing in an "acting" capacity does not qualify)*.

(a) A current, original letter written on department letterhead and signed by the Fire Chief, or his/her authorized representative, describing your specific background as it relates to the rank and experience requirement(s).

(C) RESPONSIBILITIES

Under direct supervision of a registered CSRT Senior Instructor, the Primary Instructor Trainee will:

(1) Assist in classroom and field exercise setup.

(2) Support the logistics of the component(s) being trained in.

(3) Teach no more than 50% of a single course delivery.

  (a) Completing a Primary Instructor Trainee Task Book requires participating in at least two (2) CSRT courses.

(4) Carry out all other related tasks as assigned by the Senior Instructor.

(5) Satisfactorily complete and have signed by a CSRT Senior Instructor the Primary Instructor Task Book within two (2) years of beginning the Primary Instructor Trainee process.

CSRT PRIMARY INSTRUCTOR

(A) QUALIFICATIONS

(1) Course work.

(a) Have attended and passed a SFT Rescue Systems 1 courses.

(b) Have attended and passed a SFT Confined Space Rescue Technician course.

(2) Instructor requirements (all of the following):

(a) Regional Instructor Orientation.

1. Have attended and passed the SFT Regional Instructor Orientation or be a currently registered SFT instructor in good standing who has previously attended a Regional Instructor Orientation.

a. Prospective instructors shall satisfy all instructor requirements and become registered as an instructor within one (1) year of attending the Regional Instructor Orientation.

(b) Ethical Leadership in the Classroom.

1. Have attended and passed the SFT Ethical Leadership in the Classroom course and signed the Instructor Code of Ethics/Conduct.

(c) Instructor Training [one (1) of the following five (5) options]:

1. Have attended and passed 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.

(d) Primary Instructor Task Book

1. Completed the CSRT Primary Instructor Trainee Task Book.

a. Signed off by at least one (1) CSRT Senior Instructor within two (2) years of beginning the Primary Instructor Trainee process.

(3) Teaching experience.

(a) Taught a minimum of 80 hours within a fire service related program.

(4) Rank and experience
(Performing in an "acting" capacity does not qualify.)

(a) Have a minimum of three (3) years experience within a California fire department in the field of rescue.

1. For example, being a member of an identifiable rescue team.

(B) APPLICATION

Submit a complete application package for a PACE II review that includes all of the following:

(1) Application form.

(a) A current instructor application signed by the applicant (available online).

(2) Resume.

(a) A current resume of education, position/rank, and experience.

(3) Course work.

(a) Copies of your SFT course completion certificates.

(4) Instructor requirements.

(a) Regional Instructor Orientation.

1. A copy of your SFT course certificate.

(b) Ethical Leadership in the Classroom.

1. A copy of your SFT course certificate.

(c) Instructor training.

1. Copies of your SFT Fire Instructor 1A and 1B certificates or qualifying equivalents.

(d) Primary Instructor Task Book.

1. Copy of your Primary Instructor Task Book signed off by at least one (1) CSRT Senior Instructor within two (2) years of beginning the Primary Instructor Trainee process.

(5) Teaching experience.

(a) A current, original letter written on department letterhead and signed by the Fire Chief, College Administrator, or his/her authorized representative, describing your specific background as it relates to your teaching experience.

1. May be combined in one letter with the rank and experience verification.

(6) Rank and experience *(performing in an "acting" capacity does not qualify)*.

(a) A current, original letter written on department letterhead and signed by the Fire Chief, or his/her authorized representative, describing your specific background as it relates to the rank and experience requirement(s).

1. May be combined in one letter with the teaching verification.

(C) APPLICATION REVIEW

Instructor applications will be reviewed by the Peer Assessment for Credential Evaluation (PACE II) committee on a quarterly basis.

(1) If the application is complete and approved, a letter from SFT confirming instructor registration will be mailed.

(a) The applicant will then be formally recorded as a Registered Instructor with SFT.

(2) If the application is incomplete, SFT staff will return to the applicant a check-off sheet indicating what documentation is lacking.

(a) The application will remain on file until follow-up documentation is submitted.

1. Any identified application deficiencies must be satisfactorily resolved within one (1) year of the date of the application.

(b) Follow-up documentation for an incomplete application will be reviewed at the next regularly scheduled PACE II meeting.

1. A copy of the review form must accompany the follow-up documentation.

(3) Any misrepresentation or falsification of information submitted may be grounds for denial of instructor registration.

(4) If, in the judgment of the PACE II committee, the instructor candidate has displayed conduct that does not uphold the values of honesty, integrity, and responsibility expected of a SFT instructor, approval may be denied.

(D) RESPONSIBILITIES

Under supervision of a registered CSRT Senior Instructor, the Primary Instructor will:

(1) Administration.

(a) Setup the classroom and field exercises.

(2) Course.

(a) Teach the current curriculum as adopted by SFT.

1. Abiding by the information and requirements listed in the Course Information and Required Materials manual for the course.

(b) Ensure all objectives of the course curriculum are met.

(c) Teach at least 50% of the course.

1. For courses delivered on a "shift" or back-to-back schedule, a Primary Instructor must be assigned to each shift and teach at least 50% of that shift's course schedule.

2. A Primary Instructor may be assigned to more than one (1) shift.

(d) Administer any skills exams.

(e) Ensure the safety of all students and adjunct instructors.

(3) Student task books.

(a) Evaluate student/team performance and sign each student's task books.

(4) Recordkeeping.

(a) Record and maintain:

1. Daily attendance records.

2. Student progress chart.

3. Student assignment records.

4. Calendar of events identifying the topics taught.

(b) Turn over all class records to the Senior Instructor upon completion of the class.

(5) Supervision.

(a) Verify the qualifications for a Guest Lecturer and directly supervise by attending and monitoring the presentation.

(E) MAINTAINING PRIMARY INSTRUCTOR STATUS

(1) Abide by all published procedures of SFT, including the Instructor Code of Ethics/Conduct.

(2) Be a CSRT Primary Instructor for at least two (2) SFT Confined Space Rescue Technician courses every four (4) years.

(3) Submit any change of address or phone number.

   (a) Department.

   (b) Home.

   (c) Cell.

   (d) Email.

(4) Attend an update course delivered by SFT when required.

CSRT SENIOR INSTRUCTOR TRAINEE

(A) QUALIFICATIONS

(1) Course work.

(a) No additional course work required.

(2) Instructor requirements (all of the following):

(a) Currently registered as a SFT CSRT Primary Instructor in good standing.

(3) Teaching experience.

(a) No additional experience required.

(4) Rank and experience.

(a) No additional experience required.

(B) APPLICATION

Submit the following to the CSRT Senior Instructor who will be evaluating you:

(1) Resume.

(a) A current resume of education, position/rank, and experience.

(2) Instructor requirements.

(a) Verification of your Primary Instructor status.

(C) RESPONSIBILITIES

Under direct supervision of a registered CSRT Senior Instructor, the Senior Instructor Trainee will:

(1) Administration.

(a) Ensure all administrative requirements are completed in accordance with printed guidelines, including, but not limited to:

1. Submitting a "Request for Course Scheduling."
2. Qualifying each Assistant Instructor, Skills Evaluators, and Guest Lecturers.
3. Returning, within fifteen (15) days of course completion, all required student and course materials, using a carrier that can track your shipment.

(2) Course.

(a) Ensure all objectives of the course curriculum are met.

(b) Ensure the maximum student limit is not exceeded for the class.

(c) Function as the Safety Officer to ensure the safety of all students and adjunct instructors.

1. Coordinate and monitor all safety issues during the delivery of the course.

(3) Senior Instructor Trainee Task Book.

(a) Complete the Senior Instructor Trainee Task Book within two years.

(4) Recordkeeping.

(a) Maintain class records under the supervision of the Senior Instructor in accordance with the State Fire Training Policy and Procedures Manual.

(5) Supervision.

(a) Ensure that the student/instructor ratio is maintained.

(b) Supervise the Primary Instructor's presentation of the course.

CSRT SENIOR INSTRUCTOR

(A) QUALIFICATIONS

(1) Course work.

(a) None.

(2) Instructor requirements (all of the following):

(a) Currently registered as a SFT CSRT Primary Instructor in good standing.

(b) Senior Instructor Trainee Task Book.

1. Completed the CSRT Senior Instructor Task Book.

a. Signed off by at least two (2) CSRT Senior Instructors within two (2) years of beginning the Senior Instructor Trainee process.

(3) Teaching experience.

(a) No additional experience required.

(4) Rank and experience.

(a) No additional experience required.

(B) APPLICATION

Submit a complete application package for a PACE II review that includes all of the following:

(1) Application form.

(a) A current instructor application signed by the applicant (available online).

(2) Resume.

(a) A current resume of education, position/rank, and experience.

(3) Instructor requirements.

(a) Verification of your CSRT Primary Instructor status.

(b) Task book (when applicable).

1. Copy of your Senior Instructor Task Book signed off by at least two (2) CSRT Senior Instructors within two (2) years of beginning the Senior Instructor Trainee process.

(C) APPLICATION REVIEW

Instructor applications will be reviewed by the Peer Assessment for Credential Evaluation (PACE II) committee on a quarterly basis.

(1) If the application is complete and approved, a letter from SFT confirming instructor registration will be mailed.

(a) The applicant will then be formally recorded as a Registered Senior Instructor with SFT.

(2) If the application is incomplete, SFT staff will return to the applicant a check-off sheet indicating what documentation is lacking.

(a) The application will remain on file until follow-up documentation is submitted.

1. Any identified application deficiencies must be satisfactorily resolved within one (1) year of the date of the application.

(b) Follow-up documentation for an incomplete application will be reviewed at the next regularly scheduled PACE II meeting.

1. A copy of the review form <u>must</u> accompany the follow-up documentation.

(3) Any misrepresentation or falsification of information submitted may be grounds for denial of instructor registration.

(4) If, in the judgment of the PACE II committee, the instructor candidate has displayed conduct that does not uphold the values of honesty, integrity, and responsibility expected of a SFT instructor, approval may be denied.

(D) RESPONSIBILITIES

(1) Administration.

(a) Ensure all administrative requirements are completed in accordance with printed guidelines, including, but not limited to:

1. Submitting a "Request for Course Scheduling."
2. Qualifying each Assistant Instructor, Skills Evaluators, and Guest Lecturers.
3. Returning, within fifteen (15) days of course completion, all required student and course materials, using a carrier that can track your shipment.

(b) Verify student eligibility.

(2) Course.

(a) Ensure all objectives of the course curriculum are met.

(b) Ensure the maximum student limit is not exceeded for the class.

(c) Ensure the safety of all students and adjunct instructors.

1. Coordinating and monitoring all safety issues during the delivery of the course.

(3) Instructor Trainee Task Book.

(a) Evaluate a Primary Instructor Trainee's performance and sign the Primary Instructor Task book.

(b) Evaluate a Senior Instructor Trainee's performance and sign the Senior Instructor Task Book.

(4) Recordkeeping.

(a) Maintain all class records received from the Primary Instructor(s) for a minimum of four (4) years.

1. SFT may request, at any time, the Senior Instructor to submit these records for review. Failure to comply shall result in disciplinary action.

(5) Supervision.

(a) Ensure that the student/instructor ratio is maintained.

(b) Supervise each Primary Instructor's presentation of the course.

(E) MAINTAINING SENIOR INSTRUCTOR STATUS

(1) Abide by all published procedures of SFT, including the Instructor Code of Ethics/Conduct.

(2) Be a CSRT Primary or Senior Instructor for at least two (2) SFT Confined Space Rescue Technician courses every four (4) years.

(3) Submit any change of address or phone number.

  (a) Department.

  (b) Home.

  (c) Cell.

  (d) Email.

(4) Attend an update course delivered by SFT when required.

CONFINED SPACE RESCUE - TECHNICIAN

APPENDIX E

POWER POINT SLIDES

Confined Space Rescue Technician

Program Funding

- Funding for this program was provided by…
  - Department of Homeland Security
  - Governor's Office of Homeland Security
  - CDF-State Fire Marshal

Curriculum Committee

- Kent Freeman – Project Leader
  - Roseville Fire Department
- Mike Bilheimer
  - San Bernardino City Fire Department
- Wayne Chapman
  - Orange County Fire Authority
- Stan Klopfenstein
  - Santa Fe Springs Fire Department
- Don Shellhammer
  - Vista Fire Department
- Lou Steslicki
  - Upland Fire Department
- John Mc Kently
  - CMC Rescue, Inc.

Student Introductions

- Name
- Department
- Rank
- Years of Experience
- Current Assignment
- Reason for taking CSR Technician

0-4

Facilities Orientation

- Classroom location(s)
- Restrooms
- Food locations
- Smoking
- Breaks
- Telephones
- Parking

0-5

Mission...

- Prepare students to safely and effectively perform rescues from confined spaces in compliance with recognized standards and regulations

0-6

Our Goals

- Provide fire service personnel with the opportunity to apply the principles of confined space rescue through directed rescue scenarios
- Provide fire service personnel with the knowledge, skills, and abilities to perform confined space rescue as it also relates to incidents involving terrorism and/or weapons of mass destruction (WMD)

0-7

Course Description

- 40-Hour Course
  - Day 1 – Lecture
  - Day 2 – Skills
  - Day 3 – Skills / Entries
  - Day 4 – Entries
  - Day 5 – Entries / Written Exam

0-8

Confined Space Identification

Lesson Objective

- Provide fire service personnel with information to identify confined spaces and permit required confined spaces

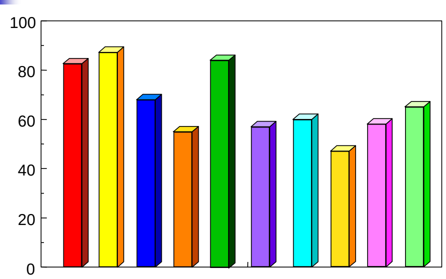
1-1

Confined Space Regulations

- Title 8, California Code of Regulations (CCR), General Industry Safety Orders (GISO), Sections 5156, 5157, and 5158

1-2

DEATHS IN CONFINED SPACE



1-3

Total deaths - 670

Causes of Fatalities

- 65% Hazardous Atmospheres
- 13% Engulfment
- 7% Struck by Falling Objects
- 6% Heat Stress / Exposure
- 4% All Others

1-4

Confined Space

- Area large enough to enter to work
- Has limited or restricted means for entry and exit
- Is not designed for continuous employee occupancy

1-5

Permit Required Confined Space

Meets the definition of a confined space and contains one or more of the following:

- Contains or has the potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant

1-6

Permit Required Confined Space

Continued

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section
- Contains any other recognized serious safety or health hazard

1-7

1-8

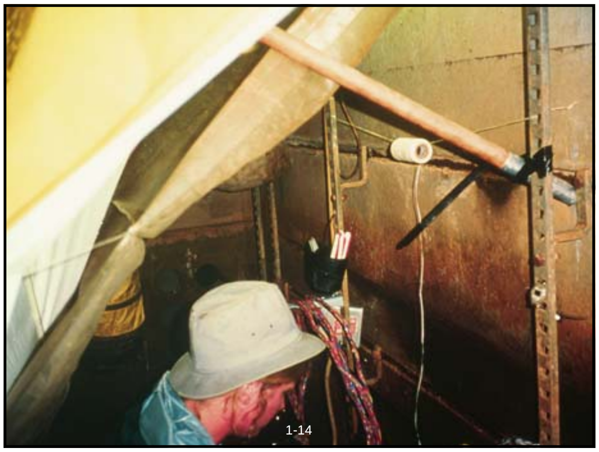

1-9

1-10


1-11


1-12


1-13



Confined Space Identification

- Summary
  - Confined spaces are common
  - Critical that rescuers identify confined spaces and understand their dangers
  - Training provides information for a successful rescue

1-15

Confined Space Regulations

Lesson Objective

- Provide fire service personnel with information on the regulations and standards which regulate entry into confined spaces

2-1

Section 5156: Confined Space Entry

- Provides the scope of the confined space regulation and lists those industries that are exempt from Section 5157

2-2

Section 5157: Permit-Required Confined Spaces

- Requirements for practices and procedures to protect employees from the hazards of entry into permit-required confined space
- Applies to employers, as specified in Section 5156 (b) (1)

2-3

Warning Sign

2-4

Alternate Entry Procedures

- Section 5157 (C)(5)(b)
  - Commonly referred to as C5 Entry
  - Routinely used by Industry to reduce the amount of required personnel

2-5

Duties of Authorized Entrants

- Know the Hazards
- Communicate with the Attendant
- Alert the Attendant to problems
- Exit the permit space when necessary

2-6

Duties of Attendants

- Know the hazards
- Be aware of behavioral effects of hazards on entrants
- Remain outside permit space until relieved by another attendant
- Communicate with entrant to monitor status and alert entrants of need to evacuate
- Monitor activities inside and outside the permit space to determine if it is safe
- Perform no duties that might interfere with primary duty to monitor and protect entrants

2-7

Duties of Entry Supervisors

- Know the hazards
- Verify entry permit information
- Terminate entry and cancel permits as required
- Remove unauthorized individuals
- Assure consistent transfer of responsibility

2-8

Section 5157 (k): Rescue and Emergency Services

- Lists the minimum criteria for permit-required confined space rescue

2-9

Section 5158: Other Confined Space Operations

- Prescribes minimum standards for those industries exempted from Section 5157

2-10

Confined Space Hazards

Lesson Objective

- Provide fire service personnel with the ability to identify the hazards associated with confined spaces

4-1

Confined Space Hazards

- All confined space hazards fall into one of four basic categories:
  - Atmospheric Hazards
  - Physical/Mechanical Hazards
  - Environmental Hazards
  - Psychological Hazards

Note: All hazards must be identified and controlled (rendered non-hazardous) before entry.

4-2

Atmospheric Hazards

- Hazardous atmosphere means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self rescue, injury, or acute illness from one or more of the following causes:

4-3

Atmospheric Hazards (continued)

- Oxygen concentration <19.5% or >23.5%
- Flammable gas, vapor, or mist >10% LEL
- Airborne combustible dust at a concentration that obscures visions at 5’ or less
- Radiation or radioactivity
- Any substance at or beyond its PEL
- Any other immediately dangerous to life or health atmosphere

Common Toxic Gases In Confined Spaces

- Methane
- Carbon Monoxide
- Carbon Dioxide
- Hydrogen Sulfide
- Sulfur Dioxide

Physical/Mechanical Hazards

- Engulfment
- Mechanical
- Corrosive
- Radiation
- Falls
- Falling Debris

Environmental Hazards

- Heat or Cold
- Insects and Vermin
- Snakes & Reptiles
- Mold and Fungus

4-7

Psychological Hazards

- Claustrophobia
- Fatigue
- High Noise Levels

4-8

Atmospheric Hazards

Lesson Objective

- Provide fire service personnel with the ability to select and use atmospheric monitoring equipment

5-1

Atmospheric Monitor

5-2

Monitoring Strategies

- General Site Monitoring
- Perimeter Monitoring
- Confined Space Monitoring
- Personal Monitoring

5-3

Atmospheric Monitoring

- The following order
  - Oxygen, LEL, selected toxics
- Prior to entry
- Continuously throughout entry
- Periodically log results
- Monitor at all levels within space
  - 4 foot increments

5-4

Vapor Density of Gases

Hydrogen	H_2	0.0695
Methane	CH_4	0.5540
Carbon Monoxide	CO	0.9660
Air		1.0000
Hydrogen Sulfide	H_2S	1.1912
Carbon Dioxide	CO_2	1.5291
Sulfur Dioxide	SO_2	2.2638

5-5

Hazard Control

Lesson Objective

- Provide fire service personnel with the ability to select and use the equipment necessary to control hazards in confined spaces

6-1

Ventilation

- Replaces contaminated air
- Decreases possibility of explosion
- Reduces/Eliminates toxic atmosphere
- Increases survival profile of victim
- Reduces temperature inside space

6-2

Ventilation Devices

6-3

Ventilation Calculations

- Volume of Space
  - Width x Height x Depth = Total Cubic Feet
  - Cubic Feet ÷ CFM rating of blower = Minutes per air exchange
- Ventilation goal = 7 air exchanges
- Continuous ventilation

6-4

Hazardous Energy

- Electrical
- Pressure
- Momentum / Gravity
- Residual / Stored
- Mechanical

6-5

Lockout / Tagout / Blockout

- Electrical
- Mechanical
- Pipes or Ducts

6-6

Lockout / Tagout / Blockout

- Retain someone intimately familiar with the electrical and mechanical systems in the area, plant, or confined space where you are making entry
- Allow these personnel to brief, guide, or conduct the shutdown of these systems

6-7

Medical Considerations

- Claustrophobia
- Heat Stress / Fatigue
- Heat Exhaustion
- Heat Stroke

6-8

Personal Protective Equipment

Lesson Objective

- Provide fire service personnel with the ability to identify, select, and use personal protective equipment

7-1

Personal Protective Equipment

- Helmet
- Flash Protection
- Hood
- Boots
- Gloves
- Eye and Ear Protection
- Knee and Elbow Pads

7-2

Personal Protective Equipment (continued)

- Personal Audible Locator (PAL)
- Respiratory Protection
- Atmospheric Monitoring Instrument
- Lighting
- Communications System

7-3

Levels of Chemical Protective Clothing

- Level A
- Level B
- Level C
- Level D

7-4

Respiratory Protection

- Atmospheric hazards cause 65 percent of deaths in confined spaces
- Identify hazardous atmospheres and wear appropriate respiratory protection
- Comply with regulations

7-5

Self-Contained Breathing Apparatus (SCBA)

- 30-60 minute air supply
- Big and bulky
- Can be connected to a supplied air system
- Positive pressure

7-6

Supplied Air Respirator (SAR) with Escape Cylinder

- Connected to remote air source
- NIOSH requirements limit airline length to 300 feet
- 5-10 minute air supply per cylinder
- Escape cylinders required with SAR when entering IDLH atmosphere

7-7

Air Purifying Respirators (APR)

- Inhale through filters or cartridges that filter airborne contaminants from the atmosphere
- Cartridges have service life
- Not for use in IDLH or less than 19.5% oxygen
- Not recommended for confined space rescue

7-8

Respirator Protection Factor

- Respirators rated by the protection they provide
- Factor = contamination concentration outside the face piece : inside the face piece
- ANSI recommends factor of 10,000
- Must be fit tested

7-9

California Code of Regulations

- Title 8 (CCR) §5144: Respiratory Protection Requirements
  - Employers required to establish a written Respiratory Protection Program
  - Must have required elements

7-10

Personal Protective Equipment

- Summary
  - Confined space rescue operation is one of the most dangerous types of rescue
  - Proper equipment and training is essential for safe and efficient rescue

7-11

Phases of Confined Space Rescue

Lesson Objective

- Provide fire service personnel with the information necessary to plan, organize, operate and command at confined space rescue incidents

8-1

Phases of Confined Space Rescue

- Phase 1: Preparation
- Phase 2: Assessment
- Phase 3: Pre-Entry Operations
- Phase 4: Entry and Rescue Operations
- Phase 5: Termination

8-2

Phase 1: Preparation

- Rescue Team Evaluation
  - CAL/OSHA and NFPA standards
  - Adequate personnel
  - Adequate equipment
- Equipment Evaluation
  - Minimum equipment

8-3

Phase 1: Preparation (cont.)

- Pre-Planning (Hazard Analysis)
  - Identify potential rescue sites
  - Contact site representatives
- Personnel Evaluation
  - Suitable personnel for the work
  - Adequate training
  - Problems with claustrophobia

8-4

Phase 1: Preparation (cont.)

- Incident Management
  - Incident Command System (ICS)
  - Unified Command
  - Incident Commander
  - Command Staff
  - Section Chiefs

8-5

Phase 2: Assessment

- Approach assessment
  - Review pre-plans
  - Scene assessment
- Resources assessment
  - Develop initial plan
  - Evaluate on-site resources
  - Request additional resources

8-6

Phase 2: Assessment (cont.)

- Documentation
  - All completed safety measures on permit
  - Permit signed by Entry Supervisor
  - Mandatory information on permit
  - Permit cancelled by Supervisor
  - Any problems noted on permit

8-7

Phase 3: Pre-Entry Operations

- Making the general area safe
  - Establish perimeter
  - Establish ventilation
  - Assign entry points
  - Eliminate ignition sources

8-8

Phase 3: Pre-Entry Operations (continued)

- Making the rescue area safe
  - Assign personnel to all positions
  - Lock out procedures
  - Ventilate space
  - Establish tracking system
  - Establish communication plan
  - Provide entry support

8-9

Phase 3: Pre-Entry Operations (continued)

- Pre-entry briefing
  - Rescue objective
  - Emergency procedures
  - Chain of command
  - Time limits
  - Hazards

8-10

Phase 4: Entry and Rescue Operations

- All pre-entry requirements must be fulfilled
- Duties of the Rescue Group Supervisor
  - Reports to IC
  - Coordinates all aspects of entry and rescue

8-11

Phase 4: Entry and Rescue Operations (continued)

- Duties of the Attendant
  - Communicate with and provide for the safety of the entrants
  - Reports to the Rescue Group Supervisor
  - Continually monitors the atmosphere
  - Maintains log of entry teams
  - Communicates between Entry Team and Rescue Group Supervisor

8-12

Phase 4: Entry and Rescue Operations (continued)

- Entry Team Duties
  - Communicate with Attendant
  - Manage air-lines
  - Use tag lines to mark progress
  - Be aware of hazards
  - Brief other teams

8-13

Phase 4: Entry and Rescue Operations (continued)

- Duties of the Back-Up Team
  - Safety for Entry Team
  - Fully prepared for immediate entry
  - Not involved in other support functions
  - Replaced by additional back-up if they enter the space

8-14

Phase 4: Entry and Rescue Operations (continued)

- Duties of Rigging Team
  - Report to the Rescue Group Supervisor
  - Determine entry and retrieval system to be used
  - Provide equipment to Entry Team
  - Operate entry and retrieval systems
  - Coordinate activities with Attendant

8-15

Phase 4: Entry and Rescue Operations (continued)

- Other Positions
  - Safety Officer
  - Medical Group
  - Decontamination Group
  - Logistics Chief
  - Air Supply

8-16

Phase 5: Termination

- Document exit time
- Debrief entry personnel
- Consider Critical Incident Stress Debriefing

8-17

Phase 5: Termination (cont.)

- Service & secure equipment
- Secure the space
- Plan for post incident analysis
- Cancel entry permit and file

8-18

Phases of Confined Space Rescue

- Summary
  - Five separate phases: Preparation, Assessment, Pre-Entry Operations, Entry and Rescue Operations, Termination
  - Roles and responsibilities of rescue team members and the confined space rescue group
  - Functions within the incident command system

8-19

Rescue Rope and Related Equipment

Lesson Objective

- Provide fire service personnel with the information on the use, care, and maintenance of rope rescue equipment and systems for confined space rescue

9-1

Rescue Rope and Related Equipment (continued)

- Standards and Regulations
  - State and federal laws
  - Additional requirements from standards
- Metric System
  - Standard measurement
  - Strength ratings

9-2

Rescue Rope and Related Equipment (continued)

- Equipment Description and Capabilities
  - Software
  - Hardware
- Rope
  - Uses and Construction
  - Specification and Care

9-3

Rescue Rope and Related Equipment (continued)

- Webbing
- Prusik Loop
- Anchor Straps
- Load Release Strap
- Harness
- Caribiners

9-4

Rescue Rope and Related Equipment (continued)

- Anchor Plate
- Mechanical Ascenders
- Figure Eight Plate
- Brake Bar Rack
- Edge Protection
- Pulleys

9-5

Rescue Rope and Related Equipment (continued)

- Static System Safety Factor (SSSF)
- Equipment Considerations
- What makes a good knot
- Knot efficiency
- Rules of knots

9-6

Rescue Rope and Related Equipment (continued)

- Knots
  - Overhand knot
  - Overhand bend
  - Half hitch
  - Double fisherman
  - Prusik

9-7

Rescue Rope and Related Equipment (continued)

- Knots (continued)
  - Figure eight stopper
  - Figure eight bend
  - Figure eight on a bight
  - Figure eight follow through loop
  - Tensionless hitch

9-8

Rescue Rope and Related Equipment (continued)

- Anchors
  - Types of anchors and how to select them
  - Single point anchors
  - Multiple point anchors
  - Critical angle

9-9

Rescue Rope and Related Equipment (continued)

- Rescue System
  - Belay system
  - Lowering system
  - Raising system
  - Pulley system

9-10

Rescue Rope and Related Equipment (continued)

- Summary
  - Capabilities and limitations of systems
  - Two basic systems
    - Lowering and Raising systems
  - Importance of anchor systems

9-11

High-Point Anchor System

Lesson Objective

- Provide fire service personnel with the ability to use various types of high directional anchors

10-1

Tripod

- Free standing used for entry, retrieval, and rescue
- Legs adjust to varying heights and angles
- Loads are placed downward on the legs or within the footprint

10-2

Tripod (continued)

- Sizes vary based upon intended use and manufacturer
- Should utilize a retrieval, fall protection, and/or mechanical advantage system
- May be used with rope

10-3

Davit Arms

- Used for lowering or retrieval work
- Free standing or used with fixed mounting device
- Shorter than tripods
- Used in conjunction with commercial winches and fall protection devices

10-4

Fall Protection Devices

- Self-retracting device attached to a high-point anchor system
- Intended to catch a falling worker
- Can be reset by removing load
- May have “Load indicator” mechanism

10-5

High-Point Anchor System

- Summary
  - Quick and easy to assemble
  - Provides a self-supporting system
  - Utilized with commercial winches or rope

10-6

Confined Space Communications

Lesson Objective

- Provide fire service personnel with the knowledge of communications techniques and equipment

11-1

Communication Techniques and Equipment

- Portable Radio
- Hard-wire System
- Voice
- Hand Signals

11-2

Communication Techniques (continued)

- Rope Signals - OATH
  - O = OK = 1 pull
  - A = Advance Line = 2 pulls
  - T = Take Up = 3 pulls
  - H = Help = 4 pulls

11-3

Communication Techniques (continued)

- Tapping or rapping codes
- Personal Distress Device (PDD)
  Personal Alarm Locator (PAL)
- Light Signals
- Back-up Plans

11-4

Confined Space Communications

- Summary
  - Required when entering confined spaces
  - Numerous options when choosing technique and equipment
  - Over-riding priority is to provide a reliable communications link between entrant and attendant

11-5

Permitting Confined Spaces

Lesson Objective

- Provide fire service personnel with the knowledge of identifying and permitting applicable confined spaces

12-1

Reasons for Permitting

- Required by CAL/OSHA Regulations
- Safety Checklist and tactical log
- Legal Document

12-2

Required Information

- Identification of spaces
- Purpose, date, and intended duration of entry
- Hazards and how to isolate and manage them

12-3

Required Information (cont.)

- Acceptable entry conditions
- Initial and periodic atmospheric monitor readings
- Communication procedures and special equipment needs

12-4

Required Information (cont.)

- Personnel and assigned positions
- Additional permits required
- Information for notification and ability of rescue teams
- Signature of Entry Supervisor

12-5

Permitting Considerations

- Duration based upon local agency operational procedures

12-6

Permitting Confined Spaces

- Summary
  - CAL/OSHA requirements
  - Permit system identified in the rescue agency's operational policies
  - Helps in pre-planning confined space rescue operations

12-7