



COURSE SYLLABUS

Course: Fire Inspector 1C: Fire Protection Systems and Hazards

CFSTES

Hours: 24:00 (21:00 = instruction / 3:00 = testing)

Designed For: The entry-level inspector

Description: Upon completion of this course the student will have an introductory knowledge of fire growth potential in a building or space; portable fire extinguishers; existing fixed fire suppression systems; existing fire detection and alarm systems; hazardous conditions involving equipment, processes and operations; fire growth potential in a wildland urban interface environment; inspections related to tents, canopies and temporary membrane structures; and emergency planning and preparedness measures.

Prerequisites: Fire Inspector 1B: Foundations of Fire and Life Safety

Passing Criteria: 80%

Certification: Fire Inspector I

Class Size: 30

Restrictions: None

REQUIRED STUDENT MATERIALS	EDITION	PUBLISHER
▪ California Fire Code	current	International Code Council (ICC)
▪ <i>Fire Inspection and Code Enforcement</i>	7th	IFSTA
▪ Instructor handouts on WUI		SFT
REQUIRED INSTRUCTOR MATERIALS	EDITION	PUBLISHER
▪ California Building Code	current	International Code Council (ICC)
▪ California Fire Code	current	International Code Council (ICC)
▪ CCR Title 19	current	Online: www.oal.ca.gov/publications.htm Print: Barclays (www.west.thompson.com)
▪ <i>Inspection and Code Enforcement Instructor Resource Kit</i>	7th	IFSTA
▪ Instructor handouts on WUI		SFT
▪ Protecting Your Home from Wildfire with Jack Cohen	video	US Forest Service Rocky Mountain Research Station (www.fs.fed.us/rm/publications/titles/videos/protecting.html)
▪ Video clip of the MGM fire (1978)	video	www.history.com (Engineering Disasters)

FIRE INSPECTOR 1C: FIRE PROTECTION SYSTEMS AND HAZARDS COURSE SYLLABUS

Course Objectives: to provide the student with:

- An introduction to fire growth potential in a building or space
- An introduction to portable fire extinguishers
- An introduction to existing fixed fire suppression systems
- An introduction to existing fire detection and alarm systems
- An introduction to hazardous conditions involving equipment, processes and operations
- An introduction to fire growth potential in a wildland urban interface environment
- An introduction to inspections related to tents, canopies and temporary membrane structures
- An introduction to emergency planning and preparedness measures

Course Content 24:00

Unit 1: Introduction

Topic 1: Orientation and Administration 0:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to

Enabling Learning Objectives (ELO):

1. Identify the requirements of the facility that is hosting the program
2. Will complete all required paperwork for State Fire Training and the organization that is hosting the class.

Discussion Questions

1. To be determined by instructor

Activities

1. Complete State Fire Paperwork and Organizational paperwork

Evaluation: Formative Test, Summative Test

Unit 2: Fire Growth Potential in a Building or Space (CTS 3-13)

Topic 1: Fire Behavior2:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe the fire tetrahedron, stages of a fire, and the impact of flame spread on smoke development, and identify energy sources and heat transfer mechanisms.

Enabling Learning Objectives (ELO):

1. Describe the fire triangle / tetrahedron
 - Triangle: oxidizer, reducing agent (fuel), energy
 - Tetrahedron: oxidizer, reducing agent (fuel), energy, chemical chain reaction
2. Identify energy sources, including:
 - Mechanical
 - Chemical
 - Electrical
 - Nuclear
3. Describe fire stages, including:
 - Incipient
 - Growth
 - Fully developed
 - Decay
4. Describe the impact of flame spread and smoke development, including:
 - Maintaining a tenable environment
 - o Flashover
 - o Backdraft
 - Impaired visibility caused by smoke development
 - Compromised exits due to products of combustion
5. Identify heat transfer mechanisms, including:
 - Convection
 - Conduction
 - Radiation
 - Direct flame contact

Discussion Questions

1. What are the components of the fire tetrahedron?
2. In which stage of a fire does flashover occur?
3. What is the most common heat transfer method found in a structure fire?
4. What form of heat transfer takes place when a fire transfers from one structure to another?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Topic 2: Elements that Impact Fire Growth Potential1:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe maintenance requirements for building construction elements and fire protection systems; how interior finishes, decorations and decorative materials impact fire growth potential; storage practices; commodity classifications; and how to verify deficiencies; and identify safe housekeeping practices and special

furnishing requirements for atriums and assembly areas.

Enabling Learning Objectives (ELO):

1. Describe maintenance requirements for building construction elements (passive), including:
 - Shafts
 - Corridors
 - Rated stairwells
 - Doors
 - Fire barriers
 - Fire walls
 - Protected openings
 - Penetrations
2. Describe maintenance requirements for active fire protection building systems, including:
 - Smoke control
 - Fire sprinklers
 - Fire alarms
3. Describe how interior finishes impact fire growth potential, including:
 - Wall and ceiling finishes
 - Floor finishes
 - Steiner tunnel test
4. Describe how decorations and decorative materials impact fire growth potential
5. Identify special furnishing requirements for:
 - Atriums
 - Assembly areas
6. Identify safe housekeeping practices
7. Describe storage practices, including:
 - Piled storage
 - High piled storage
 - Palletized storage
 - Rack storage
8. Describe commodity classifications (see CFC, chapter 23)
 - I, II, III, IV, high hazard, plastics
9. Describe how to verify deficiencies, including:
 - Observation and documentation
 - Reporting
 - Resolving or referring

Discussion Questions

1. What do the results of a Steiner tunnel test reveal?
2. What passive and active systems failed in the MGM fire?
3. What impact would an unprotected shaft have on a multistory building during a fire?
4. How does a material's flame spread impact fire behavior?
5. What is the difference between piled storage and high piled storage?

Activities

(Instructor to develop)

1. Analyze a video of the MGM fire.

Evaluation: Formative Test, Summative Test

Unit 3: Portable Fire Extinguishers (CTS 3-8)

Topic 1: Components and Operation 1:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to identify fire classifications of portable fire extinguishers, agents used in the portable fire extinguishers, and types of portable fire extinguishers, and determine fire extinguishers ratings, selection and local methods, and properly use a portable fire extinguisher.

Enabling Learning Objectives (ELO):

1. Identify fire classifications of portable fire extinguishers

- A, B, C, D, K
- 2. Describe how to determine fire extinguisher ratings
- 3. Identify agents used in portable fire extinguishers, including:
 - Water
 - CO₂
 - Foam
 - Dry chemical
 - Wet chemical
 - Clean agents
- 4. Identify portable fire extinguisher types, including:
 - Stored pressure
 - Cartridge operated
 - Pump operated
- 5. Describe selection and location methods, including:
 - Hazard
 - Travel distance
 - Size
 - Mounting height requirements
- 6. Describe the proper use of a portable fire extinguisher on a fire (PASS)
 - Pull the pin
 - Aim at the base of the fire
 - Squeeze the handle
 - Sweep the nozzle from side to side

Discussion Questions

1. How often should an inspector do a visual inspection of a fire extinguisher?
2. When does the code require a hydrostatic test for a fire extinguisher?
3. What are the classifications of fire as it relates to the classification of a fire extinguisher?

Activities

1. Activity 3-1: Portable Fire Extinguisher Ratings

Evaluation: Formative Test, Summative Test

Topic 2: Inspection, Testing and Maintenance0:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to inspect and test a portable fire extinguisher.

Enabling Learning Objectives (ELO):

1. Describe the service, testing/maintenance and periodic inspection process, including:
 - Verifying pressure
 - Checking inspection tag(s)
 - Identifying service intervals (CCR, Title 19, chapter 3)
 - Checking service collar
 - Checking the seal
 - Identifying hydrostatic test identification
 - Verifying any deficiencies
 - Observe and document
 - Report
 - Resolve or refer
 - Checking for obstructions

Discussion Questions

1. How many tags are required on a fire extinguisher?
2. When does the code require a licensed technician to inspect a fire extinguisher?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Unit 4: Existing Fixed Fire Suppression Systems (CTS 3-6)

Topic 1: Water-Based Fire Protection Systems3:00
Terminal Learning Objective (TLO): At the end of this topic, the student will be able to identify the types and components of water-based fire protection systems, types and components of standpipes, and stationary fire pumps; and inspect, test, and verify deficiencies in water-based fire suppression systems.

Enabling Learning Objectives (ELO):

1. Identify the types and components of water-based fire protection systems, including:
 - Automatic sprinklers
 - Water spray
 - Water mist
 - Foam water
2. Identify the types and components of standpipes, including:
 - Classifications
 - Wet and dry pipe systems
3. Identify stationary fire pumps, including:
 - Types
 - Components
 - Drivers (engine or motor)
 - Controllers
4. Describe periodic inspection and testing, including:
 - Determining the adequacy of fire protection based on the hazard present
 - Common components to inspect
 - Other considerations
 - California adoption of NFPA 25
 - CCR Title 19
5. Describe how to verify deficiencies, including:
 - Observation and documentation
 - Reporting
 - Resolving or referring

Discussion Questions

1. Is a water spray system the same as a fire sprinkler system?
2. Where do you find a dry pipe fire sprinkler system?
3. How often does the code require fire pump testing? Who can do the testing?
4. When does the code require inspection, testing and maintenance for a fire sprinkler system?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Topic 2: Special-Agent Fire Extinguishing Systems 1:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to identify special-agent fire extinguishing system types, components, locations, and processes; and inspect, test and verify deficiencies in special-agent fire extinguishing systems.

Enabling Learning Objectives (ELO):

1. Identify system types and components, including:
 - Dry chemical
 - Wet chemical
 - Clean agent
 - CO₂ systems
 - Foam systems
2. Identify locations and process, including:
 - Flammable and combustible liquids and gases
 - Water reactive
 - Food preparation equipment
 - File storage
 - Sensitive electronic equipment

- Electrical transformers and switches
- 3. Describe periodic inspection and testing, including:
 - Determining the adequacy of fire protection based on the hazard present
 - Common components to inspect
 - Other considerations
 - CCR, Title 19, chapter 5
- 4. Describe how to verify deficiencies, including:
 - Observation and documentation
 - Reporting
 - Resolving or referring

Discussion Questions

1. What is the most common application for a wet chemical fire extinguishing system?
2. What is the most common application for a dry chemical fire extinguishing system?
3. What is the most common application for a clean agent fire extinguishing system?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Unit 5: Existing Fire Detection and Alarm Systems (CTS 3-7)

Topic 1: Fire Alarm Systems and Components..... 1:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to identify detection and alarm system components, automatic alarm-initiating devices, notification methods, when panels require monitoring, and the types of signals transmitted.

Enabling Learning Objectives (ELO):

1. Identify detection and alarm system components, including:
 - Fire alarm control units
 - Power supplies
 - Initiating devices
 - Alerting devices
 - Auxiliary control interface
2. Identify alarm-initiating devices, including:
 - Smoke detectors
 - Heat detectors
 - Pilot sprinkler
 - Manual pull stations
 - Flame detectors
 - Water flow switches
 - Gas detectors
3. Identify notification methods, including:
 - Public mode
 - Private mode
4. Identify when panels must be monitored, including:
 - Supervised
 - Non-supervised
5. Identify the types of signals that are transmitted, including:
 - Supervisory
 - System trouble
 - Alarms

Discussion Questions

1. What is the difference between an initiating and a notification appliance?
2. What is the difference between a supervisory and a trouble signal?
3. What types of signals does the code require be transmitted to a central station?
4. What is the difference between a public mode and a private mode fire alarm system?
5. When is a fire alarm system required to be monitored?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Topic 2: Inspection, Testing and Maintenance.....0:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to test and inspect existing fire detection and alarm systems.

Enabling Learning Objectives (ELO):

1. Describe how to observe the service, testing/maintenance and periodic inspection process, including:
 - Conducting the visual observation of components
 - Determining panel readiness
 - Confirming that all initiating devices are unobstructed
 - Reviewing the owner's documentation of periodic inspections
 - Reviewing any third-party notices of deficiencies in the system
 - Verifying deficiencies, including:
 - Observation and documentation
 - Reporting
 - Resolving or referring

Discussion Questions

1. When can a fire alarm system be disabled?
2. Who should be notified when a fire alarm system is disabled?
3. What is the inspection interval for inspection of a fire alarm system?

Activities

(Instructor to develop)

1. Given a hypothetical scenario, complete an NFPA 72 Inspection and Testing form.

Evaluation: Formative Test, Summative Test

Unit 6: Hazardous Conditions Involving Equipment, Processes and Operations (CTS 3-9)

Topic 1: Recognition of Hazardous Conditions..... 1:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe safe operations practices and techniques; identify applicable codes, standards, and policies; identify unsafe conditions and behaviors; and verify deficiencies.

Enabling Learning Objectives (ELO):

1. Describe the safe operations practices and techniques, including:
 - Dust production
 - Flammable and combustible materials
 - Hazardous materials storage and handling
 - Ignition sources
 - Unsafe housekeeping
 - Vapor recovery
2. Identify the applicable codes, standards and policies of the jurisdiction
3. Identify unsafe behaviors such as:
 - Poor housekeeping
 - Ignoring ignition sources
 - Open burning
 - Improper electricity use
 - Careless use of flammable and combustible liquids
4. Identify unsafe conditions such as:
 - Electrical hazards
 - Material storage facilities
 - Heating, ventilating and air-conditioning equipment systems
 - Cooking equipment
 - Industrial furnaces and ovens
 - Powered industrial trucks

5. Describe how to verify deficiencies, including:

- Observation and documentation
- Reporting
- Resolving or referring

Discussion Questions

1. When does the code allow open burning?
2. What common fire hazards are often found during an inspection?
3. When does the code require fabrics to be flame retardant? What code regulates fabrics?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Unit 7: Fire Potential in the Wildland Urban Interface Environment (CTS 5-1 and 5-2)

Topic 1: History 1:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe the wildland urban interface environment and the consequences of severe wildland fire conditions.

Enabling Learning Objectives (ELO):

1. Describe the wildland urban interface
 - A location where significant combustible vegetation meets the built environment, and there is the potential for fire to transition from vegetation to those structures
2. Identify the history of fire in the wildland urban interface, including:
 - Paint fire (Montecito)
 - Tunnel fire (Oakland)
3. Describe the consequences of severe wildland fire conditions, including:
 - Interface conflagrations will exceed fire suppression resource capabilities
 - Life loss
 - Property loss
 - Environmental impact
 - Economic impact

Discussion Questions

1. What does WUI stand for?
1. What are some of the fire problems illustrated by the Paint Fire (Santa Barbara / 1990)?
2. What are some of the fire problems illustrated by the Tunnel Fire (Caldecott Tunnel / 1984)?

Activities

(Instructor to develop)

1. Identify the consequences of a WUI fire and discuss ideas in small groups.

Evaluation: Formative Test, Summative Test

Topic 2: Fire Behavior in a Wildland Urban Interface 1:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to identify factors that impact fire behavior in the wildland urban interface environment and methods of heat transfer.

Enabling Learning Objectives (ELO):

1. Identify factors impacting wildland fire behavior, including:
 - Fuel
 - Fuel loading
 - Combustible vegetation
 - Fire-resistant plant materials
 - Fuel moisture content
 - Topography
 - Aspect
 - Slope
 - Features
 - Weather
 - Wind
 - Temperature

- Relative humidity
 - Atmospheric stability
 - Precipitation
2. Identify heat transfer methods, including:
- Direct flame contact
 - Convection
 - Radiation
 - Ember transfer
 - Structure to structure
 - Fuel and fire laddering
 - Crown fire migration

Discussion Questions

1. How do weather conditions impact fire behavior?
2. How is fuel loading measured in a wildland urban interface environment?
3. What is aspect?
4. What are the types of fire transfer?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Topic 3: Fire Hazard Severity Zones 1:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe the fire hazard severity zone development process, define severity zone classifications, identify areas of responsibility, and describe construction methods as they relate to zone classification.

Enabling Learning Objectives (ELO):

1. Describe the fire hazard severity zone development process, including:
 - Fuel hazard
 - Weather
 - Fire history
 - Topography
 - Fuel receptivity
2. Define severity zone classifications, including:
 - Moderate
 - High
 - Very high
3. Identify responsibility areas, including:
 - Local Responsibility Area (LRA)
 - State Responsibility Area (SRA)
 - Federal lands
4. Describe construction requirements depending on zone classification
 - Special construction features (CBC chapter 7A)
 - Vegetation management requirements (CBC chapter 7A and CFC chapter 47)

Discussion Questions

1. What are the differences between an SRA and an LRA?
2. Can an SRA be within city limits?
3. In which severity zones do the requirements of CBC chapter 7A apply?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Topic 4: Wildland Urban Interface Issues 1:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe methods for dealing with fire hazards associated with a wildland urban interface environment, the components of a vegetation management plan, and documentation and reporting methods within a wildland urban interface environment.

Enabling Learning Objectives (ELO):

1. Describe methods for dealing with fire hazards associated with wildland urban interface environments, including:
 - Prescriptive construction requirements found in CBC, chapter 7A
 - Prescriptive fuel modification
 - Performance-based design
 - Master-planned communities
 - Construction features
 - Engineered fuel modification zone
2. Describe the components of a vegetation management plan, including:
 - Defensible space
 - Size, distance and zones
 - Fuel modification
 - Changing existing plant materials
 - Fuel reduction
 - Reducing the amount of existing vegetation
 - Wildland urban interface maintenance
 - As required by the AHJ or in accordance with a fuel management plan
3. Describe documentation and reporting methods in a wildland urban interface environment, including:
 - Observation and documentation
 - Reporting
 - Resolving or referring

Discussion Questions

1. What are the components of a vegetation management plan?
2. What are the components of a master-planned community in a WUI environment?
3. What construction features does chapter 7A of CBC modify for structures in a WUI environment?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Unit 8: Tents, Canopies and Temporary Membrane Structures (CTS 3-15)

Topic 1: Tents, Canopies and Temporary Membrane Structures..... 1:00

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to define the terms "tent", "canopy" and "temporary membrane structure", identify the state requirements for each, and identify when the California Building Code regulates each.

Enabling Learning Objectives (ELO):

1. Define the following terms:
 - Tent
 - Canopy
 - Temporary membrane structure
2. Identify the state requirements for tents, canopies and other temporary membrane structures (10 persons or greater) (see CCR, Title 19, chapter 2, article 3), including:
 - Vehicle parking
 - Location on site
 - Structural requirements
 - Prohibited smoking
 - Fireworks and open flame
 - Fire extinguishers and other fire protection equipment
 - Fire safety personnel
 - Abatement of fire and panic hazards
 - Exit requirements
 - Cooking and heating equipment
 - Flame resistance
 - Labeling of tents
3. Identify when the California Building Code regulates a tent, canopy or membrane structure

Discussion Questions

1. What is the difference between a tent and a canopy?
2. What occupant load requires the presence of fire safety personnel?
3. What canopy size does the code exempt from permitting and regulation?

Activities

1. To be determined by instructor.

Evaluation: Formative Test, Summative Test

Unit 9: Emergency Planning and Preparedness Measures (CTS 3-10)

Topic 1: Emergency Evacuation and Relocation Requirements and Elements.....1:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to describe the elements of an evacuation plan and identify which occupancies require an evacuation plan, the frequency of fire drills, and special considerations based on specific occupancies.

Enabling Learning Objectives (ELO):

1. Identify what occupancies are required to have an evacuation plan, including:
 - K-12 schools
 - High-rise buildings
 - Hospitals
 - Care facilities
 - Hotels
 - Organized camps
 - Office buildings with two or more stories
 - Covered malls
 - (See CCR Title 19, article 1, section 3.09)
2. Describe the elements of an evacuation plan, including:
 - Evacuation routes: maps identifying current location and egress routes
 - Types of evacuations (partial vs. full)
 - Monitor duties when evaluating a fire drill
 - Occupant duties in participating in fire drills
3. Identify the frequency with which fire drills must be practiced (Title 19 & CFC 405.2)
4. Identify special considerations based on specific occupancies:
 - Safe dispersal area for buildings, including:
 - Minimum of 50 feet from building
 - Five square feet per person
 - Hospitals are designed to shelter patients in place by compartmentalization (discuss the design and shelter in-place concept)
5. Describe how to verify deficiencies, including:
 - Observation and documentation
 - Reporting
 - Resolving or referring

Discussion Questions

1. How often should a high rise building have a fire drill?
2. What is the required frequency of fire drills for public schools?
3. In what code can you find the public school fire drill requirements?

Activities

1. To be determined by the instructor.

Evaluation: Formative Test, Summative Test

Topic 2: Conducting an Emergency Evacuation Drill0:30

Terminal Learning Objective (TLO): At the end of this topic, the student will be able to identify common human behavior associated with emergencies, conduct a fire drill, and identify issues to cover in a post-drill debriefing.

Enabling Learning Objectives (ELO):

1. Identify the human behavior that occurs during fires and other emergencies, including:
 - Panic

- Apathy
 - It is a misdemeanor offense to fail to respond to an evacuation order as part of an emergency or fire drill (see CCR, Title 19, section 3.10)
 - Exit imprinting
 - People tend to leave the way they came in
2. Define the considerations to conduct or evaluate fire drills, including:
 - Should be generally scheduled in advance
 - Conduct during business hours
 - Coordinate with the local agency
 - Notify dispatch of the drill, time and location
 3. Describe conducting a fire drill, including:
 - Observing and documenting participants' actions
 - Verifying evacuation as prescribed by plan
 4. Identify issues to cover in a post-drill debriefing, including:
 - Occupant accountability and participation
 - Time needed to evacuate the building as prescribed in the plan
 - Did the fire drill follow the written plan
 - Methods to improve fire drill plan
 - Identify revisions to improve the fire drill plan

Discussion Questions

1. Who should a fire inspector notify before observing a fire drill?
2. How can a fire inspector motivate people to participate in a fire drill?

Activities

(Instructor to develop)

1. Conduct a surprise class fire drill and discuss participant behavior.

Evaluation: Formative Test, Summative Test

Activity 3-1: Portable Fire Extinguisher Ratings

Match each fire hazard with the appropriate fire extinguisher rating.

Fire Extinguisher Ratings

- Class A
- Class B
- Class C
- Class D
- Class K

Component

Fire Extinguisher Rating

1. Television set
2. Cardboard boxes
3. Drop cloth soaked with oil-based paint
4. Cooking oil in a deep fat fryer
5. Electrical transformer
6. Magnesium chips
7. Propane from the relief valve on a small tank
8. A small pile of waste lumber
9. Broken kerosene lamp
10. Smoking extension cord
11. Railroad flare
12. Oil on a cooking griddle

Activity 3-1: Portable Fire Extinguisher Ratings

Answer Key

Bill still needs to provide.

DRAFT