Firefighter Certification IV (FIRS 1319)

Credit: 3 semester credit hours (2 hours lecture, 4 hours lab)

Co-requisite: FIRS 1103, FIRS 1301, FIRS 1329, FIRS 1407, and FIRS 1433

Course Description[1]

One in a series of courses in basic preparation for a new firefighter. Should be taken in conjunction with Firefighter Certification I, II, VI and VII to satisfy the Texas Commission on Fire Protection (TCFP) curriculum for Basic Structural Fire Suppression, Course #100.

Required Textbook and Materials

1. *Essentials of Fire Fighting and Department Operations* 6th Edition. Brady Publishing. Validated by IFSTA

   ISBN-13: 13-314080-4

   ISBN-10: 0-13-314080-6

2. *Hazardous Materials for First Responders* 4th Edition. Published by: Fire Protection Publications, Oklahoma State University. Validated by IFSTA

   ISBN: 978-087939389-2

Course Objectives

Upon completion of this course, the student will be able to:

1. Demonstrate competencies, for subjects taught, set forth in the TCFP curriculum for Basic Fire Suppression found at

http://www.tcfp.state.tx.us/standards/curriculum_manual/chapter_1.pdf

101-1.00 The firefighter trainee shall identify state laws and rules related to health and safety.
101-2.00 The firefighter trainee shall describe the responsibilities of a firefighter relating to compliance with the provisions of occupational safety and health programs.
101-3.00 The firefighter trainee shall identify the correct laws and rules applicable to Basic Firefighter certification by the Texas Commission on Fire Protection.
101-4.00 The firefighter trainee shall identify the various levels of instructor certification by the Texas Commission on Fire Protection.
102-1.00 The firefighter trainee shall identify, safely carry, and describe how to use forcible entry tools safely.
103-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to portable fire extinguishers.

[1] This course may be offered only by institutions licensed as a fire academy by the Texas Commission on Fire Protection

104-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to ropes.
105-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standards applicable to fire service ladders.
106-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standards applicable to fire service hose.
107-1.00 The firefighter trainee shall identify and describe the purpose of salvage and its value to the fire department and in public relations.
108-1.00 The firefighter trainee shall identify and describe the safety precautions necessary during overhaul.
109-1.00 The firefighter trainee shall identify, define, and demonstrate characteristics of fire streams.
110-1.00 The firefighter trainee shall identify and describe the principles, advantages, and effects of proper ventilation.
111-1.00 The firefighter trainee shall describe and demonstrate the proper techniques of searching for victims.
112-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to fire prevention inspections.
113-1.00 The firefighter trainee shall describe the operation of fire hydrants, fully open and close fire hydrants, and identify the NFPA hydrant color code.
114-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standards applicable to fire protection systems.
115-1.00 The firefighter trainee shall identify and describe the process of combustion and define key terms associated with fire science.
116-1.00 The Firefighter trainee shall identify and be able to describe the purpose, goals, and definitions of the NFPA standards applicable to Hazardous Materials.
117-1.00 The firefighter trainee shall explain, identify, or demonstrate emergency service communication procedures.
118-1.00 The firefighter trainee shall describe the importance and purpose of communications between the fire department and the community.
119-1.00 The firefighter trainee shall define the following terms related to wildland fire suppression.
120-1.00 The firefighter trainee shall describe the purpose of the following NFPA standards applicable to SCBAs.
121-1.00 The firefighter trainee shall be able to describe the purpose of the following NFPA standards applicable to personal protective equipment.
122-1.00 The firefighter trainee shall be able to describe the purpose of the NFPA standard applicable to professional firefighters.
123-1.00 The firefighter trainee shall identify and describe the basic types of building construction and the general fire behavior expected with each type of construction.
124-1.00 The firefighter trainee shall identify and describe the general requirements, purpose, and definitions of the NFPA standard(s) applicable to Live Fire Training Evolutions.
125-1.00 The firefighter trainee shall identify the responsibilities of the firefighter which could assist in the subsequent investigation of a fire.

156-1.00 The firefighter trainee shall demonstrate procedures for testing fire hose.
158-1.00 The firefighter trainee shall list and describe dangerous building conditions.
159-1.00 The firefighter trainee shall identify and define foam making appliances, and shall demonstrate a foam stream from each.
160-1.00 The firefighter trainee shall recognize the characteristics of ventilating a basement.
161-1.00 The firefighter trainee, operating as a member of a team, shall demonstrate the extrication of a victim from a vehicle.
162-1.00 The firefighter trainee shall identify the types of fire extinguishers in an occupancy and ensure that they conform to the fire prevention requirements for that occupancy.
163-1.00 The firefighter trainee shall identify and describe water systems and their fundamental components.
164-1.00 The firefighter trainee shall identify the features and characteristics of automatic sprinkler systems.
166-1.00 The firefighter trainee shall identify and be able to describe the purpose, goals, and definitions of the NFPA standards applicable to Hazardous Materials.
173-1.00 The firefighter trainee shall identify and describe the basic types of building construction and the general fire behavior expected with each type of construction.
174-1.00 The firefighter trainee shall extinguish or control live fires.
175-1.00 The firefighter trainee shall identify the methods for protecting evidence for fire cause determination.
176-1.00 The firefighter trainee shall identify and describe the purpose of an incident management system.
177-1.00 The firefighter trainee shall identify fire incident reporting systems.
178-1.00 The firefighter trainee shall identify and describe the benefits and components of pre-incident planning.
179-1.00 The firefighter trainee shall be able to describe various types of automotive fire apparatus, their functions, and their features.
180-1.00 The firefighter trainee shall identify various types of fire apparatus pumps and pump components, and shall identify their function(s), theory(s), and principle(s) of operation.

Course Outline

A. General
   1. Organization of the fire department
      a. History
      b. Organizational structure
   2. The role of the Fire Fighter I
   3. Mission of the fire service
      a. Emergency activities
      b. Non-emergency activities
   4. The value of life safety initiatives in support of the fire department mission and to reduce fire fighter line-of-duty injuries and fatalities
      a. Courage To Be Safe So Everyone Goes Home

5. Role of other agencies as they relate to the fire department
    a. Private entities
    b. Local
    c. Regional
    d. State
    e. Federal
6. Aspects of the fire department's member assistance program
    a. Critical Incident Stress Management (CISM)
    b. Member Assistance Programs (MAP)
7. Importance of physical fitness and a healthy lifestyle to the performance of duties of a fire fighter
8. The critical aspects of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program
9. The combustion process and key terms associated with fire science
    a. The four products of combustion commonly found in structural fires that create a life hazard
        i. Flame
        ii. Heat
        iii. Smoke
        iv. Gases and irritants
    b. Key terms
        i. Fire
        ii. Flash point
        iii. Ignition temperature
        iv. Fire point
        v. Flammable or explosive range
        vi. LEL
        vii. UEL
        viii. Boiling point
        ix. Oxidation
        x. Pyrolysis
        xi. Reducing agent
        xii. Vaporization
        xiii. Combustion
        xiv. Vapor density
        xv. Specific gravity
        xvi. Thermal layering
        xvii. heat stratification
        xviii. thermal balance
10. Fire theory
    a. Key terms
        i. Fire triangle
        ii. Fire tetrahedron
    b. The relationship of the concentration of oxygen to combustibility and firefighter safety

i. Ventilation-limited fire conditions
ii. Flow paths
iii. Door control

11. Identify and describe heat energy sources
    a. Chemical heat energy
    b. Electrical heat energy
    c. Mechanical heat energy
    d. Nuclear heat energy
12. The stages of a fire and describe the appropriate action to be taken for extinguishment
    a. Conditions and associated hazards and the appropriate actions to be taken for extinguishment
        i. Ignition
        ii. Growth
        iii. Decay - oxygen depleted
        iv. Flashover
        v. Fully developed/fully involved
        vi. Decay - fuel depleted
    b. Special conditions that occur during a fire's growth
        i. Flameover/rollover
        ii. Thermal layering
        iii. Ventilation-limited
        iv. Backdraft
    c. Methods of heat transfer
        i. Conduction
        ii. Convection
        iii. Radiation
        iv. Direct flame impingement
13. Physical states of matter in which fuels are commonly found
    a. Three types of fuel
        i. Solid fuel
        ii. Liquid fuel
        iii. Gaseous fuel
    b. Chemical and physical properties of fuels
        i. Specific gravity
        ii. Vapor density
        iii. The theory of surface to mass ratio as it relates to the combustion process
14. Chemical by-products of combustion
    a. Poisonous gases and irritants common in smoke
        i. Carbon dioxide
        ii. Carbon monoxide
        iii. Hydrogen cyanide
15. Units of heat measurement
    a. British thermal unit (BTU)
    b. Fahrenheit (^{o}F)

c. Celsius (^{o}C)
d. Calorie (C)

16. Fire extinguishment theory
    a. fire extinguishment theory
    b. four methods of extinguishment
        i. Temperature reduction
        ii. Fuel removal
        iii. Oxygen exclusion
        iv. Inhibiting chemical reaction
17. Characteristics of water as it relates to its fire extinguishing potential
    a. physical characteristics of water
    b. Law of Specific Heat
    c. Law of Latent heat
    d. advantages and disadvantages of water as an extinguishing agent
    e. Law of Heat Flow

B. General Skill Requirements
    1. Types of personal protective equipment (PPE) ensembles
        a. Station/work uniforms
        b. Structural firefighting
        c. Wildland firefighting
        d. Emergency medical service (EMS)
        e. Specialized ensembles (i.e. ARFF, technical rescue)
    2. Donning
    3. Doffing/preparing for re-use
    4. Care and maintenance
        a. Basic inspection
        b. Advanced inspection
        c. Record keeping
        d. Familiarization with NFPA 1851

C. Fire Department Communications

D. Response to a reported emergency
    1. Procedures for reporting an emergency
        a. Conventional phone
        b. Cellular phone
        c. Call box
        d. Telecommunication Devices for the Deaf (TDD)
        e. Still alarms or walk-ins
        f. Automatic alarms
    2. Departmental SOPs for taking and receiving alarms
        a. Nature of emergency
        b. Location of emergency
        c. Caller information
        d. Responding units
        e. Call back number
    3. Radio codes or procedures

a. Clear speech – plain English
b. Emergency communications
    i. Emergency communications per AHJ
    ii. Mayday
    iii. Evacuation order
4. Information needs of dispatch center
    a. Nature of emergency
    b. Location of emergency
    c. Caller information
    d. Responding units
    e. Call back number

E. Receive a telephone call
1. Departmental standard operating procedures (SOPs)
2. Phone etiquette

F. Transmit and receive messages via the fire department radio
1. Departmental radio procedures and etiquette for routine traffic
2. Departmental radio procedures and etiquette for emergency traffic
3. Departmental radio procedures and etiquette for emergency evacuation procedures

G. Activate an emergency call for assistance, given vision-obscured conditions, PPE, and department SOPs, so that the fire fighter can be located and rescued.
1. Personnel accountability systems
    a. Passport
    b. Tag system
    c. Electronic system
2. Emergency communication procedures
    a. Radio
    b. Face-to-face
    c. Tagline
    d. Evacuation signal
3. Emergency evacuation methods
    a. Roof escape
    b. Balcony escape
    c. Self-rescue
    d. Ladder escape
    e. Room escape

H. Fireground Operations

I. Self-contained breathing apparatus (SCBA) during emergency operations
1. Conditions that require respiratory protection
    a. Oxygen deficiency
    b. Elevated temperatures
    c. Toxic environments
    d. Smoke (by-products of combustion)
2. Uses and limitations of SCBA
    a. Wearer

i. Facial and long hair
ii. Protective clothing
iii. Donning
(a) Properly donned
(b) SCBA correctly worn
iv. Eyeglasses or contact lenses
v. Use in high or low temperatures
vi. Accidental submersion
vii. Communication
viii. Working in teams
ix. Personal alert safety system (PASS)
x. Doffing
xi. Physical conditioning

b. Equipment
c. Air supply

3. Types of SCBA
   a. Open circuit
   b. Closed circuit
   c. Supplied air respirators (SARs)
4. Components of SCBA
   a. Backpack and harness assembly
   b. Air cylinder assembly
   c. Regulator assembly
   d. Face piece assembly
   e. PASS device
   f. Rapid Intervention Crew/Universal Air Connection (RIC/UAC)
5. Donning and doffing procedures
   a. Over-the-head method
   b. Coat method
   c. Seat mounted
   d. Compartment mounted
6. Breathing techniques
   a. Controlled breathing
   b. Buddy breathing
7. Indications for and emergency procedures used with SCBA
   a. Use of emergency by-pass or purge valve
   b. Rapid Intervention Crew/Universal Air Connection (RIC/UAC)
   c. Conservation of air
8. Physical requirements of the SCBA wearer
   a. Cardiovascular conditioning
   b. Respiratory conditioning
   c. Psychological/emotional stability
9. Maintenance and inspections
   a. Replacing a cylinder
   b. Refilling a cylinder

   c. Cleaning
   d. Inspections
      i. Daily
      ii. Monthly
      iii. Annually

J. Respond on apparatus to an emergency scene
   1. Mounting procedures for riding fire apparatus
      a. Hand grip
      b. Footing
      c. Seatbelt
   2. Dismounting procedures for riding fire apparatus
   3. Hazards associated with riding fire apparatus
   4. Ways to avoid hazards associated with riding fire apparatus
      a. Seated and utilizing safety restraints
      b. Hearing protection, if required
      c. Secure loose objects in cab
   5. Prohibited practices
      a. Donning PPE while in motion
      b. Riding on the tailboard/sideboards
   6. Types of departmental personal protective equipment (PPE) and the means for usage
      a. Safety bars/gates
      b. Safety chains

K. Establish and operate in work areas at emergency scenes
   1. Potential hazards involved in operating on emergency scenes
      a. Vehicle traffic
      b. Utilities
      c. Environmental conditions
   2. Proper procedures for dismounting apparatus in traffic
   3. Procedures for safe operation at emergency scenes
   4. Protective equipment available for members' safety on emergency scenes
   5. Protective equipment available for members' safety on work zone designations

L. Force entry into a structure
   1. Basic construction types within the department's community or service area
      a. Doors
         i. Swinging doors
            (a) Inward opening
            (b) Outward opening
            (c) Double swing
         ii. Wooden doors
         iii. Metal doors
         iv. Tempered plate glass doors
         v. Revolving doors
         vi. Sliding doors

vii. Overhead doors
viii. Fire doors

b. Windows
   i. Checkrail windows (double-hung)
   ii. Casement windows (hinged)
   iii. Projected windows (factory)
   iv. Awning and jalousie windows
   v. Plastic windows (high security)
   vi. Screened or barred windows
c. Walls
   i. Masonry and veneered walls
   ii. Metal walls
   iii. Wood frame walls
   iv. Partition walls

2. Operation
   a. Doors
   b. Windows
   c. Locks
3. Dangers associated with forcing entry
   a. Through doors
   b. Through windows
   c. Through walls
4. Tools
   a. Cutting tools
   b. Prying tools
   c. Pushing/pulling tools
   d. Striking tools
5. Maintenance of tools
   a. Axe heads and cutting edges
   b. Wooden handles
   c. Fiberglass handles
   d. Unprotected metal surfaces
   e. Power equipment

M. Exit a hazardous area as a team
1. Personnel accountability systems
   a. Passport
   b. Tag system
   c. Electronic system
2. Communication procedures
   a. Radio
   b. Face-to-face
   c. Tagline
   d. Evacuation signal
3. Emergency evacuation methods

   a. Roof escape
   b. Balcony escape
   c. Self-rescue
   d. Ladder escape
   e. Room escape
4. What constitutes a safe haven/refuge
   a. Absence of immediately dangerous to life and health (IDLH) hazard
   b. Area outside of collapse zone
5. Elements that indicate or create a hazard
6. Emergency procedures for loss of air supply
   a. Stay calm/don't panic
   b. Activate PASS device
   c. Declare Mayday

N. Set up ground ladders
1. Parts of a ladder
   a. Beam
   b. Bed section
   c. Butt
   d. Butt spur
   e. Fly section
   f. Guides
   g. Halyard
   h. Heat sensor label
   i. Hooks
   j. Pawls (dogs)
   k. Protection plates
   l. Pulley
   m. Rail
   n. Rung
   o. Staypole
   p. Stops
   q. Tie rod
   r. Tip
2. Hazards associated with setting up ladders
   a. Overhead obstruction (energized power lines)
   b. Lifting and moving
   c. Uneven terrain
   d. Soft spots
   e. High traffic areas (doorways)
   f. Exposure to flame or heat
3. What constitutes a stable foundation for ladder placement
   a. Flat, stable surface
   b. Non-skid surface
4. Different angles for various tasks

   a. Roof
   b. Window
      i. Entry
      ii. Ventilation or working
      iii. Rescue set
5. Safety limits to the degree of angulation
6. What constitutes a reliable structural component for top placement

O. Attack a passenger vehicle fire operating as a member of a team
1. Principles of fire streams as they relate to vehicle fires
   a. Straight stream
   b. Full fog
   c. Power cone
2. Precautions to be followed when advancing hose lines toward a vehicle
   a. Uphill
   b. Upwind
   c. 45 degree angle approach
3. Observable results that a fire stream has been properly applied
4. Identifying alternative fuels and the hazards associated with them
   a. Compressed Natural Gas (CNG)
   b. Liquefied Petroleum Gas (LPG)
   c. Ethanol
   d. High voltage electrical power
5. Dangerous conditions created during a vehicle fire
   a. Energy absorbing bumpers
   b. Hydraulic pistons (supports)
      i. Hatchbacks
      ii. Trunks
      iii. Tailgates
      iv. Hoods
   c. Shock absorbers/struts
   d. Toxic by-products of combustion
   e. Supplemental Restraint System (SRS)
   f. Side Impact Protection System (SIPS)
   g. Batteries
   h. Combustible metals
6. Common types of accidents or injuries related to fighting vehicle fires and how to avoid them
   a. Traffic hazards
   b. Injuries
   c. Respiratory
7. Access compartments
   a. Passenger
   b. Trunk
   c. Engine
8. Methods for overhauling a vehicle

a. Chock wheels
b. Disable battery
c. Apply water thoroughly
d. Confirm no leaking fluids or fuels

P. Extinguish fires in exterior Class A materials
1. Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires
a. Types of attack lines
i. ¾ or 1 inch (booster or reel line)
ii. 1½ to 1¾ inches
iii. 2 to 2½ inches
iv. 3 inch or greater
b. Water streams
i. Low volume (less than 40 GPM)
ii. Handline (40 to 350 GPM)
iii. Master (350 GPM or greater)
2. Dangers associated with stacked and piled materials
a. Collapse
b. Energized sources
c. Products of combustion
d. Increased weight (absorption of water)
e. Exposures
3. Various extinguishing agents and their effects on different material configurations
a. Water
i. Cooling
ii. Increased surface tension
b. Foam
i. Blanketing or smothering
ii. Cooling
iii. Decreased surface tension
4. Tools and methods to use in breaking up various types of materials
a. Tools
i. Pike pole
ii. Rubbish hook
iii. Rake
b. Heavy equipment
i. Tractor
ii. Dozer
5. Difficulties related to complete extinguishment of stacked and piled materials
a. Agent penetration
b. Access
c. Density of material
d. Height and area of pile
6. Water application methods for exposure protection and fire extinguishment
a. Direct application

   b. Indirect application
7. Dangers such as exposure to toxic or hazardous materials associated with storage building and container fires
8. Obvious signs of origin and cause
   a. Burn pattern
   b. Charring
   c. Evidence of accelerants
   d. Trailers
9. Techniques for the preservation of fire cause evidence
   a. Protect evidence
   b. Preserve area
   c. Limit access

Q. Conduct a search and rescue in a structure

1. Use of forcible entry tools during rescue operations
   a. Striking
   b. Prying
   c. Cutting
   d. Pulling
2. Ladder operations for rescue
   a. Conscious victim
   b. Unconscious victim
   c. Fire fighter rescue
3. Psychological effects of operating in obscured conditions and ways to manage them
4. Methods to determine if an area is tenable
   a. Level of heat
   b. Smoke
   c. Ventilation-limited fire conditions
   d. Creation of flow paths
   e. Structural stability
   f. Risk/benefit analysis
5. Primary and secondary search techniques
   a. Define the following
      i. Primary search
      ii. Secondary search
   b. Search techniques
      i. Right hand/left hand
      ii. Large area/small area considerations
      iii. Rope assisted, or hose line
      iv. Tools (used to extend reach during search)
      v. Vent-Enter-Isolate-Search (VEIS)
6. Team members' roles and goals
   a. Finding victims
   b. Obtaining information on the extent of the fire
   c. Search priorities

i. Closest to fire area
ii. Remainder of fire floor
iii. Floor above
iv. Floor below

d. Rescue vs. recovery

7. Methods to use and indicators of finding victims
   a. Probable victim locations
      i. Behind doors
      ii. Under windows
      iii. On/under beds
      iv. In closets
      v. In bathtubs
   b. Additional considerations
      i. Type of occupancy
      ii. Time of day
      iii. Building size and arrangement
      iv. Information from neighbors
      v. Occupant indicators
         (a) Vehicles in driveway
         (b) Toys in yard
   c. Call out/listen
   d. Victim sighting through opening (i.e. window/door)
   e. Door control to prevent flow paths
8. Victim removal methods
   a. Types of carries
      i. Extremity carry
      ii. Seat carry
      iii. Chair carry
      iv. Webbing drag
      v. Blanket drag
      vi. Ladder rescue
         (a) Conscious
         (b) Unconscious
   b. Securing of a victim
      i. Basket
      ii. Stretcher
      iii. Long spine board
      iv. Other devices
9. Considerations related to respiratory protection
   a. Personal use/work time
   b. Emergency procedures
   c. Rescue air/RIT pak
   d. Conditions for use
      i. Heat
      ii. Smoke

iii. Oxygen deficiency
iv. Toxic atmospheres

R. Attack an interior structure fire operating as a member of a team
1. Principles of fire streams
a. Definitions
i. Pressure
ii. Friction loss
iii. Elevation loss/gain
iv. Fire stream
v. Vaporization
vi. Latent heat vaporization
vii. British Thermal Unit (BTU)
viii. Water hammer
b. Fire streams
i. Low-volume stream
ii. Handline stream
iii. Master stream
iv. Cooling/extinguishing properties
2. Types of nozzles
a. Solid stream
i. Types
ii. Advantages
iii. Disadvantages
iv. Flow rate
b. Fog stream
i. Types
ii. Advantages
iii. Disadvantages
iv. Flow rate
v. Water flow adjustment
(a) Manually adjustable
(b) Automatic (constant-pressure)
vi. Stream patterns
(a) Straight stream
(b) Narrow fog
(c) Wide fog
vii. Broken stream
(a) Types
(b) Advantages
(c) Disadvantages
(d) Flow rate
c. Specialty nozzles
i. Types
ii. Advantages

iii. Disadvantages
iv. Flow rate

3. Design of nozzles
   a. Solid stream nozzle
      i. Components/parts
      ii. Operating pressure
         (a) 50 psi hand line
         (b) 80 psi master stream
   b. Fog stream nozzle
      i. Components/parts
      ii. Operating pressure
         (a) 100 psi hand line
         (b) 50-75 psi low pressure hand line
         (c) 100 psi master stream
   c. Broken stream nozzle
      i. Components/parts
      ii. Operating pressure varies by design
4. Operation of nozzles
   a. Operating valves
      i. Ball valve
      ii. Slide valve
      iii. Rotary control valve
   b. Flow selection
      i. Automatic
      ii. Adjustable
      iii. Fixed
5. Nozzle pressure effects
   a. Reach
      i. Solid stream
      ii. Fog stream
      iii. Broken stream
   b. Nozzle reaction
      i. Solid stream
      ii. Fog stream
      iii. Broken stream
   c. Water pattern
      i. Solid stream
      ii. Straight stream
      iii. Narrow fog
      iv. Wide fog
      v. Broken stream
   d. Flow paths caused by air entrainment
      i. Solid or straight streams
      ii. Fog streams
6. Flow capabilities of nozzles

   a. Low volume nozzles – 40 GPM or less
   b. Hand line nozzles – 40-350 GPM
   c. Master stream nozzles – 350 GPM and above
7. Precautions to take when advancing hose lines to a fire
   a. Into a structure
   b. Up a stairway
   c. Down a stairway
   d. From a standpipe
   e. Up a ladder
8. Observable results that a fire stream has been properly applied
   a. Direct attack
      i. Smoke
      ii. Heat
      iii. Flame
   b. Indirect attack
      i. Smoke
      ii. Heat
      iii. Flame
      iv. Patterns
         (a) T pattern
         (b) Z pattern
         (c) O pattern
   c. Combination attack
      i. Smoke
      ii. Heat
      iii. Flame
      iv. Patterns
         (a) T pattern
         (b) Z pattern
         (c) O pattern
9. Dangerous building conditions created by fire
   a. Flashover
   b. Rollover
   c. Ventilation-limited
   d. Backdraft
   e. Smoke explosion
   f. Imminent building collapse
   g. Fire behind, below, or above attack team
   h. Kinks or obstructions to the hose line
   i. Holes, weak stairs, or other fall hazards
   j. Suspended loads on fire-weakened supports
   k. Hazardous or highly flammable commodities likely to spill
   l. Electrical shock hazards
10. Principles of exposure protection
   a. Conduction

b. Convection
c. Radiation
d. Direct flame impingement

11. Potential long-term consequences of exposure to products of combustion
    a. Respiratory diseases
    b. Cardiovascular diseases
    c. Stroke
    d. Cancer
    e. Death
12. Physical states of matter in which fuels are found
    a. Solid
    b. Liquid
    c. Gaseous
13. Common types of accidents or injuries and their causes
    a. Common injuries
    b. Common activities
    c. Common causes
        i. Slips, trips, falls
        ii. Failure to wear proper PPE
        iii. Failure to follow safety procedures
14. Application of each size and type of attack line
    a. 30-350 GPM
    b. 1½" to 3" hose lines
    c. AHJ
15. The role of the backup team in fire attack situations
    a. "Two-in/two-out" rule
    b. Fire fighter rescue
    c. AHJ
16. Attack and control techniques for grade level, above grade level and below grade level
    a. Grade level
        i. Single story structures
        ii. Large single story structures
    b. Above grade level
        i. Multi-story structures
        ii. Low-rise
        iii. Mid-rise
        iv. High-rise
    c. Below grade level
        i. Basements
        ii. Vaults
    d. Coordinating fire attack with ventilation
    e. Exterior offensive attack
        i. Blitz attack
        ii. Transitional attack

iii. Softening the target

17. Exposing hidden fires
    a. Overhaul techniques
        i. Opening walls
        ii. Opening floors
        iii. Opening ceilings
    b. Other concealed spaces – special considerations
        i. Utility chutes/shafts
        ii. Cocklofts
        iii. Attics
        iv. Basements
        v. Other

S. Perform horizontal ventilation on a structure operating as part of a team
    1. Principles, advantages, limitations and effects of horizontal, mechanical and hydraulic ventilation
        a. Purposes
            i. Life safety
            ii. Fire attack and extinguishment
            iii. Fire spread control
            iv. Reduce flashover potential
            v. Reduce backdraft potential
            vi. Property conservation
        b. Types of horizontal ventilation
            i. Natural
            ii. Mechanical
                (a) Positive pressure
                (b) Negative pressure
                (c) Hydraulic
        c. Advantages
            i. Natural
            ii. Mechanical
                (a) Positive pressure
                (b) Negative pressure
                (c) Hydraulic
        d. Limitations
            i. Natural
            ii. Mechanical
                (a) Positive pressure
                (b) Negative pressure
                (c) Hydraulic
        e. Effects
            i. Natural
            ii. Mechanical
                (a) Positive pressure
                (b) Negative pressure

(c) Hydraulic

2. Safety considerations when venting a structure
   a. Life safety hazards
   b. Determining the location and extent of the fire
   c. Identifying building construction features
   d. Flow paths
   e. Predicting fire travel and growth
3. Fire behavior in a structure
   a. Products of combustion
   b. Behavior of heat, smoke and fire gases
   c. Airflow characteristics
4. Products of combustion found in a structure fire
   a. Heat
   b. Smoke
   c. Gases and irritants
5. Backdrafts
   a. Signs
   b. Causes
   c. Effects
   d. Prevention
6. Relationship of oxygen concentration to life safety and fire growth
   a. Firefighter safety
   b. Victim safety

T. Perform vertical ventilation on a structure as part of a team
1. Methods of heat transfer
   a. Conduction
   b. Convection
   c. Radiation
   d. Direct flame impingement
2. Principles of thermal layering within a structure on fire
   a. Definition of thermal layering (i.e. heat stratification, thermal balance)
   b. Thermal layering as it relates to ventilation
   c. Thermal layering in relation to life safety/rescue
3. Roof Styles
   a. Flat
   b. Pitched
   c. Hip
   d. Gable
   e. Mansard
   f. Shed
   g. Butterfly
   h. Gambrel
4. Techniques and safety precautions for venting flat roofs
   a. Weather conditions
   b. Determining need

   c. Exposures
   d. Obstructions/weight on roof
   e. Maintain structural support integrity during cut
   f. PPE
   g. Tools
   h. Ladder placement
   i. Sounding roof
   j. Slips, trips, and falls
   k. Reduced visibility
   l. Equipment safety
   m. Location of vent cut
   n. Secondary means of escape
   o. Personnel
   p. Types of cuts
5. Techniques and safety precautions for venting pitched roofs
   a. Angle of pitch
   b. Weather conditions
   c. Determining need
   d. Exposures
   e. Obstructions/weight on roof
   f. Maintain structural support integrity during cut
   g. PPE
   h. Tools
   i. Ladder placement
   j. Sounding roof
   k. Slips, trips, and falls
   l. Reduced visibility
   m. Equipment safety
   n. Location of vent cut
   o. Secondary means of escape
   p. Personnel
   q. Types of cuts
6. Techniques and safety precautions for venting basements
   a. Determining need
   b. Exposures
   c. Obstructions/weight on floor above
   d. Maintain structural support integrity during cut
   e. PPE
   f. Tools
   g. Slips, trips, and falls
   h. Reduced visibility
   i. Equipment safety
   j. Location of ventilation openings
   k. Personnel
7. Basic indicators of potential collapse or roof failure

   a. Construction
      i. Solid beam
      ii. Light weight trusses
   b. Size up
      i. Sagging roof
      ii. Spongy roof
      iii. Melting tar
      iv. Smoke seepage
      v. Visible fire
   c. Elapsed time of fire
8. Effects of construction type
   a. Structural integrity
   b. Fire spread
9. Elapse time under fire conditions on structural integrity
10. Vertical ventilation
   a. Advantages
   b. Disadvantages
11. Trench/strip ventilation
   a. Advantages
   b. Disadvantages

U. Overhaul a fire scene
1. Types of fire attack lines and water application devices most effective for overhaul
   a. Attack lines
   b. Fire extinguishers
   c. Buckets and basins
   d. SOPs per AHJ
2. Water application methods for extinguishment that limit water damage
   a. Water conservation
   b. Soaking in buckets and basins
3. Types of tools to expose hidden fire
   a. Prying and pulling tools
   b. Cutting tools
   c. Striking tools
   d. Power tools
   e. Thermal imaging camera
4. Methods to expose hidden fires
   a. Sight
   b. Touch
   c. Sound
   d. Electronic instruments
5. Dangers associated with overhaul
   a. Toxic atmospheric conditions
   b. Weakened floors and structural members
   c. Sharp objects and debris

   d. Utilities
   e. Slippery surfaces
6. Obvious signs of area of origin or signs of arson
   a. Burn patterns
   b. Smoke markings
   c. Physical evidence
7. Reasons for protection of fire scene
   a. Securing the scene
   b. Preservation of evidence

V. Conserve property
1. The purpose of property conservation and its value to the public
2. Methods used to protect property
   a. Removal of property
   b. Protection of property in place
3. Types and uses of salvage covers
   a. Types
   b. Uses
      i. Cover property
      ii. Construct basins, chutes and catchalls
      iii. Floor runners
      iv. Debris removal
4. Operations at properties protected with automatic sprinklers
5. How to stop the flow of water from an automatic sprinkler head
   a. Sprinkler stops and wedges
   b. Operate main control valves
6. Identification of the main control valve on an automatic sprinkler system
   a. Sprinkler riser
   b. Indicating valves
      i. Outside stem and yoke (OS&Y)
      ii. Butterfly valve
      iii. Wall post indicator valve (WPIV)
      iv. Post indicator valve (PIV)
      v. Post indicator valve assembly (PIVA)
7. Forcible entry issues related to salvage
   a. Utilize forcible entry only when necessary
   b. Try before you pry

W. Connect a fire department pumper to a water supply
1. Loading and off-loading procedures for mobile water supply apparatus (AHJ)
   a. Portable water tanks
   b. Drafting and siphoning appliances
   c. Relay pumping apparatus
   d. Fill apparatus and drafting appliances
   e. Portable pumps
   f. Fire hydrant appliances

   g. Dry hydrants or suction supply points
2. Fire hydrant operation
   a. Types
      i. Dry barrel hydrant
      ii. Wet barrel hydrant
   b. Color coding
      i. Class AA light blue
      ii. Class A green
      iii. Class B orange
      iv. Class C red
3. Suitable static water supply sources
   a. Lakes
   b. Rivers
   c. Streams
   d. Ponds
   e. Pools
4. Procedures protocol for connecting to various water sources
   a. Hydrant to pumper connection
      i. Forward hose lay
      ii. Reverse hose lay
   b. Drafting

X. Extinguish incipient Class A, Class B, and Class C
1. Classifications of fire
   a. Class A – ordinary combustible materials
   b. Class B – flammable and/or combustible liquids and gases
   c. Class C – energized electrical equipment
   d. Class D – combustible metals
   e. Class K – combustible cooking oils
2. Types of fire
   a. Combustible materials
   b. Flammable liquids and gases
   c. Energized electrical equipment
   d. Combustible metals
   e. Combustible cooking oils
3. Rating systems for fire
   a. Class A test
      i. Wood panel
      ii. Wood crib
   b. Class B test
      i. Pan of flammable liquid
      ii. n-heptane used
   c. Class C test
      i. Applies to energized electrical fires only
      ii. De-energized equipment is treated as a class A, B or D fire

   d. Class D test
      i. Metal fires only
      ii. Dry powder agent must be formulated to the specific metal
   e. Class K test
      i. Cooking oil fires
      ii. Uses a specialized extinguishing agent
4. Operating methods of portable extinguishers
   a. Acronym PASS
      i. Pull
      ii. Aim
      iii. Squeeze
      iv. Sweep
   b. Distance from the fire
5. Limitations of portable extinguishers
   a. Type of agent for fire
   b. Size of extinguisher for fire

Y. Illuminate the emergency scene
1. Safety principles and practices
   a. Safely lifts equipment during set up
   b. Locates the power plant in a remote and well-ventilated position
   c. Arranges power cords neatly to minimize tripping hazards
   d. Ground Fault Interrupter (GFI) operations
2. Power supply capacity and limitations
   a. Power supply (portable or mounted)
   b. Lights
   c. Auxiliary equipment
   d. Cords
   e. Connectors
3. Light deployment methods
   a. Organizes lights to illuminate area sufficiently
   b. Follow equipment operating guidelines

Z. Turn off building utilities
1. Electrical systems
   a. Properties
   b. Principles
   c. Safety concerns
2. Gas systems
   a. Properties
   b. Principles
   c. Safety concerns
3. Water systems
   a. Properties
   b. Principles
   c. Safety concerns
4. Utility disconnect methods

   a. Electrical
      i. Electric meter
      ii. Main breaker box
   b. Natural gas meter
   c. Water meter
5. Dangers associated with utility disconnect methods
   a. Electrocution
   b. Fire/explosion
6. Use of required safety equipment (AHJ)

AA. Combat a ground cover fire

1. Types of ground cover fires
   a. Crown fire – aerial fuel
   b. Surface fire – surface fuel
   c. Subsurface fire – subsurface fuel
2. Parts of ground cover fires
   a. Head
   b. Origin
   c. Heel
   d. Flanks
   e. Fingers
   f. Spot fires
   g. Island
   h. Perimeter
   i. Green
   j. Black
3. Methods to contain or suppress
   a. Direct attack
   b. Indirect attack
4. Safety principles and practices
   a. Proper use of PPE
   b. Proper use of tools
   c. Scene hazard awareness
5. Factors influencing the spread of ground fires
   a. Weather
   b. Topography
   c. Fuel

BB. Tie a knot appropriate for hoisting tool

1. Knot types and use
   a. Safety knot or overhand knot
   b. Half hitch
   c. Clove hitch
   d. Figure 8
   e. Figure 8 on a bight
   f. Figure 8 with a follow through
   g. Bowline

h. Sheet bend or becket bend

2. Differentiating between life safety and utility rope
   a. Natural
   b. Synthetic
3. Reasons for placing rope out of service
   a. Inspection
      i. Routine
      ii. After use
   b. Storage
   c. Maintenance
4. Types of knots used for given tools, ropes or situations
   a. Hoisting an axe
   b. Pike pole
   c. Hose
   d. Ladder
   e. Power tools or fans
5. Hoisting methods for tools and equipment
6. Using rope to support response activities
   a. Utility
   b. Life safety/rescue

CC. Rescue Operations

DD. Preparedness and Maintenance

EE. Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools

1. Types of cleaning methods for various tools and equipment
   a. Ladders
   b. Ventilation equipment
   c. SCBA
   d. Ropes
   e. Salvage equipment
   f. Hand tools
2. Correct use of cleaning solvents
   a. Mild diluted detergent
   b. Safety solvent
   c. Water

FF. Clean, inspect, and return fire hose to service

1. Departmental procedures for noting a defective hose and removing it from service (AHJ)
2. Cleaning methods
   a. Rinse
   b. Gently scrub with mild detergent
   c. Final rinse
3. Hose rolls
   a. Straight roll
   b. Donut roll

c. Twin donut roll
d. Self-locking twin donut roll

4. Hose loads
   a. Forward lay
   b. Reverse lay
   c. Accordion load
   d. Horseshoe load
   e. Reverse horseshoe load
   f. Flat load
   g. Triple layer load
   h. Minuteman load
   i. Booster hose load (reel)

GG. Responsibilities of the Fire Fighter II in assuming and transferring command within an incident management system

1. Identify and describe the purpose of an Incident Management System
   a. Common terminology
   b. Modular organization
   c. Integrated communications
   d. Unified command structure
   e. Consolidated action plans
   f. Manageable span of control
   g. Predesignated incident facilities
   h. Comprehensive resource management
2. Functions necessary to manage an incident effectively and the responsibilities within the Incident Management System
   a. Command
   b. Safety
   c. Liaison
   d. Information
   e. Operations
   f. Planning
   g. Logistics
   h. viii. Finance/Administration
3. Components and functions of the operations section within the Incident Management System
   a. Incident Command
   b. Staging
   c. Branches
   d. Divisions and Groups
   e. Strike Teams and Task Forces
   f. Single Resources
4. Procedure for implementing the Incident Management System
   a. Hazard and risk analysis
      i. What has occurred?

ii. What is the current status of the emergency? iii. Is anyone trapped or injured?
iii. Can the emergency be handled with the resources on scene or en route?
iv. Does the emergency fall within the scope of the individual's training?

b. Risk vs. benefit

5. Establishing command and the transfer of command
   a. First on scene
      i. Investigation
      ii. Command
      iii. Pass command for fast attack/rescue
   b. Considerations for transfer of command
      i. Arrival of senior staff
      ii. Specialized incident
      iii. Resource requirements
      iv. Time restraints
      v. Demobilization
   c. Methods of transferring command
      i. Face-to-face
      ii. Via radio
6. Transferring command
   a. Situation status report (sit stat)
   b. Communicating transfer of command

HH. Fire Department Communications

II. performing activities related to initiating and reporting responses

JJ. Complete a basic incident report

1. Content requirements for basic incident reports
   a. National Fire Incident Reporting System (NFIRS)
   b. Texas fire incident reporting system (TXFIRS)
2. Purpose of accurate reports
   a. A legal record of an incident
   b. Consistent format for the collection of data usable at the state and national level
3. Usefulness of accurate reports
   a. Provides information to officials for evaluation performance and making changes
   b. Aids in determining departmental needs
4. Consequences of inaccurate reports
   a. Incorrect data
   b. Litigation
5. How to obtain necessary information
   a. Person or entity involved
   b. Owner
   c. Bystanders or eye witnesses
   d. Dispatch
   e. Equipment involved in ignition

f. Fire fighters on scene
6. Required coding procedures
   a. NFIRS
   b. TXFIRS

KK. Communicate the need for team assistance
1. Alarm assignment SOP
2. Fire department radio communication procedures

LL. Fireground Operations

MM. Extinguish an ignitable liquid fire, operating as a member of a team
1. Methods by which foam prevents a hazard
   a. Blanketing effect
   b. Vapor suppression
2. Methods by which foam controls a hazard
   a. Heat resistance
   b. Fuel resistance
   c. Vapor suppression
3. Principles by which foam is generated
   a. Components of finished foam
      i. Foam solution
         (a) Foam concentrate
         (b) Water
      ii. Air (aeration/mechanical agitation at the nozzle)
   b. Water + concentrate = foam solution
   c. Foam solution + air = finished foam
4. Methods by which foam is generated
   a. Foam eductor
      i. Venture principle
      ii. In-line eductor iii. Bypass eductor
   b. Around the pump foam proportioner
   c. Balanced pressure foam system
   d. Premix
5. Cause for poor foam generation
   a. Foam concentrate/fuel type mismatch
   b. Fuel area and depth
   c. Wrong application rate
   d. Inadequate water supply, or pressure
   e. Foam eductor type and setting
   f. Nozzle type and setting
   g. Back pressure
6. Corrective measures for poor foam generation
   a. Identify fuel type
      i. Hydrocarbon
      ii. Polar solvent
   b. Determine fuel depth and surface area
   c. Determine application rate (GPM/ft^2)

   d. Acquire adequate supply of foam concentrate
   e. Establish water supply and correct pressure
   f. Verify proper eductor operation
      i. Setting (i.e. 1%, 3%, 6%)
      ii. Concentrate pick-up tube
   g. Nozzle flow matches eductor capability (GPM) and provides aeration
   h. Check for hose kinks and/or blockage
   i. Assure nozzle is fully open
7. Differentiating between hydrocarbon and polar solvent fuels
   a. Hydrocarbon fuels
      i. Examples
      ii. Concentrate types
      iii. Concentrate percentage and application rate
   b. Polar solvent fuels
      i. Examples
      ii. Concentrate types
      iii. Concentrate percentage and application rate
8. Advantages, uses and limitations of fire-fighting foams
   a. Protein
      i. High water retention and heat resistance
      ii. Effective vapor suppression iii. Limited shelf life
      iii. Poor fuel resistance
      iv. Slow knockdown
      v. Poor compatibility with dry chemical agents
   b. Fluoroprotein
      i. Excellent fuel resistance
      ii. Compatible with specific dry chemical agents
      iii. High heat resistance
      iv. Requires use of foam nozzle
   c. Film Forming Fluoroprotein (FFFP)
      i. Fast film-forming capability
      ii. High heat resistance
   d. Aqueous Film Forming Foam (AFFF) / Alcohol Type Concentrate (ATC)
      i. Fast film-forming capability
      ii. Applied with regular fob nozzles
      iii. Compatible with specific dry chemical agents
      iv. ATC suitable for polar solvent fuel fires
      v. Quick drain-down may require continued application
   e. High-expansion foam
      i. Reduces surface tension of water
      ii. Excellent penetration into Class A materials
      iii. Poor heat resistance
   f. Class A foams
      i. Reduces surface tension of water

ii. Foamy water solution clings to surfaces
iii. Fast extinguishment
iv. Requires a more accurate proportioning system
v. Impacts fire investigation laboratory tests
vi. Creates difficult salvage operations

9. Advantages and disadvantages of using fog nozzles
   a. Suitable for use with AFFF and Class A foams
   b. Not suitable for use with protein and fluoroprotein foams
   c. Use of expansion tubes
   d. Reduced reach when flowing foam
10. Advantages and disadvantages of using foam nozzles
   a. Creates highest quality of foam
   b. Must be used with protein and fluoroprotein foam
   c. Stream reach less than a standard fog nozzle
11. Foam stream application techniques
   a. Roll-on technique
   b. Bank-down technique
   c. Rain-down technique
12. Hazards associated with foam usage
   a. Mildly irritating
   b. Mildly corrosive
   c. Environmental impact
   d. Limited foam stream reach
13. Methods to reduce or avoid hazards
   a. Flush affected areas with water
   b. Control run-off
   c. Additional exposure lines for personnel protection

NN. Coordinate an interior attack line for a team's accomplishment of an assignment in a structure fire

1. Selection of the nozzle for fire attack
   a. Handlines
      i. Fog nozzles
      ii. Solid stream
      iii. Broken stream
   b. Master streams
      i. Fog nozzles
      ii. Solid stream
2. Selection of the hose for fire attack
   a. Small diameter (¾", 1", 1½", 1¾", 2") handlines
   b. Medium diameter (2½", 3") handlines
   c. Medium (2½", 3") or large diameter hose (3½", 4", 5", 6") for master stream support
3. Selection of adapters and appliances to be used for specific fire ground situations
   a. Wyes – gated and non-gated
   b. Siamese – clapper and non-clapper

c. Water thief
d. Manifold (portable hydrant)
e. Hydrant valve
f. Double male
g. Double female
h. Reducers
i. Adapters
    i. Adapts one thread type to another
    ii. Adapts threaded couplings to sexless couplings

4. Dangerous building conditions created by fire and fire suppression activities
    a. Dangerous fire conditions in a building
        i. Ventilation-limited
        ii. Flashover
        iii. Backdraft
    b. Conditions that contribute to the spread and intensity of the fire
        i. Fire loading
        ii. Combustible furnishings and finishes
        iii. Roof coverings
        iv. Wooden floors and ceilings
        v. Large, open spaces
    c. Conditions that make the building susceptible to collapse
        i. Damage to structural system of the building from fire or firefighting activities
        ii. Age of the building
        iii. Lightweight or truss construction
        iv. Older buildings exposed to weather
        v. Firefighting operations
            (a) Improper vertical ventilation
            (b) Added weight of water used for fire extinguishment
5. Indicators of building collapse
    a. Deterioration of mortar joints
    b. Overall age and condition of the building
    c. Cracks in walls, floors, ceilings, and roofs
    d. Signs of building repair (tie rods and stars)
    e. Large open spans
    f. Bulges, bowing and leaning of walls
    g. Sagging floors
    h. Abandoned buildings
    i. Large volume of fire
    j. Extended firefighting operations
    k. Smoke coming from cracks in walls
    l. Dark smoke from truss roof or floor spaces
    m. Multiple fires in same building or damage from previous fires
6. Effects of fire suppression activities on:
    a. Wood

b. Masonry (brick, block, stone)
c. Cast iron
d. Steel
e. Reinforced concrete
f. Gypsum wallboard
g. Glass
h. Plaster on lath

7. Search and rescue procedures
   a. Define the following
      i. Primary search
      ii. Secondary search
   b. Search techniques
      i. Right hand/left hand
      ii. Large area/small area considerations
      iii. Rope assisted, or hose line
      iv. Use of tools
         (a) To extend reach
         (b) Door chocks or door/latch straps
         (c) Thermal imaging cameras
      v. Vent-Enter-Isolate-Search (VEIS)
      vi. Communication during search
      vii. Search marking systems
8. Ventilation procedures
   a. Door control
   b. Types
      i. Natural
      ii. Mechanical
         (a) Positive pressure
         (b) Negative pressure
         (c) Hydraulic
   c. Techniques
      i. Horizontal
      ii. Vertical
   d. Coordinate with fire attack
   e. Special considerations
      i. Concrete roofs
      ii. Metal roofs
      iii. Ventilating basements
      iv. Ventilating high-rises
      v. Ventilating windowless buildings
      vi. Ventilating large buildings
9. Indicators of structural instability
   a. Truss
   b. Lightweight construction
   c. Cracks or separations in walls, floors, ceilings and roof structures

   d. Presence of tie rods and stars
   e. Loose bricks, blocks, or stones falling from buildings
   f. Deteriorated mortar joints
   g. Walls that appear to be leaning
   h. Structural members that appear to be distorted
10. Suppression approaches for various types of structural fires
   a. Offensive
   b. Exterior offensive attack
      i. Blitz attack
      ii. Transitional attack
      iii. Softening the target
   c. Defensive
   d. Occupancy
      i. Single-family dwellings
      ii. Multi-family dwellings
      iii. Commercial occupancies
      iv. High-rises
11. Suppression practices for various types of structural fires
   a. Residential fires
      i. Attic
      ii. Grade-level
      iii. Upper-level
      iv. Basement
      v. Concealed spaces
   b. Small business fires
      i. Attic
      ii. Grade-level
      iii. Upper-level
      iv. Basement
      v. Concealed spaces
12. Association between specific tools and special forcible entry needs
   a. Hand tools
      i. Pry axe
      ii. Detroit door opener
   b. Power tools
      i. Chain saw
      ii. Circular saw
      iii. Reciprocating saw
      iv. Drill
   c. Lock tools
      i. A tool
      ii. K tool
      iii. J tool
      iv. Shove knife
      v. Duck bill lock breaker

vi. Locking pliers and chain
vii. Bam bam tool
viii. Elevator keys

d. Hydraulic/pneumatic tools
   i. Rabbet tool
   ii. Hydraulic spreaders
   iii. Hydraulic rams
   iv. Hydraulic cutters
   v. Pneumatic spreaders
   vi. Pneumatic cutters
   vii. Pneumatic drills and saws

OO. Control a flammable gas cylinder fire

1. Characteristics of pressurized flammable gases
   a. Pressure
   b. Vapor pressure
   c. Vapor density
   d. Expansion ratio
2. Elements of a gas cylinder
   a. Cylinder design
   b. Cylinder valves
   c. Pressure relief valves
   d. Test limits
3. Effects of heat on closed cylinders
   a. Increase in pressure
   b. Thermal damage
   c. Container failure
4. Effects of pressure on closed cylinders
   a. Expansion of cylinder
   b. Pressure relief valves
   c. Container failure
5. Boiling liquid expanding vapor explosion (BLEVE) signs
   a. Pinging sound of pressure-stretched metal
   b. Discoloration of metal shell
   c. Bulge or bubble in metal shell
   d. Activation of pressure relief valve
   e. Failure of pressure relief valve
   f. Increase in intensity of pressure relief valve (torch)
6. BLEVE effects
   a. Container failure
   b. Violent explosion with fragmentation
   c. Rapid expansion of gases
   d. Huge fireball
   e. Radiant heat
   f. Flying container fragments
7. Methods for identifying contents

a. Placards
b. Labels
c. Shipping papers
d. Facility documents

8. How to identify safe havens before approaching flammable gas cylinder fires
    a. Perform scene size-up
        i. Note position and condition of container
        ii. Analyze terrain
        iii. Identify possible safe havens
    b. Do not approach container from the ends
9. Water stream usage for pressurized cylinder fires
    a. Volume of water
        i. Vapor space
        ii. Point of impingement
        iii. 500 gpm minimum
    b. Placement of streams
    c. Manned vs. unmanned fire streams
10. Water stream demands for pressurized cylinder fires
    a. Secured, uninterrupted source
    b. Adequate stream application
11. What to do if the fire is prematurely extinguished
    a. Vapor dispersion
    b. Vapor control (close valve)
    c. Secure or eliminate ignition sources
12. Valve types and their operation
    a. Shut-off valves
    b. Pressure relief valves
13. Alternative actions related to various hazards
    a. Evacuate
    b. Isolate
    c. Allow self-extinguishment
    d. Retreat
14. When to retreat
    a. Failure of relief valve
    b. Significant container damage
    c. Loss of water

PP. Protect evidence of fire cause and origin

1. Methods to assess origin and cause
    a. Legal considerations (Michigan v. Tyler court decision)
    b. Unusual odors
    c. Abnormal behavior of fire when water is applied
    d. Obstacles hindering fire fighting
    e. Incendiary devices
    f. Trailer
    g. Structural alterations

   h. Fire patterns
   i. Heat intensity
   j. Availability of documents
   k. Fire detection and protection systems
   l. Intrusion alarms
   m. Location of fire
   n. Personal possessions
   o. Household items
   p. Equipment or inventory
   q. Business records
   r. Time of day
   s. Weather conditions
   t. Vehicles and people on scene
2. Types of evidence
   a. Physical evidence
   b. Trace or transfer evidence
   c. Demonstrative evidence
   d. Direct evidence
   e. Circumstantial evidence
3. Means to protect various types of evidence
   a. Securing the fire scene
   b. Chain of custody
   c. Do not gather or handle evidence
   d. Avoid trampling over evidence
   e. Avoid excess use of water
   f. Protect human footprints and tire marks
   g. Protect partially burned papers found in a furnace, stove or fireplace
   h. Leave charred documents found in containers
4. Role and relationship of Fire Fighter II to the fire investigation
   a. The importance of writing a chronological account of important circumstances personally observed
   b. Identify the importance of reporting hearsay to the investigator
   c. Identify the importance of performing salvage and overhaul carefully
5. Criminal investigators
   a. Fire marshal
   b. Arson investigator
   c. Fire investigator
   d. Police
6. Insurance investigators in fire investigations
   a. Insurance investigator
   b. Private investigator
7. Effects and problems associated with removing property or evidence from the scene
   a. Legal considerations (Michigan v. Tyler court decision)
   b. Chain of custody

c. Documentation/photographs

QQ. Rescue Operations

RR. Extricate a victim entrapped in a motor vehicle as part of a team

1. The fire department's role at a vehicle accident
   a. Response
   b. Arrival and size-up
   c. Stabilization of the scene
   d. Gaining access and disentangling victims
   e. Removing and treating the victim
2. Points of strength in auto body construction
   a. Vehicle door and door posts
   b. Vehicle roof
   c. Steering wheel
   d. Vehicle floor
   e. Vehicle pedals
   f. Vehicle seats
   g. Reinforced dashboard
3. Points of weakness in auto body construction
   a. Vehicle windshield and windows
   b. Dashboard
4. Dangers associated with vehicle components and systems
   a. Vehicle stabilization
   b. Airbag systems (SRS and SIPS)
   c. Roll over protection systems (ROPS)
   d. Hybrid electrical systems
   e. Fuels
5. Uses and limitations of hand extrication equipment
   a. Hydraulic devices
      i. Upright
      ii. Upside down
      iii. On its side
      iv. On an inclined surface
   b. Pneumatic devices
   c. Block and tackle
   d. Cribbing and shoring materials
   e. Ratchet device
6. Uses and limitations of power extrication equipment
   a. Hydraulic extrication spreaders
   b. Hydraulic extrication shears
   c. Hydraulic extrication ram
7. Safety procedures when using various types of extrication equipment
   a. PPE
   b. Flammable hazards
   c. Electrical hazards
   d. Pinch hazards

e. Crush hazards
f. Vehicle safety device deployment hazards
g. Proper tool use

SS. Assist rescue operation teams

1. The fire fighter's role at a technical rescue operation
   a. Safety
   b. Receive direction from technical rescue personnel
   c. Work as a team
   d. Basic components of rescue operations
      i. Preparation
      ii. Response
      iii. Arrival and size-up
      iv. Stabilization
      v. Access
      vi. Disentanglement
      vii. Removal
      viii. Transport
      ix. Security of the scene and preparation for next call
      x. Post incident analysis
2. The hazards associated with technical rescue operations
   a. Machinery
   b. Confined space
   c. Rope rescue (vertical rescue)
   d. Trench
   e. Structural collapse
   f. Water and ice
   g. Energized electrical line
   h. Elevator and escalator emergencies
   i. Wilderness
   j. Mine, tunnel and cave
   k. Industrial/hazardous materials
3. Types and uses of rescue tools
   a. Machinery (e.g., hydraulic spreaders/cutters/rams)
   b. Confined space (e.g., taglines, harnesses, supplied air respirators, air monitoring devices, tripod, winch)
   c. Rope rescue (vertical rescue, e.g., rope, carabiners, anchor plates, pulleys)
   d. Trench (e.g., shoring, cribbing, stringers, rakers, air monitoring devices)
   e. Structural collapse (e.g., jacks, shoring, cribbing)
   f. Water and ice (e.g., PFDs, throw bag of rope)
   g. Elevator and escalator emergencies (e.g., elevator keys)
   h. Wilderness (e.g., compass, GPS, stokes basket)
   i. Mine, tunnel and cave (e.g., shoring, ropes, flashlights)
4. Rescue practices and goals
   a. Machinery
   b. Confined space

c. Rope rescue (vertical rescue)
d. Trench
e. Structural collapse
f. Water and ice
g. Elevator and escalator emergencies
h. Wilderness
i. Mine, tunnel and cave

TT. Fire and Life Safety Initiatives, Preparedness, and Maintenance

UU. Perform a fire safety survey in an occupied structure

1. Organizational policy and procedures
   a. Scheduling considerations
      i. FD personnel
      ii. Structure occupant
   b. Approach and introduction
   c. Conducting the survey
   d. Formulate recommendations
2. Common causes of fire and their prevention
   a. Housekeeping practices
   b. Smoking
   c. Open burning
   d. Electrical sources of ignition
   e. Common hazards by location
      i. Kitchen
      ii. Living area
      iii. Bedroom
      iv. Garage/storage
      v. Bathroom
      vi. Laundry
      vii. Attics and basements
      viii. Exterior
   f. Special hazards
3. The importance of a fire safety survey and public fire education programs to fire department public relations and the community
   a. Enhances community life safety
   b. Prevents loss
   c. Promotes community support
4. Referral procedures – AHJ

VV. Present fire safety information to station visitors or small groups

1. Educational programs
   a. Learn Not to Burn
   b. EDITH (Exit Drill In The Home)
   c. Installation and maintenance of smoke alarms
   d. Change your clock – change your battery
   e. Stop, drop and roll
   f. Fire safety for babysitters

g. Fire safety for seniors
h. Fire safety for college students
i. Wildland prevention program

2. How to use informational materials
   a. Pamphlets
   b. Coloring books
   c. Public service announcements (PSAs)
   d. Public presentations
3. Basic presentation skills
   a. Age and audience appropriateness
   b. Knowledge of subject – preparation
   c. Use of props
   d. Professional attire
   e. Positive attitude
4. Departmental standard operating procedures (SOPs) for giving fire station tours – AHJ

WW. Prepare a pre-incident survey

1. The sources of water for fire protection
   a. Pressurized
   b. Static
2. The fundamentals of fire suppression and detection systems
   a. Automatic sprinkler systems
      i. Types
         (a) Wet pipe
         (b) Dry pipe
         (c) Pre-action
         (d) Deluge
         (e) Residential
      ii. Sprinkler heads
         (a) Deflector style
            (i) Upright
            (ii) Pendant
            (iii) Side wall
            (iv) Deluge
            (v) Special
         (b) Activating devices
            (i) Fusible link
            (ii) Frangible bulb
            (iii) Chemical pellet
      iii. Control valves
         (a) Outside screw and yoke (OS&Y)
         (b) Butterfly valve
         (c) Wall post indicator valve (WPIV)
         (d) Post indicator valve (PIV)

(e) Post indicator valve assembly (PIVA)

iv. Valves
(a) Check valve
(b) Main drain
(c) Alarm test
(d) Inspector test

v. Fire department connection (FDC)
(a) Two 2½" inlets
(b) One large diameter hose (LDH)

b. Standpipe systems
i. Class I
(a) Fire department use only
(b) 2½" connection with a valve

ii. Class II
(a) Occupant use
(b) 1½" single jacket hose preconnected

iii. Class III
(a) Occupant or fire department use
(b) 2½" connection with 1½" reducer and hose preconnected

c. Specialized extinguishment systems
i. Dry chemical systems
ii. Wet chemical systems
iii. Foam systems
iv. Clean agent systems
v. Carbon dioxide systems

d. Fire department notification systems
i. Local alarm systems
ii. Remote station systems
iii. Auxiliary systems
iv. Proprietary systems
v. Central station systems

e. Fire alarm system components
i. Initiating devices
(a) Heat detectors
(i) Fixed-temperature detectors
(ii) Rate-of-rise detectors
(iii) Combination rate-of-rise fixed temperature detectors
(b) Smoke detectors
(i) Ionization
(ii) Photoelectric
(c) Flame detectors
(i) Ultraviolet (UV)
(ii) Infrared (IR)
(iii) Fire – gas detectors
(iv) Manual pull station

ii. Indicating devices
(a) Audible
(i) Bells
(ii) Horns
(iii) Sirens
(iv) Recorded announcement
(b) Visual
(i) Strobes
(ii) Rotating beacons
(iii) Fire alarm control panel (FACP)

3. Common symbols used in diagramming construction features, utilities, hazards, and fire protection systems
   a. Construction features
      i. Fire escape
      ii. Skylight
      iii. Stairs
      iv. Elevator
      v. Fire wall
   b. Utilities
      i. Gas
      ii. Electric
      iii. Water
   c. Fire protection
      i. Hydrant
      ii. Sprinkler riser
      iii. Fire department connection
      iv. Automatic sprinklers
      v. Not sprinklered
      vi. Standpipe
      vii. Fire alarm
      viii. Fire pump
   d. Hazards
      i. Gasoline tank
      ii. Steam boiler
         (a) Vertical
         (b) Horizontal
4. Departmental requirements for a pre-incident survey
   a. Tactical information – considerations/planning for:
      i. Water supply
      ii. Utilities
      iii. Search and rescue
      iv. Forcible entry
      v. Ladder placement
      vi. Ventilation

   b. Occupancy type
      i. High rise
      ii. Assembly
      iii. Health care facilities
      iv. Detention and correctional facilities
      v. Residential occupancies
   c. Locations requiring special considerations
      i. Gas or liquid fuel pipelines
      ii. Electrical transmission lines
      iii. Ships and waterways
      iv. Subways
      v. Railroads
      vi. Airports
      vii. Industrial facilities
      viii. Hazardous materials bulk storage locations
5. Departmental requirements for form completion – AHJ
6. The importance of accurate diagrams
   a. Accurate diagrams promote better decision making
   b. Enhances civilian and firefighter safety
   c. Search and rescue operations are conducted efficiently

XX. Maintain power plants, power tools, and lighting equipment

1. Types of cleaning methods
   a. Metal parts
   b. Wood parts
   c. Fiberglass/synthetic parts
   d. Cutting edges
   e. Power tools
   f. Electrical/electronic devices
2. Correct use of cleaning solvents
   a. Associated hazards
   b. Application
   c. Safety considerations
3. Manufacturer and departmental guidelines for maintaining equipment and its documentation
   a. Per the manufacturer's recommendations
   b. Inspection frequency and procedures per AHJ
4. Problem-reporting practices
   a. Tag problem item
   b. Remove from service
   c. Report problem per AHJ

YY. Perform an annual service test on fire hose

1. Procedures for safety conducting hose service testing
   a. Routine inspection
      i. Lay clean hose out on flat surface
      ii. Inspect hose for defects

iii. Mark defects as found
iv. Tag hose with description of defects found

b. Annual service test
i. Don protective gear – wear helmet and gloves at a
ii. minimum
iii. Connect up to 300 feet maximum of hose to a discharge outlet
iv. Attach a nozzle or valve to the end of the hose
v. Fill hose to 50 psi, remove air, twists and kinks in hose
vi. Mark hose at the base of the coupling
vii. Check couplings and hose for leaks
viii. If couplings leak at the gasket, replace the gasket
ix. After gaskets are replaced or if no leaks are present, increase pressure to manufacturer's recommended pressure per NFPA 1962 and maintain for 5 minutes
x. Monitor hose and couplings for leaks or failure
xi. Reduce pressure, depressurize hose, and drain
xii. Inspect marks at couplings for separation or slippage
xiii. Tag failures or defects
xiv. Distinctly mark hose that passed
xv. Log test results for departmental record

c. Safety notes:
i. Always wear a helmet and gloves while working around pressurized hose
ii. Never walk over, straddle, or stand over hose being pressure tested

2. Indicators that dictate any hose be removed from service
a. Mechanical damage
i. Bent or damaged couplings
ii. Hose separating from couplings
iii. Cuts or holes
iv. Crushed suction hose

b. Chemical damage
i. Chemical degradation
ii. Contamination

c. Heat damage
i. Burn holes
ii. Delamination

d. Mildew/rot
e. Service test pressure failure (i.e. burst hose)

3. Recording procedures for hose test results
a. Hose records should contain:
i. Hose size/length, type, and diameter
ii. Date of manufacture
iii. Date of purchase
iv. Testing dates
v. Any repairs made

b. Other information per AHJ

Grade Scale

90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
0 – 59	F

Course Evaluation

Live Fire Evaluations	5%
Exams	60%
Research Paper	10%
Physical Training	5%
Final Exam	20%
Final Course Grade	100%

Course Policies

1. No food, drinks, or use of tobacco products in class.
2. Computers, telephones, headphones, and any other electronic devices must be turned off while in class or used only with permission of the instructor.
3. Do not bring children to class.
4. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an 'F' in the course.
5. Additional class policies as defined by the individual course instructor.

Technical Requirements **(for courses using Blackboard)**

The latest technical requirements, including hardware, compatible browsers, operating systems, software, Java, etc. can be found online at: https://help.blackboard.com/en-us/Learn/9.1_2014_04/Student/015_Browser_Support/015_Browser_Support_Policy A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of the online technology and resources.

Disabilities Statement

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building. You may also visit the online resource at http://www.lit.edu/depts/stuserv/special/defaults.aspx

Student Code of Conduct Statement

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document