

CERTIFICATION CURRICULUM MANUAL

CHAPTER ONE

BASIC FIRE SUPPRESSION

NFPA 1001 2008 edition

Effective June 1, 2010



Texas Commission on Fire Protection
P.O. Box 2286 Austin, Texas 78768-2286 (512) 936-3838

REFERENCE LIST FOR THE BASIC FIRE SUPPRESSION CURRICULUM

Certified Training Facilities approved to teach this curriculum, must have the following reference materials:

Certification Curriculum Manual. Austin, TX: Texas Commission on Fire Protection. Current issue.

Essentials of Fire Fighting (5th ed.) (2007). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association.

Firefighter's Handbook: Essentials of Firefighting and Emergency Response (3rd ed.) (2008). Clifton Park NY: Thomson Delmar Learning.

Fundamentals of Fire Fighter Skills (2nd ed.) (2008). Sudbury, MA: Jones and Bartlett Publishers, Inc.

NFPA 1001: Standard for Fire Fighter Professional Qualifications (2008 ed.). Quincy, MA: NFPA Publications. National Fire Protection Association.

Standards Manual for Fire Protection Personnel. Austin, TX: Texas Commission on Fire Protection. Current issue.

CHAPTER ONE FIRE SUPPRESSION CURRICULUM OUTLINE

INTRODUCTION

Testing committee members met for the first time on August 24, 1989 in response to the charge set forth by the Commission for the development of a written and practical examination. The intent of the exam was to verify practical skills and knowledge necessary for the performance of a basic firefighter within the State of Texas.

Initially, the twenty-one member committee included chiefs, training officers, college instructors and firefighters. After the committee responded to the Commission with its findings, Commissioners presented the committee with the additional charge of evaluating the existing basic firefighter curriculum and formulating changes necessary to implement the testing program. After many meetings filled with professional criticism and introspect, the committee developed competencies and specific learning objectives as the minimum requirement for certification as a basic firefighter in the State of Texas.

An additional goal, set by the Commission and charged to the testing committee, was to ensure the learning objectives in the curriculum met the objectives of NFPA 1001, *Standard for Fire Fighter Professional Qualifications*. This provides a good foundation, which made way for national accreditation by the International Fire Service Accreditation Congress.

Upon a recommendation in December 1991, through action of the Fire Protection Personnel Advisory Committee and the Commission, approximately one-third of the original twenty-one members were asked to maintain an active role on the committee. In January 1994, there were two more members added to the testing committee. The current Curriculum and Testing Committee consists of ten fire service professionals from around the state.

The committee developed the competencies and objectives focusing on the minimum requirements for a basic firefighter in Texas. The amount of questioning and discussion incurred at the meetings, along with the mixture of diverse fire service professionals representing areas within the state, serve as a means for validating the competencies and objectives. It is in the spirit of the fire service of Texas that these individuals contributed to the development of a workable curriculum.

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**CHAPTER ONE
BASIC FIRE SUPPRESSION
CURRICULUM OUTLINES**

BASIC FIRE SUPPRESSION		
SECTIONS	SUBJECT	RECOMMENDED HOURS
101-5.1; 102-6.1	General	60
101-5.2; 102-6.2	Fire Department Communications	12
101-5.3; 102-6.3	Fireground Operations	306
102-6.4	Rescue Operations	32
101-5.5; 102-6.5	Prevention, Preparedness, and Maintenance	56
601; 602; 603-6.2; 603-6.6	Hazardous Materials Awareness, Operations, Mission Specific as identified in Chapter 6	56
	TOTAL RECOMMENDED HOURS	522*

*TOTAL RECOMMENDED HOURS include Fire Fighter I, Fire Fighter II, Awareness and Operations

FIREFIGHTER I CURRICULUM OUTLINE		
SECTION	SUBJECT	RECOMMENDED HOURS
101-5.1	General	40
101-5.2	Fire Department Communications	4
101-5.3	Fireground Operations	222
101-5.4	(Reserved for future use)	
101-5.5	Prevention, Preparedness, and Maintenance	28
	TOTAL RECOMMENDED HOURS	294

FIREFIGHTER II CURRICULUM OUTLINE		
SECTION	SUBJECT	RECOMMENDED HOURS
102-6.1	General	20
102-6.2	Fire Department Communications	8
102-6.3	Fireground Operations	84
102-6.4	Rescue Operations	32
102-6.5	Prevention, Preparedness, and Maintenance	28
	TOTAL RECOMMENDED HOURS	172

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**CHAPTER SIX
HAZARDOUS MATERIALS AWARENESS AND OPERATIONS
CURRICULUM OUTLINES**

HAZARDOUS MATERIALS AWARENESS CURRICULUM OUTLINE		
SECTIONS	SUBJECT	RECOMMENDED HOURS
601-4.1	General	1
601-4.2	Analyzing the Incident	5
601-4.3	Planning the Response – Reserved – None required at this level	
601-4.4	Implementing the Planned Response	2
601-4.5	Evaluating Progress – Reserved – None required at this level	
601-4.6	Terminating the Incident – Reserved – None required at this level	
	TOTAL RECOMMENDED HOURS	8

HAZARDOUS MATERIALS OPERATIONS CURRICULUM OUTLINE		
SECTIONS	SUBJECT	RECOMMENDED HOURS
602-5.1	General	1
602-5.2	Analyzing the Incident	14
602-5.3	Planning the Response	9
602-5.4	Implementing the Planned Response	6
602-5.5	Evaluating Progress	2
602-5.6	Terminating the Incident – Reserved – None required at this level	
603-6.2; 603-6.6	Mission Specific – PPE and Product Control	16
	TOTAL RECOMMENDED HOURS	48

The recommended hours include time for skills evaluation and are based on 12 students. Hours needed depends on the actual number of students.

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SECTION 101

BASIC FIRE SUPPRESSION – FIREFIGHTER I

A Basic Structure Fire Protection Personnel is a Fire Fighter who has met all the job performance requirements (JPR) of Fire Fighter I and Fire Fighter II as defined in NFPA 1001 *Standard for Fire Fighter Professional Qualifications*. In order to satisfactorily meet these requirements, the Fire Fighter trainee must meet all the job performance requirements and demonstrate mastery of all the knowledge, skills, and ability requirements of the following components of the Texas Commission on Fire Protection Curriculum Manual:

- Chapter 1, Section 101 - 5 Basic Fire Suppression - Firefighter I
- Chapter 1, Section 102 - 6 Basic Fire Suppression - Firefighter II
- Chapter 6, Section 601 - 4 Hazardous Materials Awareness
- Chapter 6, Section 602 - 5 Hazardous Materials Operations
- Chapter 6, Section 603 - 6.2 Hazardous Materials Operations - Mission Specific Competencies - Using Personal Protective Equipment
- Chapter 6, Section 603 - 6.6 Hazardous Materials Operations - Mission Specific Competencies - Product Control

101-5.1 **General**

101-5.1.1 **General Knowledge Requirements**

The organization of the fire department; the role of the Fire Fighter I in the organization; the mission of fire service; the fire department's standard operating procedures (SOPs) and rules and regulations as they apply to the Fire Fighter I; the role of other agencies as they relate to the fire department; aspects of the fire department's member assistance program; the importance of physical fitness and a healthy lifestyle to the performance of the duties of a fire fighter; the critical aspects of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, as they apply to the Fire Fighter I; knot types and usage; the difference between life safety and utility rope; reasons for placing rope out of service; the types of knots to use for given tools, ropes, or situations; hoisting methods for tools and equipment; and using rope to support response activities.

1. Organization of the fire department
 - a. History
 - b. Organizational structure
2. The role of the Fire Fighter I

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3. Mission of the fire service
 - a. Emergency activities
 - b. Non-emergency activities

4. Role of other agencies as they relate to the fire department
 - a. Private entities
 - b. Local
 - c. Regional
 - d. State
 - e. Federal

5. Aspects of the fire department's member assistance program
 - a. Critical Incident Stress Management (CISM)
 - b. Member Assistance Programs (MAP)

6. Importance of physical fitness and a healthy lifestyle to the performance of duties of a fire fighter

7. The critical aspects of NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*

8. 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
 - a) LEL
 - b) UEL
 - vi. Boiling point
 - vii. Oxidation
 - viii. Pyrolysis
 - ix. Reducing agent
 - x. Vaporization
 - xi. Combustion
 - xii. Vapor density
 - xiii. Specific gravity

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- xiv. Thermal layering/heat stratification/thermal balance
9. Fire theory
- a. Key terms
 - i. Fire triangle
 - ii. Fire tetrahedron
 - b. Describe the relationship of the concentration of oxygen to combustibility and life safety
10. Identify and describe heat energy sources
- a. Chemical heat energy
 - b. Electrical heat energy
 - c. Mechanical heat energy
 - d. Nuclear heat energy
11. 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. Flashover
 - iv. Fully developed/fully involved
 - v. Decay
 - b. Special conditions that occur during a fire's growth
 - i. Flameover/rollover
 - ii. Thermal layering
 - iii. Backdraft
 - c. Methods of heat transfer
 - i. Conduction
 - ii. Convection
 - iii. Radiation
 - iv. Direct flame impingement
12. Physical states of matter in which fuels are commonly found
- a. Define and describe three types of fuel
 - i. Solid fuel
 - ii. Liquid fuel
 - iii. Gaseous fuel
 - b. Define and describe the chemical and physical properties of fuels
 - i. Specific gravity
 - ii. Vapor density

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- iii. The theory of surface to mass ratio as it relates to the combustion process
13. Identify and describe chemical by-products of combustion
- a. Poisonous gases and irritants common in smoke
 - i. Carbon dioxide
 - ii. Carbon monoxide
 - iii. Hydrogen cyanide
14. Identify and describe the units of heat measurement
- a. British thermal unit (BTU)
 - b. Fahrenheit (°F)
 - c. Celsius (°C)
 - d. Calorie (C)
15. Identify and describe the fire extinguishment theory
- a. Describe the fire extinguishment theory
 - b. Identify and describe four methods of extinguishment
 - i. Temperature reduction
 - ii. Fuel removal
 - iii. Oxygen exclusion
 - iv. Inhibiting chemical reaction
16. Identify and describe the characteristic of water as it relates to its fire extinguishing potential
- a. Identify and describe the physical characteristics of water
 - b. Identify and describe the Law of Specific Heat
 - c. Identify and describe the Law of Latent Heat
 - d. Identify and describe the advantages and disadvantages of water as an extinguishing agent
 - e. Identify and describe the law of heat flow
17. Ropes and knots
- a. Knot types and use
 - i. Safety knot or overhand knot
 - ii. Half hitch
 - iii. Clove hitch
 - iv. Figure 8
 - v. Figure 8 on a bight
 - vi. Figure 8 with a follow through
 - vii. Bowline
 - viii. Sheet bend or becket bend
 - b. Differentiating between life safety and utility rope
 - i. Natural

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- ii. Synthetic
- c. Reasons for placing rope out of service
 - i. Inspection
 - a) Routine
 - b) After use
 - ii. Storage
 - iii. Maintenance
- d. Types of knots used for given tools, ropes or situations
 - i. Hoisting an axe
 - ii. Pike pole
 - iii. Hose
 - iv. Ladder
 - v. Power tools or fans
- e. Hoisting methods for tools and equipment
- f. Using rope to support response activities
 - i. Utility
 - ii. Life safety/rescue

101-5.1.2 General Skill Requirements

The ability to don personal protective clothing within 1 minute; doff personal protective clothing and prepare for reuse; hoist tools and equipment using ropes and the correct knot; and locate information in departmental documents and standard or code materials.

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/prepare for re-use
4. Care and maintenance
 - a. Basic inspection
 - b. Advanced inspection
 - c. Record keeping

101-5.2 Fire Department Communications

This duty shall involve initiating responses, receiving telephone calls, and using fire department communications equipment to correctly relay verbal or written information, according to the JPRs in 5.2.1 through 5.2.3.

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101-5.2.1 Initiate the response to a reported emergency, given the report of an emergency, fire department SOPs, and communications equipment, so that all necessary information is obtained, communications equipment is operated correctly, and the information is relayed promptly and accurately to the dispatch center.

Requisite Knowledge: Procedures for reporting an emergency, departmental SOPs for taking and receiving alarms, radio codes or procedures, and information needs of dispatch center.

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 – Mayday
4. Information needs of dispatch center
 - a. Nature of emergency
 - b. Location of emergency
 - c. Caller information
 - d. Responding units
 - e. Call back number

Requisite Skills: The ability to operate fire department communications equipment, relay information, and record information.

101-5.2.2 Receive a telephone call, given a fire department phone, so that procedures for answering the phone are used and the caller's information is relayed.

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Requisite Knowledge: Fire department procedures for answering nonemergency telephone calls.

1. Department standard operating procedures (SOPs)
2. Phone etiquette

Requisite Skills: The ability to operate fire station telephone and intercom equipment.

101-5.2.3 Transmit and receive messages via the fire department radio, given a fire department radio and operating procedures, so that the information is accurate, complete, clear, and relayed within the time established by the authority having jurisdiction (AHJ).

Requisite Knowledge: Departmental radio procedures and etiquette for routine traffic, emergency traffic, and emergency evacuation signals.

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

Requisite Skills: The ability to operate radio equipment and discriminate between routine and emergency traffic.

101-5.3 **Fireground Operations**

This duty shall involve performing activities necessary to ensure life safety, fire control, and property conservation, according to the JPRs in 5.3.1 through 5.3.19.

101-5.3.1 Use self-contained breathing apparatus (SCBA) during emergency operations, given SCBA and other personal protective equipment, so that the SCBA is correctly donned and activated within 1 minute, the SCBA is correctly worn, controlled breathing techniques are used, emergency procedures are enacted if the SCBA fails, all low-air warnings are recognized, respiratory protection is not intentionally compromised, and hazardous areas are exited prior to air depletion.

Requisite Knowledge: Conditions that require respiratory protection, uses and limitations of SCBA, components of SCBA, donning procedures,

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breathing techniques, indications for and emergency procedures used with SCBA, and physical requirements of the SCBA wearer.

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 and activated in 1-minute time
 - 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

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- 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

Requisite Skills: The ability to control breathing, replace SCBA air cylinders, use SCBA to exit through restricted passages, initiate and complete emergency procedures in the event of SCBA failure or air depletion, and complete donning procedures.

- 101-5.3.2** Respond on apparatus to an emergency scene, given personal protective clothing and other necessary personal protective equipment, so that the apparatus is correctly mounted and dismounted, seat belts are used while the vehicle is in motion, and other personal protective equipment is correctly used.

Requisite Knowledge: Mounting and dismounting procedures for riding fire apparatus, hazards and ways to avoid hazards associated with riding apparatus, prohibited practices, and types of department personal protective equipment and the means for usage.

1. Mounting procedures for riding fire apparatus

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- 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

Requisite Skills: The ability to use each piece of provided safety equipment.

- 101-5.3.3** Establish and operate in work areas at emergency scenes, given protective equipment, traffic and scene control devices, structure fire and roadway emergency scenes, traffic hazards and downed electrical wires, an assignment, and SOPs, so that procedures are followed, protective equipment is worn, protected work areas are established as directed using traffic and scene control devices, and the fire fighter performs assigned tasks only in established, protected work areas.

Requisite Knowledge: Potential hazards involved in operating on emergency scenes including vehicle traffic, utilities, and environmental conditions; proper procedures for dismounting apparatus in traffic; procedures for safe operation at emergency scenes; and the protective equipment available for members' safety on emergency scenes and work zone designations.

1. Potential hazards involved in operating on emergency scenes
 - a. Vehicle traffic
 - b. Utilities
 - c. Environmental conditions

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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 work zone designations

Requisite Skills: The ability to use personal protective clothing, deploy traffic and scene control devices, dismount apparatus, and operate in the protected work areas as directed.

- 101-5.3.4** Force entry into a structure, given personal protective equipment, tools, and an assignment, so that the tools are used as designed, the barrier is removed, and the opening is in a safe condition and ready for entry.

Requisite Knowledge: Basic construction of typical doors, windows, and walls within the department's community or service area; operation of doors, windows, and locks; and the dangers associated with forcing entry through doors, windows, and walls.

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)

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- 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

Requisite Skills: The ability to transport and operate hand and power tools and to force entry through doors, windows, and walls using assorted methods and tools.

- 101-5.3.5** Exit a hazardous area as a team, given vision-obscured conditions, so that a safe haven is found before exhausting the air supply, others are not endangered, and the team integrity is maintained.

Requisite Knowledge: Personnel accountability systems, communication procedures, emergency evacuation methods, what constitutes a safe haven, elements that create or indicate a hazard, and emergency procedures for loss of air supply.

- 1. Personnel accountability systems

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- 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

Requisite Skills: The ability to operate as a team member in vision-obscured conditions, locate and follow a guideline, conserve air supply, and evaluate areas for hazards and identify a safe haven.

- 101-5.3.6** Set up ground ladders, given single and extension ladders, an assignment, and team members if needed, so that hazards are assessed, the ladder is stable, the angle is correct for climbing, extension ladders are extended to the necessary height with the fly locked, the top is placed against a reliable structural component, and the assignment is accomplished.

Requisite Knowledge: Parts of a ladder, hazards associated with setting up ladders, what constitutes a stable foundation for ladder placement, different angles for various tasks, safety limits to the degree of angulation, and what constitutes a reliable structural component for top placement.

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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

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Requisite Skills: The ability to carry ladders, raise ladders, extend ladders and lock flies, determine that a wall and roof will support the ladder, judge extension ladder height requirements, and place the ladder to avoid obvious hazards.

101-5.3.7 Attack a passenger vehicle fire operating as a member of a team, given personal protective equipment, attack line, and hand tools, so that hazards are avoided, leaking flammable liquids are identified and controlled, protection from flash fires is maintained, all vehicle compartments are overhauled, and the fire is extinguished.

Requisite Knowledge: Principles of fire streams as they relate to fighting automobile fires; precautions to be followed when advancing hose lines toward a automobile; observable results that a fire stream has been properly applied; identifying alternative fuels and the hazards associated with them; dangerous conditions created during an automobile fire; common types of accidents or injuries related to fighting automobile fires and how to avoid them; how to access locked passenger, trunk, and engine compartments; and methods for overhauling an automobile.

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

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- iii. Tailgates
 - iv. Hoods
 - c. Shock absorbers/struts
 - d. Toxic byproducts 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

Requisite Skills: The ability to identify automobile fuel type; assess and control fuel leaks; open, close, and adjust the flow and pattern on nozzles; apply water for maximum effectiveness while maintaining flash fire protection; advance 38 mm (1½ in.) or larger diameter attack lines; and expose hidden fires by opening all automobile compartments.

- 101-5.3.8** Extinguish fires in exterior Class A materials, given fires in stacked or piled and small unattached structures or storage containers that can be fought from the exterior, attack lines, hand tools and master stream devices, and an assignment, so that exposures are protected, the spread of fire is stopped, collapse hazards are avoided, water application is effective, the fire is extinguished, and signs of the origin area(s) and arson are preserved.

Requisite Knowledge: Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires; dangers — such as collapse — associated with stacked and piled materials; various extinguishing agents and their effect on different

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material configurations; tools and methods to use in breaking up various types of materials; the difficulties related to complete extinguishment of stacked and piled materials; water application methods for exposure protection and fire extinguishment; dangers such as exposure to toxic or hazardous materials associated with storage building and container fires; obvious signs of origin and cause; and techniques for the preservation of fire cause evidence.

1. Types of attack lines and water streams appropriate for attacking stacked, piled materials and outdoor fires
 - a. Types of attack lines
 - i. $\frac{3}{4}$ or 1 inch (booster or reel line)
 - ii. $1\frac{1}{2}$ to $1\frac{3}{4}$ inches
 - iii. 2 to $2\frac{1}{2}$ 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

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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

Requisite Skills: The ability to recognize inherent hazards related to the material's configuration, operate handlines or master streams, break up material using hand tools and water streams, evaluate for complete extinguishment, operate hose lines and other water application devices, evaluate and modify water application for maximum penetration, search for and expose hidden fires, assess patterns for origin determination, and evaluate for complete extinguishment.

- 101-5.3.9** Conduct a search and rescue in a structure operating as a member of a team, given an assignment, obscured vision conditions, personal protective equipment, a flashlight, forcible entry tools, hose lines, and ladders when necessary, so that ladders are correctly placed when used, all assigned areas are searched, all victims are located and removed, team integrity is maintained, and team members' safety — including respiratory protection — is not compromised.

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Requisite Knowledge: Use of forcible entry tools during rescue operations, ladder operations for rescue, psychological effects of operating in obscured conditions and ways to manage them, methods to determine if an area is tenable, primary and secondary search techniques, team members' roles and goals, methods to use and indicators of finding victims, victim removal methods (including various carries), and considerations related to respiratory protection.

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. Firefighter 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. Structural stability
 - d. 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
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

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- 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)
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

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- ii. Smoke
- iii. Oxygen deficiency
- iv. Toxic atmospheres

Requisite Skills: The ability to use SCBA to exit through restricted passages, set up and use different types of ladders for various types of rescue operations, rescue a fire fighter with functioning respiratory protection, rescue a fire fighter whose respiratory protection is not functioning, rescue a person who has no respiratory protection, and assess areas to determine tenability.

101-5.3.10 Attack an interior structure fire operating as a member of a team, given an attack line, ladders when needed, personal protective equipment, tools, and an assignment, so that team integrity is maintained, the attack line is deployed for advancement, ladders are correctly placed when used, access is gained into the fire area, effective water application practices are used, the fire is approached correctly, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, the correct body posture is maintained, hazards are recognized and managed, and the fire is brought under control.

Requisite Knowledge: Principles of fire streams; types, design, operation, nozzle pressure effects, and flow capabilities of nozzles; precautions to be followed when advancing hose lines to a fire; observable results that a fire stream has been properly applied; dangerous building conditions created by fire; principles of exposure protection; potential long-term consequences of exposure to products of combustion; physical states of matter in which fuels are found; common types of accidents or injuries and their causes; and the application of each size and type of attack line, the role of the backup team in fire attack situations, attack and control techniques for grade level and above and below grade levels, and exposing hidden fires.

- 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

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- 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

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- 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
- 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

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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. Backdraft
 - d. Smoke explosion
 - e. Imminent building collapse
 - f. Fire behind, below, or above attack team
 - g. Kinks or obstructions to the hose line
 - h. Holes, weak stairs, or other fall hazards
 - i. Suspended loads on fire-weakened supports
 - j. Hazardous or highly flammable commodities likely to spill
 - k. 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

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- b. Cardiac 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
 - i. Sprains and strains
 - ii. Crushing injuries
 - iii. Cuts
 - iv. Overexertion
 - v. Exposure to heat or products of combustion
 - b. Common activities
 - i. During the response
 - ii. During fire attack
 - iii. Overhaul/continued scene operations
 - iv. Returning to service
 - v. Station 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. 1 ½"-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

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- i. Multi-story structures
- ii. Low-rise
- iii. Mid-rise
- iv. High-rise
- c. Below grade level
 - i. Basements
 - ii. Vaults

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. Basement
 - v. Other

Requisite Skills: The ability to prevent water hammers when shutting down nozzles; open, close, and adjust nozzle flow and patterns; apply water using direct, indirect, and combination attacks; advance charged and uncharged 38 mm (1½ in.) diameter or larger hose lines up ladders and up and down interior and exterior stairways; extend hose lines; replace burst hose sections; operate charged hose lines of 38 mm (1½ in.) diameter or larger while secured to a ground ladder; couple and uncouple various handline connections; carry hose; attack fires at grade level and above and below grade levels; and locate and suppress interior wall and subfloor fires.

- 101-5.3.11** Perform horizontal ventilation on a structure operating as part of a team, given an assignment, personal protective equipment, ventilation tools, equipment, and ladders, so that the ventilation openings are free of obstructions, tools are used as designed, ladders are correctly placed, ventilation devices are correctly placed, and the structure is cleared of smoke.

Requisite Knowledge: The principles, advantages, limitations, and effects of horizontal, mechanical, and hydraulic ventilation; safety considerations when venting a structure; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.

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1. Principles, advantages, limitations & 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. Predicting fire travel and growth
3. Fire behavior in a structure
 - a. Products of combustion
 - b. Behavior of heat, smoke and fire gases

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- 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.

Requisite Skills: The ability to transport and operate ventilation tools and equipment and ladders, and to use safe procedures for breaking window and door glass and removing obstructions.

- 101-5.3.12** Perform vertical ventilation on a structure as part of a team, given an assignment, personal protective equipment, ground and roof ladders, and tools, so that ladders are positioned for ventilation, a specified opening is created, all ventilation barriers are removed, structural integrity is not compromised, products of combustion are released from the structure, and the team retreats from the area when ventilation is accomplished.

Requisite Knowledge: The methods of heat transfer; the principles of thermal layering within a structure on fire; the techniques and safety precautions for venting flat roofs, pitched roofs, and basements; basic indicators of potential collapse or roof failure; the effects of construction type and elapsed time under fire conditions on structural integrity; and the advantages and disadvantages of vertical and trench/strip ventilation.

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

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3. 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

4. Techniques and safety precautions for venting pitched roofs
 - a. Styles of roofs
 - i. Hip
 - ii. Gable
 - iii. Mansard
 - iv. Shed
 - v. Butterfly
 - vi. Gambrel
 - 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

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5. 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

6. 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

7. Effects of construction type
 - a. Structural integrity
 - b. Fire spread

8. Elapsed time under fire conditions on structural integrity

9. Vertical ventilation
 - a. Advantages
 - b. Disadvantages

10. Trench/strip ventilation
 - a. Advantages
 - b. Disadvantages

Requisite Skills: The ability to transport and operate ventilation tools and equipment; hoist ventilation tools to a roof; cut roofing and flooring materials to vent flat roofs, pitched roofs, and basements; sound a roof for integrity; clear an opening with hand tools; select, carry, deploy, and secure ground ladders for ventilation activities; deploy roof ladders on

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pitched roofs while secured to a ground ladder; and carry ventilation-related tools and equipment while ascending and descending ladders.

- 101-5.3.13** Overhaul a fire scene, given personal protective equipment, attack line, hand tools, a flashlight, and an assignment, so that structural integrity is not compromised, all hidden fires are discovered, fire cause evidence is preserved, and the fire is extinguished.

Requisite Knowledge: Types of fire attack lines and water application devices most effective for overhaul, water application methods for extinguishment that limit water damage, types of tools and methods used to expose hidden fire, dangers associated with overhaul, obvious signs of area of origin or signs of arson, and reasons for protection of 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

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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

Requisite Skills: The ability to deploy and operate an attack line; remove flooring, ceiling, and wall components to expose void spaces without compromising structural integrity; apply water for maximum effectiveness; expose and extinguish hidden fires in walls, ceilings, and subfloor spaces; recognize and preserve obvious signs of area of origin and arson; and evaluate for complete extinguishment.

- 101-5.3.14** Conserve property as a member of a team, given salvage tools and equipment and an assignment, so that the building and its contents are protected from further damage.

Requisite Knowledge: The purpose of property conservation and its value to the public, methods used to protect property, types of and uses for salvage covers, operations at properties protected with automatic sprinklers, how to stop the flow of water from an automatic sprinkler head, identification of the main control valve on an automatic sprinkler system, and forcible entry issues related to salvage.

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
 - i. Canvas
 - ii. Synthetic
 - a) Vinyl
 - b) Plastic
 - b. Uses
 - i. Cover property
 - ii. Construct basins, chutes and catchalls
 - iii. Floor runners

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- 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

Requisite Skills: The ability to cluster furniture; deploy covering materials; roll and fold salvage covers for reuse; construct water chutes and catch-alls; remove water; cover building openings, including doors, windows, floor openings, and roof openings; separate, remove, and relocate charred material to a safe location while protecting the area of origin for cause determination; stop the flow of water from a sprinkler with sprinkler wedges or stoppers; and operate a main control valve on an automatic sprinkler system.

- 101-5.3.15** Connect a fire department pumper to a water supply as a member of a team, given supply or intake hose, hose tools, and a fire hydrant or static water source, so that connections are tight and water flow is unobstructed.

Requisite Knowledge: Loading and off-loading procedures for mobile water supply apparatus; fire hydrant operation; and suitable static water supply sources, procedures, and protocol for connecting to various water sources.

- 1. Loading and off-loading procedures for mobile water supply apparatus (AHJ)
 - a. Portable water tanks
 - b. Drafting and siphoning appliances

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- 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

Requisite Skills: The ability to hand lay a supply hose, connect and place hard suction hose for drafting operations, deploy portable water tanks as well as the equipment necessary to transfer water between and draft from them, make hydrant-to-pumper hose connections for forward and reverse lays, connect supply hose to a hydrant, and fully open and close the hydrant.

- 101-5.3.16** Extinguish incipient Class A, Class B, and Class C fires, given a selection of portable fire extinguishers, so that the correct extinguisher is chosen, the fire is completely extinguished, and correct extinguisher-handling techniques are followed.

Requisite Knowledge: The classifications of fire; the types of, rating systems for, and risks associated with each class of fire; and the operating methods of and limitations of portable extinguishers.

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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

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b. Size of extinguisher for fire

Requisite Skills: The ability to operate portable fire extinguishers, approach fire with portable fire extinguishers, select an appropriate extinguisher based on the size and type of fire, and safely carry portable fire extinguishers.

101-5.3.17 Illuminate the emergency scene, given fire service electrical equipment and an assignment, so that designated areas are illuminated and all equipment is operated within the manufacturer’s listed safety precautions.

Requisite Knowledge: Safety principles and practices, power supply capacity and limitations, and light deployment methods.

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 Interrupters (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

Requisite Skills: The ability to operate department power supply and lighting equipment, deploy cords and connectors, reset ground-fault interrupter (GFI) devices, and locate lights for best effect.

101-5.3.18 Turn off building utilities, given tools and an assignment, so that the assignment is safely completed.

Requisite Knowledge: Properties, principles, and safety concerns for electricity, gas, and water systems; utility disconnect methods and associated dangers; and use of required safety equipment.

1. Electrical systems

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- 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)

Requisite Skills: The ability to identify utility control devices, operate control valves or switches, and assess for related hazards.

- 101-5.3.19** Combat a ground cover fire operating as a member of a team, given protective clothing, SCBA if needed, hose lines, extinguishers or hand tools, and an assignment, so that threats to property are reported, threats to personal safety are recognized, retreat is quickly accomplished when warranted, and the assignment is completed.

Requisite Knowledge: Types of ground cover fires, parts of ground cover fires, methods to contain or suppress, and safety principles and practices.

1. Types of ground cover fires
 - a. Crown fire – aerial fuel
 - b. Surface fire – surface fuel
 - c. Subsurface fire – subsurface fuel

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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

Requisite Skills: The ability to determine exposure threats based on fire spread potential, protect exposures, construct a fire line or extinguish with hand tools, maintain integrity of established fire lines, and suppress ground cover fires using water.

101-5.4 **Rescue Operations**

This duty shall involve no requirements for Fire Fighter I.

101-5.5 **Prevention, Preparedness, and Maintenance**

This duty shall involve performing activities that reduce the loss of life and property due to fire through response readiness, according to the JPRs in 5.5.1 and 5.5.2.

- 101-5.5.1** Clean and check ladders, ventilation equipment, SCBA, ropes, salvage equipment, and hand tools, given cleaning tools, cleaning supplies, and an assignment, so that equipment is clean and maintained according to

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manufacturer's or departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.

Requisite Knowledge: Types of cleaning methods for various tools and equipment, correct use of cleaning solvents, and manufacturer's or departmental guidelines for cleaning equipment and 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
3. Manufacturer's or departmental guidelines for cleaning equipment and tools (AHJ)

Requisite Skills: The ability to select correct tools for various parts and pieces of equipment, follow guidelines, and complete recording and reporting procedures.

- 101-5.5.2** Clean, inspect, and return fire hose to service, given washing equipment, water, detergent, tools, and replacement gaskets, so that damage is noted and corrected, the hose is clean, and the equipment is placed in a ready state for service.

Requisite Knowledge: Departmental procedures for noting a defective hose and removing it from service, cleaning methods, and hose rolls and loads.

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

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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)

Requisite Skills: The ability to clean different types of hose, operate hose washing and drying equipment, mark defective hose, and replace coupling gaskets, roll hose, and reload hose.

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SECTION 102
BASIC FIRE SUPPRESSION – FIREFIGHTER II

A Basic Structure Fire Protection Personnel is a Fire Fighter who has met all the job performance requirements of Fire Fighter I and Fire Fighter II as defined in NFPA 1001 *Standard for Fire Fighter Professional Qualifications*. In order to satisfactorily meet these requirements, the Fire Fighter trainee must meet all the job performance requirements (JPRs) and demonstrate mastery of all the knowledge, skills, and ability requirements of the following components of the Texas Commission on Fire Protection Certification Curriculum Manual:

- Chapter 1, Section 101 - 5 Basic Fire Suppression - Firefighter I
- Chapter 1, Section 102 - 6 Basic Fire Suppression - Firefighter II
- Chapter 6, Section 601 - 4 Hazardous Materials Awareness
- Chapter 6, Section 602 - 5 Hazardous Materials Operations
- Chapter 6, Section 603 - 6.2 Hazardous Materials Operations - Mission Specific Competencies - Using Personal Protective Equipment
- Chapter 6, Section 603 - 6.6 Hazardous Materials Operations - Mission Specific Competencies - Product Control

102-6.1 **General**

102-6.1.1 **General Knowledge Requirements**

Responsibilities of the Fire Fighter II in assuming and transferring command within an incident management system, performing assigned duties in conformance with applicable NFPA and other safety regulations and authority having jurisdiction (AHJ) procedures, and the role of a Fire Fighter II within the organization.

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

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- d. Information
 - e. Operations
 - f. Planning
 - g. Logistics
 - h. 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?
 - iv. Can the emergency be handled with the resources on scene or en route?
 - v. 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

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102-6.1.2 General Skill Requirements

The ability to determine the need for command, organize and coordinate an incident management system until command is transferred, and function within an assigned role in an incident management system.

102-6.2 Fire Department Communications

This duty shall involve performing activities related to initiating and reporting responses, according to the JPRs in 6.2.1 and 6.2.2.

102-6.2.1 Complete a basic incident report, given the report forms, guidelines, and information, so that all pertinent information is recorded, the information is accurate, and the report is complete.

Requisite Knowledge: Content requirements for basic incident reports, the purpose and usefulness of accurate reports, consequences of inaccurate reports, how to obtain necessary information, and required coding procedures.

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 evaluating 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

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6. Required coding procedures
 - a. NFIRS
 - b. TXFIRS

Requisite Skills: The ability to determine necessary codes, proof reports, and operate fire department computers or other equipment necessary to complete reports.

- 102-6.2.2** Communicate the need for team assistance, given fire department communications equipment, SOPs, and a team, so that the supervisor is consistently informed of team needs, departmental SOPs are followed, and the assignment is accomplished safely.

Requisite Knowledge: SOPs for alarm assignments and fire department radio communication procedures. (AHJ)

1. Alarm assignment SOP
2. Fire department radio communication procedures

Requisite Skills: The ability to operate fire department communications equipment.

102-6.3 **Fireground Operations**

This duty shall involve performing activities necessary to ensure life safety, fire control, and property conservation, according to the JPRs in 6.3.1 through 6.3.4.

- 102-6.3.1** Extinguish an ignitable liquid fire, operating as a member of a team, given an assignment, an attack line, personal protective equipment, a foam proportioning device, a nozzle, foam concentrates, and a water supply, so that the correct type of foam concentrate is selected for the given fuel and conditions, a properly proportioned foam stream is applied to the surface of the fuel to create and maintain a foam blanket, fire is extinguished, reignition is prevented, team protection is maintained with a foam stream, and the hazard is faced until retreat to safe haven is reached.

Requisite Knowledge: Methods by which foam prevents or controls a hazard; principles by which foam is generated; causes for poor foam generation and corrective measures; difference between hydrocarbon and polar solvent fuels and the concentrates that work on each; the characteristics, uses, and limitations of fire-fighting foams; the advantages and disadvantages of using fog nozzles versus foam nozzles for foam

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application; foam stream application techniques; hazards associated with foam usage; and methods to reduce or avoid hazards.

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. Venturi 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 educator 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

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- c. Determine application rate (GPM/ft²)
 - 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, 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
 - iv. Poor fuel resistance
 - v. Slow knockdown
 - vi. 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 fog nozzles
 - iii. Compatible with specific dry chemical agents
 - iv. ATC suitable for polar solvent fuel fires
 - v. Quick drain-down may require continued application

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- 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

Requisite Skills: The ability to prepare a foam concentrate supply for use, assemble foam stream components, master various foam application techniques, and approach and retreat from spills as part of a coordinated team.

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102-6.3.2 Coordinate an interior attack line for a team's accomplishment of an assignment in a structure fire, given attack lines, personnel, personal protective equipment, and tools, so that crew integrity is established; attack techniques are selected for the given level of the fire (e.g., attic, grade level, upper levels, or basement); attack techniques are communicated to the attack teams; constant team coordination is maintained; fire growth and development is continuously evaluated; search, rescue, and ventilation requirements are communicated or managed; hazards are reported to the attack teams; and incident command is apprised of changing conditions.

Requisite Knowledge: Selection of the nozzle and hose for fire attack, given different fire situations; selection of adapters and appliances to be used for specific fireground situations; dangerous building conditions created by fire and fire suppression activities; indicators of building collapse; the effects of fire and fire suppression activities on wood, masonry (brick, block, stone), cast iron, steel, reinforced concrete, gypsum wallboard, glass, and plaster on lath; search and rescue and ventilation procedures; indicators of structural instability; suppression approaches and practices for various types of structural fires; and the association between specific tools and special forcible entry needs.

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 ($\frac{3}{4}$ ", 1", 1 $\frac{1}{2}$ ", 1 $\frac{3}{4}$ ", 2") handlines
 - b. Medium diameter (2 $\frac{1}{2}$ ", 3") handlines
 - c. Medium (2 $\frac{1}{2}$ ", 3") or large diameter hose (3 $\frac{1}{2}$ ", 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

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- 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. 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
 - b. 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)

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- 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 Search (VES)
 - vi. Communication during search
 - vii. Search marking systems
8. Ventilation procedures
- a. Types
 - i. Natural
 - ii. Mechanical
 - a) Positive pressure
 - b) Negative pressure
 - c) Hydraulic
 - b. Techniques
 - i. Horizontal
 - ii. Vertical
 - c. Coordinate with fire attack
 - d. 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

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- 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. Defensive
 - c. 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

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- 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

Requisite Skills: The ability to assemble a team, choose attack techniques for various levels of a fire (e.g., attic, grade level, upper levels, or basement), evaluate and forecast a fire’s growth and development, select tools for forcible entry, incorporate search and rescue procedures and ventilation procedures in the completion of the attack team efforts, and determine developing hazardous building or fire conditions.

- 102-6.3.3** Control a flammable gas cylinder fire, operating as a member of a team, given an assignment, a cylinder outside of a structure, an attack line, personal protective equipment, and tools, so that crew integrity is maintained, contents are identified, safe havens are identified prior to advancing, open valves are closed, flames are not extinguished unless the leaking gas is eliminated, the cylinder is cooled, cylinder integrity is evaluated, hazardous conditions are recognized and acted upon, and the cylinder is faced during approach and retreat.

Requisite Knowledge: Characteristics of pressurized flammable gases, elements of a gas cylinder, effects of heat and pressure on closed cylinders, boiling liquid expanding vapor explosion (BLEVE) signs and effects, methods for identifying contents, how to identify safe havens before approaching flammable gas cylinder fires, water stream usage and demands for pressurized cylinder fires, what to do if the fire is prematurely extinguished, valve types and their operation, alternative actions related to various hazards, and when to retreat.

- 1. Characteristics of pressurized flammable gases
 - a. Pressure
 - b. Vapor pressure
 - c. Vapor density

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- 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. Boiling liquid expanding vapor explosion (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

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- 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

Requisite Skills: The ability to execute effective advances and retreats, apply various techniques for water application, assess cylinder integrity and changing cylinder conditions, operate control valves, and choose effective procedures when conditions change.

- 102-6.3.4** Protect evidence of fire cause and origin, given a flashlight and overhaul tools, so that the evidence is noted and protected from further disturbance until investigators can arrive on the scene.

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Requisite Knowledge: Methods to assess origin and cause; types of evidence; means to protect various types of evidence; the role and relationship of Fire Fighter IIs, criminal investigators, and insurance investigators in fire investigations; and the effects and problems associated with removing property or evidence from the scene.

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

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- 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 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

Requisite Skills: The ability to locate the fire's origin area, recognize possible causes, and protect the evidence.

102-6.4 **Rescue Operations**

This duty shall involve performing activities related to accessing and disentangling victims from motor vehicle accidents and helping special rescue teams, according to the JPRs in 6.4.1 and 6.4.2.

- 102-6.4.1** Extricate a victim entrapped in a motor vehicle as part of a team, given stabilization and extrication tools, so that the vehicle is stabilized, the victim is disentangled without further injury, and hazards are managed.

Requisite Knowledge: The fire department's role at a vehicle accident, points of strength and weakness in auto body construction, dangers associated with vehicle components and systems, the uses and limitations

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of hand and power extrication equipment, and safety procedures when using various types of extrication equipment.

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 weaknesses in auto body construction
 - a. Vehicle windshield and windows
 - b. Dashboard

4. Dangers associated with vehicle components and systems
 - a. Vehicle stabilization
 - i. Upright
 - ii. Upside down
 - iii. On its side
 - iv. On an inclined surface
 - 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
 - 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

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- 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

Requisite Skills: The ability to operate hand and power tools used for forcible entry and rescue as designed; use cribbing and shoring material; and choose and apply appropriate techniques for moving or removing vehicle roofs, doors, windshields, windows, steering wheels or columns, and the dashboard.

- 102-6.4.2** Assist rescue operation teams, given standard operating procedures, necessary rescue equipment, and an assignment, so that procedures are followed, rescue items are recognized and retrieved in the time as prescribed by the AHJ, and the assignment is completed.

Requisite Knowledge: The fire fighter's role at a technical rescue operation, the hazards associated with technical rescue operations, types and uses for rescue tools, and rescue practices and goals.

- 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

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- 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
- i. Machinery
 - ii. Confined space
 - iii. Rope rescue (Vertical rescue)
 - iv. Trench
 - v. Structural collapse
 - vi. Water and ice
 - vii. Elevator and escalator emergencies
 - viii. Wilderness
 - ix. Mine, tunnel and cave

Requisite Skills: The ability to identify and retrieve various types of rescue tools, establish public barriers, and assist rescue teams as a member of the team when assigned.

102-6.5 **Prevention, Preparedness, and Maintenance**

This duty shall involve performing activities related to reducing the loss of life and property due to fire through hazard identification, inspection, and response readiness, according to the JPRs in 6.5.1 through 6.5.5.

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- 102-6.5.1** Perform a fire safety survey in a private dwelling, given survey forms and procedures, so that fire and life safety hazards are identified, recommendations for their correction are made to the occupant, and unresolved issues are referred to the proper authority.

Requisite Knowledge: Organizational policy and procedures, common causes of fire and their prevention, the importance of a fire safety survey and public fire education programs to fire department public relations and the community, and referral procedures.

1. Organizational policy and procedures
 - a. Scheduling considerations
 - i. FD personnel
 - ii. Dwelling owner
 - 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

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Requisite Skills: The ability to complete forms, recognize hazards, match findings to preapproved recommendations, and effectively communicate findings to occupants or referrals.

102-6.5.2 Present fire safety information to station visitors or small groups, given prepared materials, so that all information is presented, the information is accurate, and questions are answered or referred.

Requisite Knowledge: Parts of informational materials and how to use them, basic presentation skills, and departmental standard operating procedures for giving fire station tours.

1. Educational programs
 - a. Learn Not to Burn
 - b. EDITH (Exit Drills 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

Requisite Skills: The ability to document presentations and to use prepared materials.

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102-6.5.3 Prepare a preincident survey, given forms, necessary tools, and an assignment, so that all required occupancy information is recorded, items of concern are noted, and accurate sketches or diagrams are prepared.

Requisite Knowledge: The sources of water supply for fire protection; the fundamentals of fire suppression and detection systems; common symbols used in diagramming construction features, utilities, hazards, and fire protection systems; departmental requirements for a preincident survey and form completion; and the importance of accurate diagrams.

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
 - 1) Upright
 - 2) Pendant
 - 3) Side wall
 - 4) Deluge
 - 5) Special
 - b) Activating devices
 - 1) Fusible link
 - 2) Frangible bulb
 - 3) 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

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- v. Fire department connection (FDC)
 - a) Two 2 ½" inlets
 - b) One large diameter hose (LDH)
- b. Standpipe systems
 - i. Class I
 - a) Fire department use only
 - b) 2 ½" connection with a valve
 - ii. Class II
 - c) Occupant use
 - d) 1 ½" single jacket hose preconnected
 - iii. Class III
 - a) Occupant or fire department use
 - b) 2 ½" connection with 1 ½" 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
 - 1) Fixed-temperature detectors
 - 2) Rate-of-rise detectors
 - 3) Combination rate-of-rise fixed temperature detectors
 - b) Smoke detectors
 - 1) Ionization
 - 2) Photoelectric
 - c) Flame detectors
 - 1) Ultraviolet (UV)
 - 2) Infrared (IR)
 - d) Fire – gas detectors
 - e) Manual pull station
 - ii. Indicating devices
 - a) Audible
 - 1) Bells

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- 2) Horns
 - 3) Sirens
 - 4) Recorded announcement
 - b) Visual
 - 1) Strobes
 - 2) Rotating beacons
 - c) 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 preincident 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

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- 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

Requisite Skills: The ability to identify the components of fire suppression and detection systems; sketch the site, buildings, and special features; detect hazards and special considerations to include in the preincident sketch; and complete all related departmental forms.

- 102-6.5.4** Maintain power plants, power tools, and lighting equipment, given tools and manufacturers' instructions, so that equipment is clean and maintained according to manufacturer and departmental guidelines, maintenance is recorded, and equipment is placed in a ready state or reported otherwise.

Requisite Knowledge: Types of cleaning methods, correct use of cleaning solvents, manufacturer and departmental guidelines for maintaining equipment and its documentation, and problem-reporting practices.

1. Types of cleaning methods
 - a. Metal parts
 - b. Wood parts
 - c. Fiberglass/synthetic parts
 - d. Cutting edges
 - e. Power tools

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- 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

Requisite Skills: The ability to select correct tools; follow guidelines; complete recording and reporting procedures; and operate power plants, power tools, and lighting equipment.

- 102-6.5.5** Perform an annual service test on fire hose, given a pump, a marking device, pressure gauges, a timer, record sheets, and related equipment, so that procedures are followed, the condition of the hose is evaluated, any damaged hose is removed from service, and the results are recorded.

Requisite Knowledge: Procedures for safely conducting hose service testing, indicators that dictate any hose be removed from service, and recording procedures for hose test results.

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 minimum
 - ii. Connect up to 300 feet maximum of hose to a discharge outlet
 - iii. Attach a nozzle or valve to the end of the hose
 - iv. Fill hose to 50 psi, remove air, twists and kinks in hose

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- v. Mark hose at the base of the coupling
 - vi. Check couplings and hose for leaks
 - vii. If couplings leak at the gasket, replace the gasket
 - viii. 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
 - ix. Monitor hose and couplings for leaks or failure
 - x. Reduce pressure, depressurize hose, and drain
 - xi. Inspect marks at couplings for separation or slippage
 - xii. Tag failures or defects
 - xiii. Distinctly mark hose that passed
 - xiv. 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

Requisite Skills: The ability to operate hose testing equipment and nozzles and to record results.

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