The Maryland Fire and Rescue Institute of the University of Maryland is the State’s comprehensive training and education system for all emergency services.

The Institute plans, researches, develops, and delivers quality programs to enhance the ability of emergency service providers to protect life, the environment, and property.
Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe the purpose and methods to conduct emergency communications and the requirements and methods for incident reporting.

Fire Fighter II Objectives

• Outline the roles and responsibilities of a Fire Fighter II
• Define emergency traffic.
• Explain how to initiate a mayday call.
• Describe common evacuation signals.
• Explain the importance of an incident report to the entire fire service.
Fire Fighter II Objectives

- Describe how to collect the necessary information for a thorough incident report.
- Describe the resources that list the codes used in incident reports.
- Explain the consequences of an incomplete or inaccurate incident report.

Roles and Responsibilities of the Fire Fighter II

- Prepare reports.
- Communicate the need for assistance.
- Coordinate an interior attack line team.
- Extinguish an ignitable liquid fire.
- Control a flammable gas cylinder fire.

- Protect evidence of fire cause and origin.
- Assess and disentangle victims from motor vehicle collisions.
- Assist special rescue team operations.
- Perform a fire safety survey.
Roles and Responsibilities of the Fire Fighter II

- Present fire safety information.
- Maintain fire equipment.
- Perform annual service tests on fire hose.

Emergency Traffic

- Urgent messages take priority
- Portable radios have a button to transmit emergency signals
- Many departments have evacuation signals
  - After an evacuation, radio airwaves should remain clear.

Records and Reporting

- Complete a report after each incident.
- Reports should include:
  - Where and when the incident occurred
  - Who was involved
  - What happened
  - How the fire started
  - The extent of damage
  - Any injuries or fatalities
Records and Reporting

• Most incident reports are computerized, although some are still paper-based.
• The National Fire Incident Reporting System (NFIRS) is a voluntary reporting system widely used throughout the United States.

Obtaining the Necessary Information

• The property owner and/or occupant is a primary source of information.
• Bystanders or eyewitnesses should also be questioned.
• Serial numbers and model numbers should be noted on the scene.

Required Coding Procedures

• Codes are used to indicate incident type, actions taken, and property use.
• Written guides and/or computer programs provide codes and explanations of codes used in fire reports.
Consequences of Incomplete and Inaccurate Reports

• Reports can become admissible evidence in a court case.
• Incomplete or inaccurate reports may be used to prove that the fire department was negligent.

Summary

• Emergency traffic takes priority over all other communications.
• When transmitting emergency traffic, the telecommunicator generates alert tones.
• A fire fighter's call for help is the most important emergency traffic.
• Incident reports describe where and when the incident occurred, who was involved, and what happened.
Lesson 1-3 ICS (Part 1 of 2)

Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe and operate within the Incident Command System.

Fire Fighter II Objectives

• Describe the characteristics of the Incident Command System (ICS).
• Explain the organization of the ICS.
• Function within an assigned role within the ICS.
Fire Fighter II Objectives

• Organize and coordinate an ICS until command is transferred.
• Transfer command within an ICS.

Introduction

• An ICS should be used for all operations and training.
• The National Incident Management System (NIMS) defines standards and guidelines nationally.
  – Variations exist.
  – Every fire fighter must know local procedures thoroughly.

The History of the ICS

• Pre-1970s
  – Every fire department had its own methods of incident management.
  – An organization often depended on the style of the chief on duty.
  – Such an approach did not work well with other units or mutual aid companies.
The History of the ICS

• The 1970s
  – FIRESCOPE
    • Developed the first standard ICS
  – The Fire-Ground Command System (FGC)
    • Was initially developed for day-to-day department incidents

The History of the ICS

• The 1980s
  – The FIRESCOPE ICS was adopted by all federal and most state wildland firefighting agencies
  – Several federal regulations and consensus standards adopted in the 1980s called for the use of ICS at emergency incidents
• The present
  – The ICS is an amalgamation of the best of ICS and FGC.

Characteristics of the ICS

• The ICS
  – Has recognized jurisdictional authority
  – Is applicable to all risk and hazard situations
  – Is applicable to day-to-day operations
  – Employs
    • Unity of command
    • Span of control
    • Modular organization
Characteristics of the ICS

- The ICS employs
  - Common terms
  - Integrated communications
  - Consolidated incident action plans
  - Designated incident facilities
  - Resource management

Jurisdictional Authority

- Identification of jurisdictional authority
  - At smaller incidents is usually not a problem.
- Unified command
  - Is used when there are overlapping responsibilities
- Single command
- Incident action plan (IAP)

All-Risk/All-Hazard System

- ICS works equally well at all types of incidents.
  - Emergencies
  - Nonemergency events
Everyday Applicability

- ICS can be used for everyday operations.
- Regular use of ICS builds familiarity with procedures and terms.

Unity of Command

- Each person has only one supervisor.
- All orders and assignments come from that supervisor.
- The best qualified person should be assigned at the appropriate level.

Span of Control

- Span of control is the maximum number of subordinates a supervisor can have.
  - In most situations, three to seven is the most one person can manage.
- In the ICS, the span of control should be limited to five.
Modular Organization

- ICS is designed to be flexible and modular.
- Not every component must be used.
- Additional components can be added as needed.

Common Terms

- Terms are common and consistent within and among agencies in the ICS.
- Common terms eliminate confusion.
  - Each word has a single definition.
  - No two words mean the same thing.

Integrated Communications

- Communications are supported up and down the chain of command
- Messages must move efficiently through the system.
Consolidated Incident Action Plans

- Everyone follows one overall plan.
- Plans may be developed by the incident commander alone at small incidents.
- Plans are developed in collaboration with all agencies involved on larger incidents.

Designated Incident Facilities

- Assigned locations
  - Incident command post
  - Rehabilitation sector
  - Casualty collection point
  - Treatment area
  - Base of operations
  - Helispot

Resource Management

- Resource management is the standard system of assigning and tracking resources involved in the incident
- A staging area
  - Is used at large-scale incidents
  - Is located close to the incident where units can be held in reserve
- Personnel are the most vital resource
The ICS Organization

- Positions are staffed as needed.
- The IC position must be filled at every incident.

Command

- The incident commander is ultimately responsible for managing the incident.
- Command is established when the first unit arrives on the scene as is maintained until the last unit leaves the scene.

Unified Command

- Unified command is used when agencies overlap.
- Representatives from each agency cooperate to share command authority.
Incident Command Post

- The Incident Command Post
  - Is the headquarters location for the incident
  - Should be in a nearby, protected location
    - Enables command staff to function without distractions or interruptions

Command Staff

- Safety officer
- Liaison officer
- Public information officer

General Staff Functions

- There are four section chiefs for the major ICS components:
  - Operations
  - Planning
  - Logistics
  - Finance/administration
Operations

• Operations is responsible for all actions that are directly related to controlling the incident
  – Fire suppression
  – Rescue
  – Emergency medical services
• Operations is conducted in accordance with an IAP that outlines strategic objectives and how operations will be conducted

Planning

• Planning
  – Is responsible for the collection, evaluation, and dissemination of information relevant to the incident
  – Is also responsible for developing and updating the IAP

Logistics

• Logistics is responsible for providing supplies, services, facilities, and materials during the incident
Finance/Administration

- Finance/administration
  - Is responsible for accounting and financial aspects of an incident
  - Is responsible for any legal issues that may arise
  - Is not staffed at most incidents

Standard ICS Concepts and Terms

- One of the strengths of the ICS is its use of standard terms.
  - Specific terms apply to various parts of an incident organization.
  - Understanding these basic terms is the first step in understanding the system.

Single Resources and Crews

- A single resource
  - A vehicle and its assigned personnel
- A crew
  - A group of firefighters working without apparatus
Divisions and Groups

- Division
  - Geographic
- Group
  - Functional

Branches

- Branches are a higher level of combined resources working on a particular aspect of the overall emergency
- A branch director can oversee several divisions and/or groups.

Location Designators

- The ICS uses a standard system to identify the different parts of a fire scene
  - Sides
  - Exposures
  - Floors
Task Forces and Strike Teams

- Task forces and strike teams are groups of single resources assigned to work together
  - A task force is a group of up to five single resources of any type

Task Forces and Strike Teams

- A strike team
  - Five units of the same type working on a common task or function
Summary for Part I of ICS

- The History of the ICS
- Characteristics of the ICS
- Unity of Command
- Unified Command
- General Staff
- ICS Concepts and Terms
Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe and operate within the Incident Command System.

Fire Fighter II Objectives

• Describe the characteristics of the Incident Command System (ICS).
• Explain the organization of the ICS.
• Function within an assigned role within the ICS.
Fire Fighter II Objectives

- Organize and coordinate an ICS until command is transferred.
- Transfer command within an ICS.

Implementing ICS

- Modular design allows an organization to expand based on needs.
- Tasks are defined in advance.

Implementing ICS

- The most frequently used components:
  - Divisions
  - Groups
Standard Position Titles

- Standard position titles
  - Clarify roles within the ICS organization
  - Include functional/geographic area, followed by designator.

Table 5-1: Levels of an ICS Organization

<table>
<thead>
<tr>
<th>ICS Level</th>
<th>ICS Function/Location</th>
<th>Position Designator</th>
</tr>
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<tbody>
<tr>
<td>Command</td>
<td>Command and control</td>
<td>Incident Commander</td>
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<tr>
<td>Command staff</td>
<td>Safety, liaison, information</td>
<td>Officer</td>
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<tr>
<td>General staff</td>
<td>Operations, Planning, Logistics,</td>
<td>Section Chief</td>
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<td></td>
<td>Finance/Administration</td>
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<tr>
<td>Branch</td>
<td>Varies (e.g., EMS)</td>
<td>Director</td>
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<tr>
<td>Division/group</td>
<td>Varies (e.g., Division A)</td>
<td>Supervisor</td>
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<tr>
<td>Unit/crew/strike</td>
<td>Varies (e.g., Rehab)</td>
<td>Leader</td>
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<tr>
<td>Team/task force</td>
<td>(Company officer)</td>
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</tbody>
</table>

Working Within the ICS

- Every fire fighter must understand the ICS and his or her role within it.
- There are three basic components.
  - Someone is in command of every incident.
  - You always report to one supervisor.
  - The company officer reports to the incident commander.
Responsibilities of First-Arriving Fire Fighters

- ICS organization is built around the units that take initial action.
- Company officers need to assume command until relieved by a higher-ranking officer.

Establishing Command

- The officer of the first-in unit is in command.
  - This is formally announced on the radio.
- An initial report should be given as well.

Confirmation of Command

- The initial radio report lets everyone know that command has been established.
- An incident identifier should be chosen.
Transfer of Command

• One person relinquishes command.
• A current situation status report is given to the new incident commander.
• Information transfer must be complete and accurate.

Situation Status Report Information

• Tactical priorities
• Action plans
• Hazardous conditions
• Accomplishments
• Assessment of effectiveness
• Current status of resources

Command Transfer Rationale

• Transfer of command is determined by a variety of factors:
  – Complexity of the incident
  – Officer’s level of experience
  – Involvement of multiple agencies
Summary

- ICS provides a standard, professional, and organized approach to managing emergency incidents.
- All emergency operations and training exercises should be run using ICS.
- All functions in the ICS must be addressed at every incident.

Summary

- On smaller incidents, this may only require one person to handle all functions.
- The incident commander has ultimate responsibility to manage the incident.
- All fire fighters must understand the ICS and what their role in an ICS is.
Student Performance Objective

- Given information from handouts, text, and discussion the student will be able to describe how and why to prepare a preincident plan.

Fire Fighter II Objectives

- Describe why and for which types of properties a preincident plan is created.
- List the typical target hazards that may be found in a community.
- Describe how a preincident survey is performed.
- List the information that is gathered during a preincident survey.
Fire Fighter II Objectives

• Describe the information included in any sketches or drawings created during the preincident survey.
• Describe the symbols commonly used in preincident plans.
• Describe how preincident planning for safe and rapid response is performed.

Fire Fighter II Objectives

• Describe the information that needs to be gathered to assist the incident commander (IC) in making a rapid and correct size-up during an emergency incident.
• Explain how to identify built-in fire detection and suppression systems during a preincident survey.

Fire Fighter II Objectives

• Describe the tactical information that is collected during a preincident survey.
• Describe how preincident planning for an efficient search and rescue is performed.
• Describe how preincident planning for rapid forcible entry is performed.
Fire Fighter II Objectives

• Describe how preincident planning for safe ladder placement is performed.
• Describe how preincident planning for effective ventilation is performed.
• List the occupancy considerations to take into account when conducting a preincident survey.

Fire Fighter II Objectives

• List the types of locations that require special considerations in preplanning.

Introduction

• Preincident planning
  – Gives you the tools and knowledge that you need to become a much more effective firefighter:
    • You know the location of hydrants, exits, and hazards
    • Information is at your fingertips
  – Assists with command decisions
The Preincident Plan

• The preincident plan
  – Is developed under the direction of the fire officer
  – Is available to all responding units
  – Helps IC make informed decisions
  – Is used for training

Plan Components

• Items to include:
  – Detailed diagrams
  – Location and nature of any special hazards
  – Detailed information on the characteristics of the building
  – Additional information
Target Hazards

- Increased life safety hazard properties
- Large occupancies and/or unusual risks
- High possibility for conflagration

<table>
<thead>
<tr>
<th>TABLE 23.1 Typical Target Hazard Properties</th>
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Developing a Preincident Plan

- Preincident survey information can be collected and updated automatically.
- Plans can be managed through a network.

Electronic Format Advantages

- Direct access through computers
- Automatic transmission to dispatch terminals
- Easy updates
- Accessibility to everyone
Conducting a Preincident Survey

• Conductor with property owner knowledge.
  – An appointment confirms and clarifies expectations.
  – Team members should dress and act professionally.
  – A property representative should accompany the survey crew.

Conducting a Preincident Survey

• Take a systematic approach
  – Begin with the building exterior.
  – Survey each interior area.
  – Take notes, make sketches.
• Make a return visit if necessary for large properties.

Preincident Planning for Response and Access

• Establish the most efficient routes.
• Confirm street address visibility.
• Note water sources.
• Identify multiple entry access points.
• Indicate access-blocking barriers.
Access to the Exterior

- What roads lead to the building?
- Where are the hydrants and fire department connections?
- Are there security barriers?
- Are there fire lanes?
- Are there obstructions limiting access?

Access to the Exterior

- Is there enough support for the weight of the apparatus?
- Are keys or codes required for entry?
- Are there any natural or topographical barriers limiting access?
- Does landscaping or snow prevent access?

Access to the Interior

- Is the lock box operational and accessible?
- Are key codes required?
- Does the building have security guards?
- Is the key holder available?
- Where is the fire alarm annunciator panel, and is it properly programmed?
Preincident Planning for Scene Size-Up

- Essential information for size-up:
  - Building construction, height, area, use, and occupancy
  - Hazardous materials and other risk factors
  - Location of other structures jeopardized by a fire

Preincident Planning for Scene Size-Up

- Fire protection system information
  - Automatic sprinklers, standpipes, and firewalls
  - Protected and unprotected areas
- Other building features
  - Overhead passages and conveyor systems
  - Common attics and unprotected openings between floors

Preincident Planning for Scene Size-Up

- Information on building construction is also critical for size-up.
Lightweight Construction

- Lightweight construction
  - Uses assemblies of small components
  - Includes trusses and fabricated beams
  - Is used in all buildings

Remodeled Buildings

- The original fire protection may have been removed.
- There may be new hazards.
- Fire fighters should try to conduct surveys during construction or remodeling.
- Unfinished construction is vulnerable to fire.

Building Use

- Use determines the number of occupants and the probable contents.
- Major use groups include public assembly, institutional, commercial, and industrial.
- A building may contain multiple occupancies.
- Occupancy may change over time.
Occupancy Changes

• Building use may change over time.
• Preincident plans should be checked and updated on a regular schedule.
• Occupancy information must be determined during a preincident survey.

Exposures

• Exposures are any other buildings or items that may be jeopardized by an incident (example: outside storage, vehicles)
• The survey to identify potential exposures should consider
  – The size, construction, and fire load of the property
  – The distance to the exposure
  – Ease of ignition

Automatic Sprinkler Systems

• Automatic sprinkler systems are effective if properly designed and maintained
  – Note the system presence and area covered.
  – Note the interior or exterior water control valves.
  – Record the location of nearby water supplies.
  – Note area served by the fire department connection.
Standpipe Systems

- Standpipe systems are installed in high-rise buildings and some low-rise buildings
- Water is supplied to each floor
- Attack lines are connected close to the fire
- Water is delivered by pumper to the fire department connection outside the building

Fire Alarm and Fire Detection Systems

- Fire alarm and fire detection systems
  - Are sometimes connected directly to the fire department
  - Are sometimes monitored by an alarm service
  - Are automatically or manually activated
- An annunciator panel indicates the fire source

Special Fire Extinguishing Systems

- Special fire extinguishing systems
  - Protect where automatic sprinklers not suitable
  - Are required for most commercial kitchens and computer rooms
  - Are common in industrial buildings
  - Identify the system type and areas protected.
- Note the locations of special systems for flammable liquid storage.
Considerations for Water Supply

• Determine amount and identify source.
• Locate closest hydrants.
• Note static water supply sources.
• Outline desired water delivery options.

Considerations for Water Supply

• Private water supply systems may be found in large industrial or commercial complexes.
  – Determine the location, capacity, and power source of a fixed fire pump.
  – Confirm that the system is in good condition.
  – Note whether public, off-site hydrants should be used instead.
Utilities

- Determine all utility emergency shut-offs.
- Include a contact for each utility company.
- List utility hazards.

Preincident Planning for Search and Rescue

- Identify location of occupants needing rescue or assistance.
- List all building entrances and exits.
- Obtain interior floor plan.

Preincident Planning for Forcible Entry

- Identify areas where forcible entry is likely.
- Note tools needed to gain entry.
- Note lock box location.
  - Instructions for obtaining keys
Preincident Planning for Ladder Placement

- Identify best locations for ground ladders or aerial apparatus.
- Note ladder length needed to reach roof or entry points.
- List overhead obstructions.

Preincident Planning for Ventilation

- Consider information that would be useful to the ventilation team, including:
  - Best means of ventilation
  - Operability of existing openings
  - Windows and doors suitable for horizontal ventilation
  - Needed ventilation equipment
  - Building construction elements

High-Rise Buildings

- Identify building construction and special features.
- Note presence and function of all systems
- Determine existence of building emergency plan.
Assembly Occupancies

- Emergency incidents can involve large numbers of people.
- Public assembly venues may be large and complicated with complex emergency management systems.
- Gaining access may be complicated by occupant evacuation.

Healthcare Facilities

- The greatest challenge is protecting nonambulatory patients.
- A defend-in-place philosophy presumes that assistance is needed for patient escape and there is insufficient staff to move patients.
- Horizontal evacuation involves moving patients to safer areas on the same floor.

Detention and Correctional Facilities

- The problems associated with removing inmates from danger while protecting fire fighters must be considered.
- Security practices may affect access to building and occupancy areas.
Residential Occupancies

- Most plans cover multifamily residences.
- General neighborhood surveys are informative.
- Homeowners may request individual fire safety surveys.

Locations Requiring Special Considerations

- Gas or liquid fuel lines
- Electrical lines
- Ships and waterways
- Subways
- Railroad lines

Special Hazards

- Identify hazardous materials or chemical storage.
- Evaluate potential for building collapse.
- Review industrial processes.
- Contact specialists if needed.
Hazardous Materials

- Inventory types, quantities, location, use, and storage.
- List emergency steps for incidents.
- Determine whether special permits are needed.
- Locate current MSDS for inventories.

Common locations include:
- Chemical companies
- Garden centers
- Swimming pool suppliers
- Hardware stores
- Laboratories
- NFPA 704 signage may be required

Summary

- Preincident planning helps departments to make better command decisions.
- Preincident planning obtains information about a building or property and stores it in an accessible area.
- Modern technology has enhanced the ability of fire departments to capture, store, organize, and retrieve preincident plans.
Summary

• The location and nature of any special hazard should be highlighted on the diagram.
• Preincident plans should be prepared for every property posing a high life-safety hazard.
• Preincident information is gathered during a survey.

Summary

• Surveys should be conducted in coordination with the property owner.
• Preincident surveys are conducted in a systematic fashion.
• Fire fighters conducting the preincident survey should prepare sketches.

Summary

• Building layout and access information is important during the response phase.
• The preincident survey must obtain essential building information.
• There are several steps to follow when conducting a preincident survey.
Summary

• Tactical information should be gathered during the preincident survey.
• The preincident survey should identify all entrances and exits to a building.
• The preincident survey should identify any exterior and interior access issues.
• Preincident surveys should include where to safely place ladders.

Summary

• The preincident survey should identify the best locations for ventilation.
• There are several building locations that involve unique considerations.
• Preincident planning should anticipate types of incidents that could occur at specific locations.
Given information from discussion, handouts, and reading materials, describe building construction as it applies to the fire service.

Introduction

- Building construction affects how fires grow and spread.
  - Fire fighters need to understand how each type of building construction reacts when exposed to the effects of heat.
  - This helps determine when it is safe to enter a burning building and when it is necessary to evacuate.
Occupancy

• The term "occupancy" refers to how a building is used
  – Classifications indicate who is likely to be inside, how many people are inside, and what they are likely to be doing.

Contents

• Contents must be considered when responding to a building.
  – Contents vary widely but are usually related to occupancy.
  – Similar occupancies can pose different levels of risk.

Types of Construction Materials

• The properties of building materials and the details of their construction determine the basic fire characteristics of the building itself.
• Key factors that affect combustibility are
  – Combustibility
  – Thermal conductivity
  – Decrease of strength at elevated temperatures
  – Thermal expansion when heated
Masonry

- Masonry is inherently fire resistive
- Masonry is a poor conductor
- Openings can allow fire to spread.
- With prolonged exposure to fire, masonry can collapse.

Concrete

- Concrete
  - Is naturally fire resistive
  - Is a poor conductor of heat
  - Is strong under compression
  - Is weak under tension
  - Can be damaged through exposure to fire
    - Spalling

Steel

- Steel
  - Is the strongest material in common use
  - Is strong in both compression and tension
  - Will rust if exposed to air and moisture
  - Is not fire resistive
  - Is a good conductor of heat
Steel

• Steel expands and loses strength when heated.
• Any sign of bending, sagging, or stretching indicates immediate risk of failure.

Other Metals

• Aluminum
  – Is used in siding, window and door frames, and roof panels
  – Often melts and drips in fires
• Copper
  – Is primarily used for piping and wiring
• Zinc
  – Is used as a protective coating for metals

Glass

• Glass is noncombustible but not fire resistive
• Ordinary (nontreated) glass will break when exposed to flame.
Gypsum Board

- Gypsum is a very good insulator
- Gypsum has limited combustibility
  - Paper will burn, but gypsum itself will not.
  - It is often used as a firestop
- Prolonged exposure to fire will cause failure.

Wood

- Wood is the most common building material
- Engineered wood products are also called manufactured board, human-made wood, and composite wood.
  - May warp, contain toxic products, burn, and fail quickly.

Wood

- The most important characteristic of wood is combustibility.
- Wood structures weaken when they are consumed by fire.
- Wood ignites, burns, and decomposes based on ignition, moisture, density, preheating, size, and form.
- High temperatures decrease wood strength via pyrolysis.
Plastics

- Plastics are rarely used for structural support.
- The combustibility of plastic varies greatly.
- Many plastics release dense, toxic smoke when they burn.
- Thermoplastic materials melt and drip.
- Thermoset materials lose strength but will not melt.

Types of Construction

- Type I: Fire resistive
- Type II: Noncombustible
- Type III: Ordinary
- Type IV: Heavy timber
- Type V: Wood frame

Type I: Fire-Resistive

- All structural components must be noncombustible.
- Fire-resistant construction is used for:
  - Buildings designed for large numbers of people
  - Tall or large area buildings
  - Special occupancies
Type I: Fire-Resistive

- Building materials should not provide fuel for a fire.
- Steel framing must be protected.
- Fires can be very hot and hard to ventilate.
- In extreme conditions Type I buildings can collapse.

Type II: Noncombustible

- All structural components must be noncombustible.
- Fire-resistive requirements are less stringent than Type I.
- Structural components contribute little or no fuel.
- Fire severity is determined by contents.
- Noncombustible construction is most commonly found in single-story warehouses or factories.
### Type III: Ordinary

- Ordinary construction
  - Is used in a wide range of buildings
  - Is usually limited to no more than four stories
  - Has limited fire resistance requirements
- Masonry exterior walls support floors and roof.

### Type III: Ordinary

- There are two separate fire loads:
  - Contents
  - Construction materials
- Fire resistance depends on building age and local building codes.
- Exterior walls, floors, and roof are all connected.

### Type IV: Heavy Timber

- Exterior masonry walls
- Interior structural elements, floors, and roof of wood
Type IV: Heavy Timber

- There are no concealed spaces or voids.
- Heavy timber construction is used for buildings as tall as eight stories with open spaces suitable for manufacturing and storage.
- New Type IV construction is rare.

Type V: Wood Frame

- Wood frame is the most common type of construction in use.
- All major components are wood or other combustible materials.

- Wood frame construction is used in buildings of up to four stories.
- Wooden I-beams and trusses
  - Are just strong enough to carry the required load
  - Have no built-in safety margin
  - Collapse early and suddenly
- Structural fires cause the veneer to collapse and peel away
  - Firefighters should be aware of construction.
Type V: Wood Frame

- Balloon-frame construction
  - Exterior walls are assembled with continuous wood studs
- Platform-frame construction
  - Exterior wall studs are not continuous

Building Components

- Understanding how various components of a building function will improve a firefighter’s safety.

Foundations

- Foundations
  - Transfer the weight of the building and its components to the ground
  - Ensure the building is firmly planted
  - If weak or shifting can cause collapse.
Floors and Ceilings

• Fire-resistive floors
  – In a fire-resistive building, the floor-ceiling system is designed to prevent vertical fire spread.
  – If the space above the ceiling is not partitioned or protected, the fire can quickly extend horizontally.

Floors and Ceilings

• Wood-supported floors
  – Heavy-timber floors can often contain a fire for an hour or more.
  – Conventional wood flooring burns readily and can fail in as little as 20 minutes.
  – Modern construction uses lightweight wood I-beams and trusses.

Roofs

• Roofs are not designed to be as strong as floors.
• There are three primary designs:
  – Pitched roofs
  – Curved roofs
  – Flat roofs
Pitched Roofs

- Pitched roofs
  - Are sloped or inclined
  - Can be gable, hip, mansard, gambrel, or lean-to
  - Are usually supported by rafters or trusses
  - Require some sort of roof covering

Curved Roofs

- Curved roofs
  - Are used for large buildings that require large, open interiors
  - Are usually supported by bowstring trusses or arches

Flat Roofs

- Flat roofs have a slight slope for drainage
- Wood support structures use solid wood beams and joists.
Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe the components and functions of fire detection, protection and suppression systems.

Fire Fighter II Objectives

• Describe the basic components and functions of a fire alarm system.
• Describe the basic types of fire alarm initiation devices and indicate where each type is most suitable.
Fire Fighter II Objectives

• Describe the fire department’s role in resetting fire alarms.
• Describe the basic types of alarm notification appliances.
• Describe the basic types of fire alarm annunciation systems.

Fire Fighter II Objectives

• Explain the different way that fire alarms may be transmitted to the fire department.
• Identify the four types of sprinkler heads.
• Identify the different styles of indicating valves.

Fire Fighter II Objectives

• Describe the operation and application of the following types of automatic sprinkler systems: wet-pipe system, dry-pipe system, preaction system, and deluge system.
• Describe the differences between commercial and residential sprinkler systems.
Fire Fighter II Objectives

- Identify the three types of standpipes and point out the differences among them.
- Describe two problems that fire fighters could encounter when using a standpipe in a high-rise building.

Introduction

- Fire prevention and building codes require that most new structures have some sort of fire protection system installed.
- Understanding how these systems operate is important for fire fighter safety and effective customer service.
Introduction

• From a safety standpoint:
  – Fire fighters need to understand the operations and limitations of fire detection and suppression systems
• From a customer service standpoint:
  – Fire fighters can help dispel misconceptions about fire protection systems.
  – Fire fighters can advise building owners and occupants after an alarm is sounded.

Introduction

• “False alarms”
  – Sensors record an error somewhere in the system.
  – Detectors too close to a kitchen may result in numerous false alarms.
    • People may become used to nuisance alarms and fail to respond accordingly.

Fire Alarm and Detection Systems

• A fire detection system recognizes when a fire is occurring and activates the fire alarm system.
  – Alerts occupants
  – May alert the fire department
  – May automatically activate fire suppression systems
Fire Alarm and Detection Systems

- Fire alarm and detection systems can be very simple or very complex.
  - These systems generally have the same basic components.

Fire Alarm System Components

- There are three basic components in a fire alarm system:
  - Alarm initiation device
  - Alarm notification device
  - Control panel

Fire Alarm System Control Panels

- Fire alarm system control panels
  - Serve as the “brain” of the system
  - Manage and monitor the proper operation of the system
  - Can indicate the source of an alarm
  - Also manage primary power supply and provide backup power supply for the system
Fire Alarm System Control Panels

- Fire alarm system control panels
  - May perform additional functions
  - May interface with other systems
  - Vary greatly

Fire Alarm System Control Panels

- Fire alarm system control panels are used to silence the alarm and reset the system.
- Many buildings have a remote annunciator.
- In some systems, a battery will automatically activate when the external power is interrupted.

Residential Fire Alarm Systems

- A single-station smoke alarm
  - Is the most common type of residential fire alarm system
  - Includes both a smoke detection device and an audible alarm within a single unit
Residential Fire Alarm Systems

- Smoke alarms can be battery powered or hard-wired to a 110-volt electrical system.
- Up-to-date codes require a smoke alarm in every bedroom and on every floor level.
- Many home fire alarm systems are part of security systems.

Ionization Versus Photoelectric Smoke Detectors

- Ionization detectors are triggered by the invisible products of combustion.
- Photoelectric detectors are triggered by the visible products of combustion.
Alarm-Initiating Devices

• Alarm-initiating devices are the components that activate a fire alarm system
  – Manual initiation devices require human activation.
  – Automatic devices function without human intervention.

Manual Initiation Devices

• Manual initiation devices are designed so that building occupants can activate the fire alarm system
• The primary manual initiation device is the manual fire alarm box or manual pull-station.

Double-Action Pull Stations

• Double-action pull stations
  – Are designed to prevent malicious false alarms and are covered with a piece of clear plastic
  – Are often used in areas where malicious false alarms frequently occur
Automatic Initiating Devices

- Automatic initiating devices
  - Are designed to function without human intervention
  - Can use several different types of detectors
    - Some detectors are activated by smoke or by invisible products of combustion.
    - Other detectors react to heat, light produced by an open flame, or specific gases.

Smoke Detectors

- Smoke detectors are designed to sense the presence of smoke.
- Most common are ionization and photoelectric detectors.

Heat Detectors

- Heat detectors
  - Can provide property protection
  - Are used where smoke alarms cannot be used
  - Are often installed in unheated areas
  - Are generally very reliable and less prone to false alarms than smoke alarms
Fixed Temperature Heat Detectors

- Fixed temperature heat detectors
  - Are designed to operate at a preset temperature
  - Usually use a metal alloy that will melt at the preset temperature

Rate-of-Rise Heat Detectors

- Rate-of-rise heat detectors
  - Will activate if the air temperature rises more than a set amount in a given period. Most are self-restoring.
  - Generally respond faster to most fires than fixed-temperature heat detectors.

Line Heat Detectors

- Line heat detectors use wires or a sealed tube to sense heat
  - Wire-type (two types)
    - The detector has two wires inside separated by insulating material
    - The detector measures changes in electrical resistance of a wire as it heats up
  - Tube-type
    - Has a sealed metal tube filled with air
Flame Detectors

- Flame detectors
  - Are specialized devices that detect the electromagnetic light waves produced by a flame
  - Are complicated and expensive

Gas Detectors

- Gas detectors
  - Are calibrated to detect the presence of a specific gas
  - Need regular calibration
  - Are usually found only in specific commercial or industrial applications
  - Are most commonly the carbon monoxide detector type

Air Sampling Detectors

- Air sampling detectors continuously capture air samples and measure the concentrations of specific gases or products of combustion
Residential Carbon Monoxide Detectors

- Residential carbon monoxide detectors sound a visible alarm when the concentration of carbon monoxide is high enough to pose a health risk
- Activation must be investigated by personnel who can detect gas
- All occupants must be checked for carbon monoxide poisoning.

Alarm Initiation by Fire Suppression Systems

- The system
  - Alerts building occupants and the fire department to a possible fire.
  - Ensures that someone is aware water is flowing in case of an unintentional discharge

False, Unwanted, and Nuisance Alarms

- Malicious false alarms
  - Individuals deliberately activate a fire alarm.
- Unwanted alarms
  - An alarm is activated by a condition that is not really an emergency.
- Nuisance alarms
  - The alarm system improperly functions.
Alarm Notification Appliances

- Some alarm notification appliances produce an audible signal when the fire alarm is activated.
- Some signals play a recorded announcement in conjunction with the temporal-3 pattern.

Alarm Notification Appliances

- Many new systems incorporate visual notification devices.

Other Fire Alarm Functions

- Fire alarm systems may also control other building functions, such as air-handling systems, fire doors, and elevators.
- Responding fire personnel must understand which building functions are being controlled by the fire alarm.
Fire Alarm Annunciation Systems

• Zoned system
  – The alarm control panel will indicate where in the building the alarm was activated.

• Coded system
  – The zone is identified at the alarm control panel and through audio notification device.

Noncoded Alarm System

• The control panel has no information indicating where in the building the fire alarm was activated
• A bell or horn is typically sounded.
• Fire department personnel must search the entire building to find which initiation device was activated.

Zoned Noncoded Alarm System

• The zoned noncoded alarm system is the most common type of system, particularly in newer buildings
• The building is divided into multiple zones, often by floor or by wing
• The alarm control panel indicates in which zone the activated device is located.
Zoned Coded Alarm

• In addition to having all the features of a zoned alarm system, the zoned coded alarm also indicates which zone has been activated over the announcement system.
• Hospitals often use this type of system.

Master-Coded Alarm

• Audible notification devices for fire alarms also are used for other purposes.
• Most of these systems have been replaced by modern speaker systems that use the temporal-3 pattern fire alarm signal and have public address capabilities.

Fire Department Notification

• Fire alarm systems can be broken down into five categories based on how the fire department is notified of an alarm:
  – Local alarm system
  – Remote station system
  – Auxiliary system
  – Proprietary system
  – Central station
Fire Department Notification

- A local alarm system
  - Does not notify the fire department.
  - Sounds only in the building to notify the occupants.

Fire Department Notification

- A remote station system
  - A signal is sent directly to the fire department or to another monitoring location via a telephone line or a radio signal.

- An auxiliary system
  - A building’s fire alarm system is tied into a master alarm box located outside.

Fire Department Notification

- A proprietary system
  - A building’s alarms are connected directly to a monitoring site owned and operated by the building owner.
Fire Department Notification

- Central stations
  - A central station is a third-party, off-site monitoring facility
  - An activated alarm transmits a signal to the central station by telephone or radio.
  - Personnel notify the appropriate fire department.

Fire Suppression Systems

- Fire suppression systems include automatic sprinkler systems, standpipe systems, and specialized extinguishing systems such as dry chemical systems.
- Understanding how these systems work is important because they can affect fire behavior.

Automatic Sprinkler Systems

- In most automatic sprinkler systems, the sprinkler heads open one at a time as they are heated to their operating temperature.
- One of the major advantages of a sprinkler system is that it can function as both a fire detection system and a fire suppression system.
Automatic Sprinkler System Components

• There are four major components:
  – Automatic sprinkler heads
  – Piping
  – Control valves
  – A water supply, which may or may not include a fire pump

Automatic Sprinkler Heads

• Automatic sprinkler heads
  – Are the working ends of a sprinkler system
  – Are composed of:
    • A body including the orifice (opening)
    • A release mechanism
    • A deflector that directs the water in a spray pattern

Fusible Link Sprinkler Heads

• Fusible link sprinkler heads use a metal alloy that melts at a specific temperature
  – The alloy links two other pieces of metal that keep the cap in place.
  – When the designated operating temperature is reached, the cap is released.
Frangible Bulb Sprinkler Heads

- Frangible bulb sprinkler heads use a glass bulb filled with glycerin or alcohol to hold the cap in place.
  - As the bulb is heated, liquid absorbs the air bubble and expands until it breaks the glass, releasing the cap.

Chemical-Pellet Sprinkler Heads

- Chemical-pellet sprinkler heads use a plunger mechanism and a small chemical pellet to hold the cap in place.
  - The pellet will liquefy at a preset temperature.
  - When the pellet melts, liquid compresses the plunger, releasing the cap and allowing water to flow.

Special Sprinkler Heads

- Special sprinkler heads are designed for special applications.
- Early-suppression, fast-response sprinkler heads have improved heat collectors to speed up response and ensure rapid release.
Deluge Heads

- Deluge heads
  - Are easily identifiable because they have no cap or release mechanism
  - Have an orifice that is always open
  - Are only used in deluge sprinkler systems

Temperature Ratings

- A typical rating in a light hazard occupancy would be 165°F (74°C).
- The temperature rating must match the anticipated ambient air temperatures.
- Spare heads that match those used in the system should always be available on site.
Sprinkler Piping

- Sprinkler piping
  - Is the network of pipes that delivers water to sprinkler heads
  - Is usually made of steel
  - In residential systems, is sometimes plastic

Valves

- A sprinkler system includes several valves:
  - The main water supply control valve
  - The alarm valve
  - Other, smaller valves used for testing and service
- The valves play a critical role in the design and function of the system

Water Supplies

- Water may come from a municipal water system, on-site storage tanks, or static water sources.
  - The preferred source for a sprinkler system is a municipal water supply.
Fire Pumps

- Fire pumps
  - Are used when the water comes from a static source
  - May also be used to boost the pressure in some sprinkler systems, particularly for tall buildings

Fire Department Connection (FDC)

- A FDC allows the department’s engine to pump water into the sprinkler system
- A FDC is used as either a supplement or the main source of water

Water Flow Alarms

- Most systems incorporate a mechanical flow alarm called a water-motor gong.
- When the system is activated and the main alarm valve opens, water is fed through a pipe to a water-powered gong located outside the building.
Types of Automatic Sprinkler Systems

- Automatic sprinkler systems are divided into four categories:
  - Wet sprinkler systems
  - Dry sprinkler systems
  - Preaction sprinkler systems
  - Deluge sprinkler systems

Wet Sprinkler Systems

- Wet sprinkler systems are the most common and least expensive type of automatic sprinkler system.
- Piping in a wet system is always filled with water.
- As the sprinkler head activates, water is immediately discharged onto the fire.
- The major drawback is that the system cannot be used in areas where temperatures drop below freezing.

Dry Sprinkler Systems

- Dry sprinkler systems operate much like wet sprinkler systems, except that the pipes are filled with pressurized air instead of water.
- A dry-pipe valve keeps water from entering the pipes until the air pressure is released.
Preaction Sprinkler Systems

- A preaction sprinkler system is similar to a dry sprinkler system with one key difference:
  - A secondary device must be activated before water is released into the sprinkler piping.
  - When the system is filled with water, it functions as a wet sprinkler system.

Deluge Sprinkler Systems

- Water flows from all of the sprinkler heads as soon as the system is activated.
- A deluge sprinkler system does not have closed heads that open individually at the activation temperature; all of the heads in a deluge system are always open.
Deluge Sprinkler Systems

Residential Sprinkler Systems

- Residential sprinkler systems
  - Are relatively new
  - Typically use smaller piping and sprinkler heads with smaller orifices and less water discharge
  - Reduce fire death by 82%

Standpipe Systems

- Standpipe systems
  - Are a network of pipes and outlets for fire hoses to provide water for firefighting purposes
  - Are usually used in high-rise buildings, although they are found in many other structures as well.
Class I Standpipes

- Class I standpipes are designed for use by fire department personnel only
- Each outlet has a 2½" male coupling and a valve to open the water supply after the hose is connected.

Class II Standpipes

- Outlets are generally equipped with a length of 1½" single-jacket hose pre-connected to the system.
- The standpipes are intended to enable occupants to attack a fire

Class III Standpipes

- Class III standpipes
  - Have the features of both Class I and Class II standpipes in a single system
  - Have 2½" outlets for fire department use as well as smaller outlets with attached hoses for occupant use
Water Flow in Standpipe Systems

- Flow-restriction devices or pressure-reducing valves are often installed at outlets to limit pressure and flow
  - If not properly installed and maintained, these devices can cause problems for fire fighters.

Water Supplies

- Wet standpipe systems are connected to a public water supply with an electric or diesel fire pump to provide pressure.
- Most dry standpipe systems must use the FDC to pump water into the system.

Specialized Extinguishing Systems

- Specialized extinguishing systems are often used in areas where water would not be an acceptable extinguishing agent.
Dry Chemical Extinguishing Systems

- Dry chemical extinguishing systems use finely powdered agents.
- The agent is kept in self-pressurized tanks or in tanks with an external cartridge of carbon dioxide.

Wet Chemical Extinguishing Systems

- Wet chemical extinguishing systems
  - Are used in most new commercial kitchens
  - Use a proprietary liquid extinguishing agent
    - Much more effective on vegetable oils than the dry chemicals used in older kitchen systems

Initiation Devices

- Fusible links are placed above the target hazard.
- A manual discharge button is also provided so that workers can activate the system if they discover a fire.
Clean Agent Extinguishing Systems

- Clean agent extinguishing systems
  - Are installed in areas where computers or sensitive electronic equipment are used or where valuable documents are stored
  - Are nonconductive and leave no residue
- Halogenated agents or carbon dioxide are generally used.

Clean Agent Extinguishing Systems

- Clean agent extinguishing systems
  - Should be completely discharged before fire fighters arrive
  - Should be tied to the building’s fire alarm system and indicated as a zone on the control panel

Carbon Dioxide Extinguishing Systems

- Carbon dioxide extinguishing systems
  - Are designed to protect a single room or series of rooms
  - Should be connected to the fire alarm system
  - Create an oxygen-deficient atmosphere
Summary

• Fire protection systems include fire alarms, automatic fire detection, and fire suppression systems.
• Fire alarm and detection systems range from simple to complex.
• A fire alarm system has three basic components.

Summary

• The most common residential alarm system is a single-station smoke alarm.
• There are two types of fire detection devices used in a smoke alarm to detect combustion.
• Alarm initiation devices begin the fire alarm process manually or automatically.

Summary

• There are nine types of automatic initiation devices.
• Residential carbon monoxide detectors create an audible or visual alarm.
• It is important to know how to handle false, unwanted, and nuisance alarms.
• There are three types of false alarms.
Summary

• There are two methods that can be used to reduce unwanted and nuisance alarms.
• Alarm communication systems are classified into four categories.
• There are five categories of fire department notification systems.

Summary

• Fire suppression systems include sprinkler systems, standpipe systems, and specialized extinguishing systems.
• The most common fire suppression system is the automatic sprinkler system.
• Basic operating principles of an automatic sprinkler system are simple.

Summary

• Automatic sprinkler systems include four major components.
• Automatic sprinkler systems are divided into four categories.
Summary

- There are three types of standpipe systems.
- Specialized extinguishing are installed in areas where water may not be used.
Lesson 5-1 Tools and Equipment

Student Performance Objective

- Given information from handouts, text, and discussion the student will be able to describe the use and maintenance of tools and equipment in support of rescue and firefighting operations.

Tools and Equipment Objectives

- Describe the tools used in search and rescue operations.
- Explain how tools and equipment are staged for rapid access.
- Describe how to maintain power equipment and power tools.
Ropes and Knots Objectives

• Describe the hardware components used during a rope rescue.
• Describe the characteristics of a carabiner.
• Describe the characteristics of a harness.
• List the types of incidents that might require a rope rescue.

Forcible Entry Objectives

• List the general safety rules to follow when using forcible entry tools.
• List the general carrying tips when using forcible entry tools.
• List the general maintenance tips when using forcible entry tools.
• List the types of tools used in forcible entry.

Forcible Entry Objectives

• List the striking tools used in forcible entry.
• Describe the tasks that striking tools are used for in forcible entry.
• List the prying and spreading hand tools used in forcible entry
• Describe the tasks that prying and spreading hand tools are used for in forcible entry.
Forcible Entry Objectives

• List the cutting tools used in forcible entry.
• Describe the tasks that cutting tools are used for in forcible entry.
• Describe the tasks that lock and specialty tools are used for in forcible entry.

Salvage and Overhaul Objectives

• Describe the types of generators used to power lighting equipment.
• Describe how generators operate.
• Describe how to clean and maintain lighting equipment.
• Describe how to maintain generators.

Search and Rescue Tools and Equipment

• The search team carries:
  – Pushing tools (short pike pole)
  – Prying tools (Halligan tool)
  – Striking tools (sledgehammer or flat-head axe)
  – Cutting tools (axe)
  – Hand lights
Search and Rescue Tools and Equipment

- The search team may also need:
  - A thermal imaging device
  - Portable lighting
  - Lifelines
  - Prying, striking, and cutting tools
  - SCBA and spare air cylinders
  - A litter or patient packing device

Tool Staging

- Many departments have SOPs for staging tools at scenes.
  - Salvage covers at designated location for layout of commonly used tools
- SOPs specify staged tools and equipment.
- Additional personnel may transport tools to and from the staging area.

Cleaning and Inspecting Power Equipment and Tools

- Power equipment and tools are used for lighting, ventilation, salvage, and overhaul
  - Test frequently.
  - Fill with proper fuel.
  - After returning from a fire, clean, inspect, and record maintenance data.
Steps for Cleaning and Inspecting Power Tools

- Leave all tools in a “ready state.”
- Read and follow manufacturer-provided manuals.
- Learn the proper procedure for reporting a problem with power tools and taking them out of service.

Technical Rescue Hardware

- Ropes are often used to access and extricate individuals
- Several hardware components may also be needed.
- A carabiner secures and connects lines.

Harnesses

- Harnesses secure a person to a rope or object
  - Ladder belt harness
  - Seat harness
  - Chest harness
Rope Rescue

- Rope rescue involves raising and lowering rescuers to access injured or trapped individuals.
- Rope rescue courses cover the technical skills needed to raise or lower people.

Rope Rescue Incidents

- Rescuers often have to lower themselves and determine how to get the victim to safety.
- Extreme cases could involve a helicopter.
- The type and number of ropes will depend on the situation.
Trench Rescues

- Trench rescues often are complicated and require a number of skills
  - Shoring
  - Air-quality monitoring
  - Confined space operations
  - Ropes

Confined Space Rescue

- It is often difficult to extricate a victim due to poor ventilation and limited entry/exit
- Confined space rescue is often very complex

Water Rescue

- The simplest situation may involve throwing a rope to a person in the water.
- Complex situations may require ropes stretched across the stream with a tethered boat.
Forcible Entry Tools

- Fire fighters must know:
  - Which tools are available
  - Uses and limitations of each tool
  - How to select the right tool
  - How to operate each tool
  - How to carry each tool
  - How to inspect and maintain each tool

General Tool Safety

- Always wear proper personal protective equipment (PPE).
- Use the right tool for the job.
- Keep tools clean and serviced.
  - Take broken tools out of service for repair.
- Keep tools in proper area or container.

General Carrying Tips

- Request assistance with heavy tools.
- Use your legs to lift heavy tools.
General Carrying Tips

• Keep sharp edges and points away from your body.
  – Cover them with a gloved hand.
• Carry long tools pointing down.
  – Be aware of overhead wires.

General Maintenance Tips

• All tools should be in a ready state.
  – Tools must be in working order, in their storage place, and ready for use.

General Maintenance Tips

• Tools require regular maintenance and cleaning to ensure readiness.
  – Perform required checks conscientiously.
  – Follow manufacturer’s guidelines.
  – Keep proper records of maintenance, repairs, and warranty work performed.
Types of Forcible Entry Tools

- Striking tools
- Prying/spreading hand tools
- Cutting tools
- Lock tools

Striking Tools

- Striking Tools
  - Are used to generate an impact force directly on an object or another tool
  - Usually have heads made of hardened steel

Flat-Head Axe

- One side is a cutting blade.
- The other side is a flat striking surface.
- Firefighters often use the flat side to strike a Halligan tool and drive a wedge into an opening.
Battering Ram

- A battering ram
  - Is used to force doors and breach walls
  - Is usually made of hardened steel
  - Has handles
- Two to four people are needed to use a battering ram

Sledgehammer

- Sledgehammers
  - Come in various weights and sizes
  - Have heads weighing from 2 to 20 lbs.
  - Have handles that may be short or long
  - Can be used alone or with other striking tools

Halligan Tool

- Halligan tools
  - Are widely used
  - Are commonly used to perform forcible entry
  - Incorporate three tools: the adz, pick, and claw
Pry Bar

- The pry bar
  - Is made from hardened steel
  - Is commonly used to force doors and windows, remove nails, or separate building materials
  - Comes in various shapes, allowing firefighters to exert different amounts of leverage

Pry Axe

- The pry axe
  - Is a multipurpose tool
  - Is used to cut and force open doors and windows
  - Includes the adz, pick, and claw
  - Consists of the body and the handle

Hydraulic Tools

- Hydraulic tools include:
  - Spreaders
  - Cutters
  - Rams
- Hydraulic tools require hydraulic pressure
Rabet Tool

- The rabbet tool is a small hydraulic spreader operated by a hand-powered pump
- As the spreader opens, it applies a powerful force that opens doors.

Cutting Tools

- Cutting tools are primarily used for cutting doors, roofs, walls, and floors
- There are both hand-operated and power cutting tools

Axe

- There are many different types of axes
- The cutting edge is used to break into plaster and wood walls, roofs, and doors
- Types include flat-head, pick-head, and multi-purpose axes
Bolt Cutters

- Bolt cutters are used to cut components, such as bolts, padlocks, chains, and chain-link fences.
- Bolt cutters are available in several different sizes.
- The longer the handle, the greater the cutting force.

Circular Saw

- The circular saw
  - Is gasoline powered
  - Is light, powerful, and easy to use
  - Has blades that can be changed quickly
    - Carbide-tipped blades
    - Metal-cutting blades
    - Masonry-cutting blades

Lock and Specialty Tools

- Lock and specialty tools are used to disassemble the locking mechanism on a door.
- Lock and specialty tools cause minimal damage to the door and the door frame.
- An experienced user can usually gain entry in less than a minute.
Lock/Specialty Tools

- K tool
- A tool
- J tool
- Shove knife
- Duck-billed lock breakers
- Locking pliers and chain
- Bam-bam tool

Electrical Generators

- Gas- or diesel-powered generators provide ample power.
  - Portable
  - Vehicle-mounted
- A building’s power supply is also an option.

Lighting Methods

- Exterior lighting
  - Permits fire fighters to see what they are doing, recognize hazards, and locate victims
  - Makes the scene visible to drivers
  - Provides some light inside the structure
Lighting Methods

• Using interior lighting
  – Set up a portable light at the entry point to serve as a beacon for disoriented fire fighters.
  – Illuminate interior areas as needed.
  – Provide ample illumination to facilitate operations and increase safety.
  – Remember that interior lighting may be needed during daylight.

Cleaning and Maintenance

• Follow manufacturer’s instructions.
• Avoid strong solvents.
• Test and run generators weekly/monthly.
• Inspect and test all power tools and equipment.
• Refill generator fuel tanks.

Summary

• Search and rescue teams carry the same tools as the interior attack team.
• Tool staging lays out commonly used tools.
• Properly maintain tools and equipment.
• Test power tools frequently and service regularly.
• Read and follow manufacturer's manuals and instructions for care/inspections.
Summary

- Two hardware pieces are used in rescue incidents: the carabiner and harness.
- Rope rescues involve people trapped in inaccessible locations.
- Four types of forcible entry tools are used: striking tools, prying or spreading tools, cutting tools, and lock and specialty tools.

Summary

- Electricity for lighting equipment is supplied by a generator, inverter, or a building's electrical system.
- Portable electronic equipment should be cleaned and maintained.
- Salvage efforts prevent or limit secondary losses from smoke and water.
Given information from discussion, handouts, and reading materials students will describe the theory and practices of fire service ventilation.

Student Performance Objective

Introduction

- Ventilation
  - Is the process of removing smoke, heat, and toxic gases from a burning building and replacing them with cooler, cleaner, more oxygen-rich air
Introduction

• The ventilation process has two components:
  – The removal of smoke, toxic gases, hot air
  – The addition of cooler, cleaner, oxygen-rich air
• Modern construction uses lightweight and manufactured building components
• Firefighters may assume the fire is small, fuel is gone, or fire is in decay

Fire Behavior and Ventilation

• Proper ventilation:
  – Can facilitate locating and rescuing victims
  – Enables hose teams to advance and locate the source of fire
  – Prevents fire spread
• Lack of ventilation can contribute to:
  – Violent backdrafts
  – Delay in extinguishing fire
  – Unnecessary fire extension
  – Injury to firefighters and civilians
  – Increased property damage

Fire Behavior and Ventilation

• The primary method of fire spread is convection.
• Mushrooming occurs when the products of combustion reach the highest point.
Benefits of Proper Ventilation

- Proper ventilation can
  - Help firefighters locate trapped occupants faster
  - Provide fresh air to occupants
  - Enable firefighters to advance hose lines rapidly and safely
  - Reduce backdraft and flashover
  - Limit fire spread
  - Reduce property loss

Backdraft

- Backdraft occurs when a building is charged with hot gases and oxygen has been consumed
- When air is introduced, fuel can ignite and explode.
Backdraft

- Firefighters should
  - Release heat and unburned particles without allowing the entry of clean air.
  - Ventilate as high as possible.

Flashover

- Both ventilation and cooling are needed to relieve potential flashover conditions
- Flashover occurs when:
  - The air in the room is very hot
  - All combustibles are near their ignition point
- Applying water cools the atmosphere
- Ventilation draws heat and flames away

Factors Affecting Ventilation

- Convection
  - Heated gases will always follow the path of least resistance.
  - Ill-fitting and tight-fitting windows can cause dangerous fire conditions.
Factors Affecting Ventilation

• Firefighters can use mechanical ventilation to direct the flow of combustion gases.
  – Negative-pressure
  – Positive-pressure
  – Hose streams
• Firefighters should evaluate for signs of backdraft before creating ventilation.

Factors Affecting Ventilation

• Wind and atmospheric forces
  – Wind speed and direction
  – Temperature and humidity

Building Construction Considerations

• The way a building is constructed will affect ventilation operations.
**Fire-Resistive Construction**

- Fire-resistant construction refers to buildings with noncombustible structural components.
- There are still potential paths of fire spread:
  - Heating and cooling ducts, plumbing and electrical chases
  - Elevator shafts
  - Stairwells
- Fire-resistive buildings generally have roofs supported by steel or concrete roof decks.

**Ordinary Construction**

- Ordinary construction buildings:
  - Have exterior walls made of noncombustible material.
  - Have interior walls/floors of wood construction.
  - Have roofs with wood decking and wood structural support.

**Ordinary Construction**

- Paths of fire spread:
  - Plumbing and electrical chases
  - Void spaces in walls
  - A cockloft
Wood-Frame Construction

- Combustible exterior walls
- Paths of fire spread
  - Attics and cocklofts
  - Wood truss roofs and floors
- Construction types
  - Balloon-frame
  - Platform

Location and Extent of Smoke and Fire Conditions

- Factors to consider
  - Size of the fire
  - Stage of combustion
  - Location within the building
  - Available ventilation options

Location and Extent of Smoke and Fire Conditions

- Where to ventilate
  - Ventilate as close to the fire as possible
  - If unable to vent close to the fire:
    - Predict how the location will affect the fire.
    - Anticipate the fire spread.
Location and Extent of Smoke and Fire Conditions

- Determine fire size, intensity, and fuel
  - Light smoke, moving lazily—small fire of ordinary combustibles
  - Large amount of black rolling smoke—petroleum-based fire
- Cool days may cause smoke inversion.
- Sprinkler activation may cause fog.

Smoke Reading

- Smoke reading enables the firefighter to learn where the fire is, how big it is, and where it is moving
- Fires are dynamic events
- Smoke is the fuel all around you at a fire
- The best place to observe the pattern of smoke is outside the building

Smoke Reading

- Determining the key attributes of smoke
  - Smoke volume
  - Smoke velocity
  - Smoke density
  - Smoke color
Smoke Reading

- Determining the influences on the key attributes
  - Size of the structure
  - Wind conditions
  - Thermal balance
  - Fire streams
  - Ventilation openings
  - Sprinkler systems

Smoke Reading

- Determine the rate of change
  - Changes in the four key attributes indicate changes in the fire
- Predict the event
  - Consider the key attributes, what influences them, and their rate of change
  - Communicate key parts to the company officer

Smoke Reading

- Smoke reading through a door
  - Indications of a hot fire may mean you are dealing with a fire in a decay phase
    - This is a sign of great danger
    - The addition of oxygen results in violent backdraft
    - Fires can be dangerous even with little smoke
Smoke Reading

- Smoke reading through a door
  - If smoke exits through the top half and clean air enters through the bottom half
  - If smoke rises and the opening clears
  - If smoke thins but still fills the door

Types of Ventilation

- There are two basic types of ventilation
  - Horizontal
    - Uses horizontal openings in a structure such as doors and windows
  - Vertical
    - Involves openings in the roofs or floors

Horizontal Ventilation

- Horizontal ventilation
  - Is commonly used in residential fires and room-and-contents fires
  - Is generally fast and easy to use
  - Can be used from inside or outside the building
Horizontal Ventilation

- Horizontal ventilation
  - Uses horizontal openings such as windows and doors
  - Is most effective when the opening is directly to the outside
  - Is more difficult when there are no direct openings
  - Limits structural damage
- Only open doors when the hoseline is charged and the attack team is ready to advance.

Natural Ventilation

- Natural ventilation
  - Depends on convection currents, wind, and other natural air movements
  - Is used when air currents are adequate
  - Is used when ventilation is needed quickly
- Open the leeward side of the building first, then the windward.

Natural Ventilation

- Breaking glass
  - Try to open first.
  - Wear full PPE.
  - Ensure no one will be struck by the glass.
  - Always use a tool.
  - Keep hands above or to the side of glass.
  - Use a tool to clear remaining glass.
Natural Ventilation

- Doorways
  - Are large openings
  - May compromise entry/exit points
  - May be best for clean air points
  - Are good locations for mechanical ventilation devices

Mechanical Ventilation

- Negative-pressure ventilation
  - Limitations:
    - Positioning
    - Power source
    - Maintenance
    - Air flow control
  - Advantages
    - Explosion-proof motors

Mechanical Ventilation

- Positive-pressure ventilation uses large, powerful fans that
  - Are quick and efficient
  - Increase safety for the firefighter
- The fans
  - May spread the fire
  - May increase carbon monoxide levels
Mechanical Ventilation

- Hydraulic ventilation uses a narrow fog or broken stream pattern
  - Advantages
    - Moves several thousand cubic feet of air per minute
  - Disadvantages
    - Water damage
    - Safety hazards

Vertical Ventilation

- Vertical ventilation
  - Releases combustion products vertically
  - Occurs naturally if there is an opening
  - May be assisted by mechanical means

Vertical Ventilation

- Safety considerations
  - Determine roof construction first.
  - Be sure the ventilation opening is not between the fire fighters and their escape exit.
  - Have a charged hose line ready.
  - Leave the area once done.
Vertical Ventilation

- Safety considerations
  - “Sound” the roof
  - Walk on the areas of greatest support
  - When making cuts,
    - Be upwind
    - Have a clear exit path
    - Stand on a firm section

Roof Construction

- All roofs have two components
  - A support structure
    - Solid beams of wood, steel, or concrete
    - A system of trusses of wood, steel, or wood and steel
  - A roof covering
    - Made of various weather-resistant materials
    - Supported by the roof decking

Effects of Roof Construction on Fire Resistance

- Support system failure
  - The supporting structure fails
  - There is often a sudden and total collapse of the roof
- Roof covering failure
  - Fire burns through the roof covering
  - The initial “burn through” spreads out, causing roof failure
  - In warmer climates roofs burn through quickly; in colder climates burn with little evidence
Solid Beam versus Truss

- Solid beam
  - Girders, beams, and rafters
- Truss
  - Lightweight components
  - Wood or steel bars
  - Triangular configuration

Roof Designs

- Flat roofs
  - Can be constructed with many types of supports, decking, and materials
- Pitched roofs
  - Have a visible slope for rain, ice, and snow runoff

Roof Designs

- Arched roofs
  - Are generally found in commercial structures
  - Use bowstring trusses in which fire can severely and quickly weaken structure
Roof Ventilation

• The objective of roof ventilation is to provide the largest opening in the appropriate location
  – Using the least amount of time
  – Using the safest technique

<table>
<thead>
<tr>
<th>TABLE 35-2</th>
<th>Types of Vertical Ventilation Openings</th>
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</thead>
<tbody>
<tr>
<td>Built-in roof openings</td>
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<td>Inspection opening</td>
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<td>Primary (preplanned) openings</td>
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<tr>
<td>Secondary (defended) openings</td>
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Roof Ventilation

• Before starting vertical ventilation, assess the following:
  – Construction features
  – Indications of fire damage
  – Safety zones and exit paths
  – Built-in roof openings

Roof Ventilation

• Vertical ventilation is most effective at the highest point and over the seat of the fire
• An examination hole may be cut
• To provide a ventilation opening, cutting one hole is better than making several small ones
• The original hole should be a minimum of 4’ × 4’
Tools Used in Vertical Ventilation

- Power saws
- Axes
- Halligan tools
- Pry bars
- Tin cutters
- Pike poles, other types of hooks
- Utility rope

Types of Roof Cuts

- The rectangular cut requires four cuts completely through the decking
  - Use care to not cut structural supports.
  - Stand upwind and have a safe exit.
  - If several layers exist, peel a layer at a time if necessary.

Types of Roof Cuts

- The louver cut
  - Is used for flat or sloping roofs with plywood decking
  - Is made with a power saw or axe
  - Can quickly create a large opening
Types of Roof Cuts

• The triangular cut
  – Is used to prevent metal decking from rolling away as it is cut.
  – Is made with a saw or axe.
  – May have to be made several times because of its small size.

• The peak cut
  – The peak cut is used for peaked roofs with plywood sheathing.
  – A tool is used to reveal the roof covering along the peak.
  – A power saw or axe is used to make a series of vertical cuts.

• The trench cut
  – Is used to stop the progress of a large fire in a narrow building
  – Creates a large opening ahead of the fire
  – "Writes off" part of the building
Special Considerations

- Poor access or obstructions
- Multiple roofs and roof layers
- Boarded or sealed window openings
- Security measures such as steel bars and shutters

Ventilating Concrete Roofs

- Concrete roofs are generally flat and hard to breach
- Concrete roofs may collapse from weakened support systems when exposed to fire
- Because there are few options for ventilating concrete roofs, firefighters should search for alternative openings such as vents, skylights, and other roof penetrations

Ventilating Metal Roofs

- Discoloration and warping may indicate the seat of the fire.
- The tar roof covering can melt and leak into the building.
- Metal can roll down and create a dangerous slide directly into the opening.
Ventilating Basements

- Ventilating basements usually requires both horizontal and vertical ventilation.
- Make as many openings on one side as possible and allow fire fighters to enter from the other.
- A cellar nozzle or hose line may be needed.

Ventilating High-Rise Buildings

- Many high-rises have hard-to-break sealed windows.
- Newer buildings have smoke management capabilities in the HVAC.
- One stairwell should be designated as a rescue route.
- Positive-pressure fans can keep smoke out of the stairs.

- A cold outer atmosphere and a heated interior will cause smoke to rise quickly through vertical openings.
Ventilating High-Rise Buildings

• A hot outer atmosphere and a cooled interior will cause smoke to push down the vertical openings.

Ventilating Windowless Buildings

• Windowless buildings trap heat and smoke
• Firefighters should
  – Treat fires in windowless buildings similarly to basement fires.
  – Ventilate high.

Ventilating Large Buildings

• Ventilating large buildings is more difficult than ventilating small ones
• Smoke cools as it travels, causing stratification.
• When possible, use interior walls and doors to create smaller areas.
Equipment Maintenance

- Keep equipment in good repair and operate at peak efficiency.
- Read and follow manufacturers’ instructions.
- Rotate fuel if it is not used regularly.
- Fill fuel tanks to recommended levels.
- Practice using ventilation tools.

Summary

- Ventilation removes smoke, heat, and toxic gases from a burning building.
- Flashback or backdraft is caused by the addition of oxygen-rich air to a smoke-filled and fuel-rich atmosphere.
- New construction leads to a large fuel supply.
- Ventilation can save lives and reduce property damage.

Summary

- An increase in fire produces more smoke, heat, and toxic gases.
- Convection controls the spread of the products of combustion.
- In convection, heated gases expand and become less dense than cooler gases.
- Proper ventilation includes improved visibility, removal of heat and steam, reduction of backdraft, and limited fire spread.
Summary

- Backdraft can be reduced by ventilation.
- Ventilation and cooling are needed to relieve potential flashover conditions.
- Convection currents carry smoke and superheated gases to uninvolved areas.
- The direction and force of the wind should be considered.

Summary

- Structural components in fire-resistive construction are made of noncombustible or limited-combustible materials.
- Ordinary construction buildings have exterior walls composed of noncombustible or limited-combustible materials.
- Wood-frame buildings contain void spaces.
- Firefighters must be able to recognize when ventilation is needed.

Summary

- Vertical ventilation makes structural holes.
- Horizontal ventilation include natural and mechanical methods.
- Vertical ventilation allows the products of combustion to travel up and out.
- Firefighters must evaluate all pertinent safety issues and avoid unnecessary risks.
- When working on a roof, firefighters should have two safe exit routes.
Summary

- Roofs are composed of support structures and roof coverings.
- Roof designs can be flat, pitched, or arched.
- Vertical ventilation openings include built-in, inspection, primary, and secondary.
- Commercial or industrial structures have concrete roofs.

Summary

- Metal roofs conduct heat and are supported by lightweight steel metal joists.
- Venting a basement may include both horizontal and vertical.
- HVAC systems may be used to ventilate high-rise buildings.
- All equipment and tools must be in a ready state and be properly maintained.
Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe the care, maintenance, and inspection of fire hose.

Fire Fighter II Objectives

• Describe how to perform a service test on a fire hose.
• List the information that should be noted on a hose record.
• Describe how to perform a service test on a fire hydrant.
Causes of Hose Damage

- Mechanical damage
- Heat and cold
- Chemicals
- Mildew

Hose Inspections

- Test each length of hose at least annually.
- Perform visual hose inspections at least quarterly.

Hose records provide a written history of each individual length of fire hose.

Hydrant Inspection and Testing

- Hydrants should be inspected at least once a year
- Hydrants
  - Should be checked for visibility and access
    - Should be visible from every direction
    - Should not be hidden by tall grass, brush, fences, debris, dumpsters, or other obstructions
  - Must be clear of snow in winter
  - May be painted a reflective color to increase visibility
Hydrant Inspection and Testing

• Checking for visibility and access
  – The bonnet may be color-coded to indicate available flow rate
  – In high snowfall areas, hydrants may be marked with a small flag mounted on top of a pole attached to the hydrant
  – Hydrants should be installed at an appropriate height above the ground
  – Hydrants should allow fire fighters to easily make connections

Hydrant Inspection and Testing

• Check for exterior signs of damage.
• Open the steamer port to ensure the barrel is dry and free of debris.
• Make sure all caps are present and that outlet hose threads are in good working order.
• Open the hydrant valve to ensure that water flows, and remove debris.
• Shut down the hydrant, and ensure it drains properly (if it is a dry-barrel hydrant).

Hydrant Inspection and Testing

• After draining, replace the cap.
• If threads need cleaning, use a steel brush.
• Use a triangular file to remove burrs in the threads.
• Check gaskets in caps to ensure they are not cracked, broken, or missing, and replace them as needed.
• Follow the manufacturer’s recommendations for lubrication
Hydrant Inspection and Testing

• Testing fire hydrants
  – Fire-suppression companies are often assigned to test the flow from hydrants in their districts.
  – Procedures for testing hydrants are simple, but an understanding of hydraulics and careful attention to detail are essential.

Hydrant Inspection and Testing

• Testing fire hydrants
  – Flow is:
    • The quantity of water moving through a pipe, hose, or nozzle
    • Measured by its volume, usually in gallons (or liters) per minute
  – Water pressure is:
    • An energy level
    • Measured in pounds per square inch (psi) (or kilopascals)

Hydrant Inspection and Testing

• Testing fire hydrants
  – Static pressure is
    • Pressure in the system when water is not moving
    • Generally created by gravity or pumps
    • Measured by placing a pressure gauge on a hydrant port and opening the hydrant valve (there cannot be any water flowing out of the hydrant.)
Hydrant Inspection and Testing

• Testing fire hydrants
  – Normal operating pressure
    • Normal operating pressure is the amount of pressure in the system during a period of normal consumption
    • A pressure gauge connected to a hydrant port during a period of normal consumption will indicate the normal operating pressure.

Hydrant Inspection and Testing

• Testing fire hydrants
  – Residual pressure is
    • The amount of pressure that remains in the system when water is flowing.
    • The best indicator of how much more water is available (the more water that is flowing, the less residual pressure there is).

Hydrant Inspection and Testing

• Testing fire hydrants
  – Flow pressure
    • Flow pressure measures the quantity of water flowing through an opening during a hydrant test
    • Flow pressure is calculated by measuring the pressure at the center of the water stream as it passes through the orifice, factoring in the size and flow characteristics of the orifice
    • A pitot gauge is used to measure the flow in psi and calculate the flow in gallons per minute.
Hydrant Inspection and Testing

- Hydrant testing procedure
  - Requirements:
    - Two adjacent hydrants
    - Pitot gauge
    - Outlet cap with a pressure gauge
  - To test the operability and flow of a fire hydrant, follow the steps in Skill Drill 16-4.

Hydrant Inspection and Testing

- Testing fire hydrants
  - Testing Procedure
    - Place the cap gauge on one of the outlets of the first hydrant.
    - Open the hydrant valve to fill the hydrant barrel.
    - Record the initial pressure reading as the static pressure.
    - At the second hydrant, remove a discharge cap and open the valve.

Hydrant Inspection and Testing

- Testing fire hydrants
  - Testing Procedure
    - Place the pitot gauge in the middle of the stream and take a reading.
    - Record as the pitot pressure.
    - At the same time, record the residual pressure at the first hydrant.
    - Calculate (or look up in tables to determine) the flow availability based upon the readings.
Summary

- Fire hose should be inspected per NFPA standards.
- Common causes of hose damage are mechanical, heat and cold, chemical, and mildew.
- Visual hose inspections should be performed quarterly.
- Hydrants should be inspected and tested often.
Lesson 6-2 Fire Attack and Foam

Student Performance Objective

- Given information from handouts, text, and discussion the student will be able to describe the equipment, agents and techniques used to apply foam to extinguish fires.

Fire Fighter II Objectives

- Describe how foam suppresses fire.
- Describe the characteristics of Class A foam.
- Describe the characteristics of Class B foam.
- List the major categories of Class A foam concentrate.
Fire Fighter II Objectives

• Describe the characteristics of compressed air foam (CAF).
• List the major categories of Class B foam concentrate.
• Describe the characteristics of protein foam.

Fire Fighter II Objectives

• Describe the characteristics of fluoroprotein foam.
• Describe the characteristics of aqueous film-forming foam.
• Describe the characteristics of alcohol-resistant foam.

Fire Fighter II Objectives

• Describe how foam proportioner equipment works with foam concentrate to produce foam.
• Describe how foam is applied to fires.
Foam

- Foam
  - Is used to fight several types of fires
  - Is used to prevent ignition of materials
  - Is used to neutralize hazardous materials
  - Is produced by mixing foam concentrate with water and air

Foam Classifications

- Class A foam
  - Is used to fight fires involving ordinary combustible materials
  - Increases effectiveness of water by reducing the surface tension of water
  - Can be added to water streams and applied with several types of nozzles

Foam Classifications

- Class B foam
  - Class B foam fights flammable and combustible liquids
  - Class B foam separates fuel from the fire
  - The foam blanket must not be disturbed.
  - Class B foam can be applied to flammable liquid spills to prevent fire
Class A Foam Concentrates

- Class A foams are usually formulated to be mixed with water in ratios from 0.1% to 1% solution
- "Wet" foam has good penetration properties.
- "Stiff" foam is more effective when applied for protecting buildings.

Compressed Air Foam Systems

- The CAF method of making Class A foam
  - Compressed air is injected into a stream of water mixed with foam
  - The foam adheres to most surfaces and absorbs more heat than water
  - Hose lines with CAF are lighter

Class B Foam Concentrates

- Class B foam concentrates are used as either 3% or 6% solution
- Different types of foam concentrate should not be mixed.
- There are four major categories of Class B foam concentrate:
  - Protein foams
  - Fluoroprotein foams
  - Aqueous film forming foam (AFFF)
  - Alcohol-resistant foam
Foam Equipment

• Foam proportioning equipment
  – A foam eductor draws foam concentrate from a container into a moving stream of water.
  – A foam injector adds the foam concentrate to the water stream under pressure.

Foam Equipment

• Batch mixing
  – Concentrate is poured directly into booster tank
• Premixing
  – Pre-mixed foam is commonly used in 2½-gal extinguishers
  – The extinguisher is filled with foam solution and pressurized.

Foam Application

• Foam can be applied through:
  – Portable extinguishers
  – Handlines
  – Master stream devices
  – Fixed systems
Foam Application

• Foam can be applied with a range of expansion rates:
  – Low-expansion foam
  – Medium-expansion foam
  – High-expansion foam

Foam Application Techniques

• Sweep method (or roll-on)
  – Used on flammable product on open ground
• Bankshot method (or bounce-off)
  – Used at fires where there is an object that can be used to deflect the foam stream
• Rain-down method

Backup Resources

• If the flow of foam has to be interrupted, the fire will destroy the foam that has been applied.
• There are specific formulas to calculate how much foam is required to extinguish fires.
Foam Apparatus

- Some fire departments operate apparatus specifically designed to produce and apply foam.
  - These apparatus are commonly used at airports.
  - Large vehicles are designed to quickly apply large quantities of foam to flammable-liquids fire.
  - Remote-control monitors can be used to apply foam while the vehicle is in motion.

Summary

- Foam can fight multiple types of fire.
- Foams are either Class A or Class B.
- Foam extinguishes flammable-liquid fires by separating the fuel from the fire.
- Foam concentrate is mixed with water in different ratios to produce a foam solution.

Summary

- There are five categories of Class B foam.
- Compressed air foam (CAF) systems are a way to make Class A foam.
- A foam proportioner mixes foam concentrate into the fire stream in the proper percentage.
- Foam solution can be produced by batch mixing or premixing.
Lesson 6-3 Fire Suppression

Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe the tactics associated with fire attack in structures and with flammable liquids and gases.

Fire Fighter II Objectives

• List the factors that the incident commander evaluates when determining whether to perform a defensive attack or an offensive attack.
• Describe the characteristics of a fog stream and a straight stream.
• Describe the characteristics of a solid stream.
• Describe the objectives of an interior fire attack, a direct attack, and an indirect attack.
Fire Fighter II Objectives

• Describe the objectives of a combination attack.
• Explain how ventilation is coordinated with fire suppression operations.
• Describe the characteristics of concealed-space fires.
• Describe the characteristics of basement fires.
• Describe the tactics used to suppress basement fires and fires above ground level.

Fire Fighter II Objectives

• Describe the characteristics of flammable-gas cylinders.
• Describe the hazards presented by flammable-gas fires.
• Describe a boiling liquid/expanding vapor explosion (BLEVE).
• Describe the tactics used to suppress flammable-gas fires.

Introduction

• Fire suppression is the tactics and tasks to achieve extinguishment of the fire.
• Fire suppression can be achieved through a variety of methods
  – Removing fuel, oxygen, or heat
  – Breaking a chemical chain reaction
  – Typically extinguishing with water
Offensive Versus Defensive Operations

• Interior operations are offensive.
• Exterior operations are defensive.

Offensive Operations

• Offensive operations
  – Expose fire fighters to heat and smoke
  – Involve fire fighters getting close enough to apply extinguishing agent directly to overpower the fire.
  – Cause the least amount of property damage
  – Are used when fires are small
  – Generally use small handlines

Defensive Operations

• Defensive operations
  – Generally use large handlines or master streams.
  – Are employed when the fire is too large for offensive attack or the risk too great to fire fighters.
  – Are employed to prevent the fire from spreading.
Strategic Decisions

- Strategic decisions
  - Must be made by the incident commander
  - Are made prior to operations beginning
  - Are clearly communicated to personnel
- Confusion cannot exist.
- The strategy may change during the operation.

Command Considerations

- What are the risks versus potential benefits?
- Is it safe to send fire fighters into the building?
- What are the structural concerns?
- Is the building made of lightweight construction?
- Are there any lives at risk?

Command Considerations

- Does the size of the fire prohibit entry?
- Is there enough manpower?
- Is there an adequate water supply?
- Can proper ventilation be achieved to support offensive operations?
Interior Fire Attack

- An interior fire attack is an offensive operation where firefighters enter a structure.
- There are three methods of attack:
  - Direct
  - Indirect
  - Combination

Direct Attack

- Direct attack
  - Is the most effective method
  - Uses a straight or solid stream
  - Delivers water directly to the seat of the fire
  - Uses short, controlled bursts of water

Indirect Attack

- Indirect attack
  - Is used when the area is ready to flash over
  - Is short bursts of water applied to the ceiling
  - Uses a straight, solid, or narrow fog stream
  - Can cause serious injuries if too much water is used
Combination Attack

- Combination attack
  - Employs both indirect and direct attack method
  - Uses indirect attack to cool atmosphere, then direct attack to extinguish
  - Uses only enough water as needed to control the fire, avoiding unnecessary water damage

Ventilation

- Ventilation
  - Requires coordination
  - Allows hot smoke and gases out and improves visibility
  - If improperly done, may make it more difficult for fire fighters

Flammable-Liquid Fires

- Flammable-liquid fires are found in almost any type of occupancy
- Most vehicles involve flammable or combustible liquids.
- Special tactics are required.
Two-Dimensional Flammable Liquid Fires

- A two-dimensional flammable liquid fire is a spill, pool, or container of liquid where only the top surface is burning.
- A two-dimensional flammable liquid fire can be controlled with appropriate Class B foam.
- Watch for hot surfaces or open flames that may reignite.

Three-Dimensional Flammable Liquid Fires

- A three-dimensional flammable liquid fire is burning liquid dripping, spraying, or flowing over the edge of a container.
- A three-dimensional flammable liquid fire is more difficult to extinguish with foam.
  - A dry chemical or gaseous extinguishing agent is usually more effective.
- Do not stand in pools or contaminated runoff.

Suppression of Flammable Liquid Fires

- Larger flammable liquid fires may require the use of Class B foam.
Propane Gas

- Propane gas
  - Is used for heating, cooking, and vehicle fuel
  - Exists as a gas above –44°F (–42.2°C)
  - When stored under pressure, changes to a liquid
  - Expansion ratio of 270 to 1

Propane Gas

- Containers
  - Containers have a space filled with gas above the liquid level.
  - Piping draws from the vapor space.
  - Containers vary in size.
  - Containers are made of aluminum or steel.
  - A discharge valve controls the flow of gas.

Propane Gas

- Containers
  - A connection hose, tube, or pipe allows gas to flow to its destination.
  - Cylinders are equipped with a relief valve.
  - Cylinders must be stored in an upright position.
Propane Hazards

- Propane is
  - Highly flammable
  - Nontoxic but can cause asphyxiation
  - Odorless
  - Heavier than air

Boiling liquid expanding vapor explosion (BLEVE)
- Pressure increases from heat.
- The release valve may open to vent pressure.
- The container may fail violently.
- The best method of prevention is heavy streams of water from a distance.

Flammable-Gas Fire Suppression

- Shut off main discharge valve.
  - Do not extinguish flames unless fuel source is shut off.
  - Approach with two 1½" lines set on a fog pattern.
    - The team leader is between the two nozzle operators.
    - On the commands of the leader, the crew members should move forward, remaining together and never turning their backs to the burning product.
    - On reaching the valve, the fire fighter in the center turns off the valve, stopping the flow of gas.
Flammable-Gas Fire Suppression

• Back away from lines that are still flowing.
• For severe fires, use unattended master streams and evacuate the area.

Flammable-Gas Fire Suppression

• If the relief valve is open, the container is under stress.
  – Will sound like a tea kettle.
  – If rising in frequency, an explosion may be imminent.

Summary

• Fire suppression is all tactics and tasks performed on the fire scene.
• Fire suppression methods are either offensive or defensive.
• IC evaluates conditions constantly to determine the type of attack to be used.
Summary

• Interior fire attacks require fire fighters to enter a building and discharge an extinguishing agent onto the fire.
• The most effective means of fire suppression is a direct attack.
• An indirect attack quickly removes as much heat as possible from the fire atmosphere.
• A combination attack uses both indirect and direct attack in a sequential manner.

Summary

• Flammable-liquid fires may be encountered in almost any type of occupancy.
• Flammable-gas cylinders can be found in many places.
• BLEVE is the greatest danger with propane and similar flammable gas.
Student Performance Objective

- Given information from handouts, text, and discussion the student will be able to describe how to conduct vehicle rescue and extrication.

Fire Fighter II Objectives

- Describe a vehicle anatomy.
- List the hazards involved in responding to an emergency scene.
- List the hazards to look for when arriving on the scene of a vehicle extrication situation.
- Describe cribbing.
Fire Fighter II Objectives

• Describe the extrication tools that are used for stabilizing, bending, cutting, and disassembling.
• Describe how to gain access to a victim of a motor vehicle collision.
• Describe how to disentangle a victim of a motor vehicle collision.
• Describe how to remove and transport victims of a motor vehicle collision.

Parts of a Motor Vehicle

• Use standard terms when referring to parts of a vehicle.

Motor Vehicle Frames

• The platform frame uses beams to fabricate the load-bearing frame.
  – The engine, transmission, and body components connect to the frame.
  – The platform frame provides a sound place for stabilizing the vehicle and an anchor point for attaching cables or extrication tools.
Motor Vehicle Frames

- The unibody frame is used in most modern cars
  - Combines frame and body into single component
  - Allows for the manufacture of lighter weight vehicles
  - Does not have the frame rails found in platform frame vehicles.

Arrival and Size-Up: Traffic Hazards

- Determine where to locate your vehicle.
- Take into account emergency workers, victims, and motorists.
- Do not hesitate to request the road to be closed.

Arrival and Size-Up: Traffic Hazards

- Use large emergency vehicles to provide a barrier for motorists.
- Place apparatus at an angle to the crash.
- Place traffic cones or flares.
Arrival and Size-Up: Traffic Hazards

• Fire fighters need to be visible.
• Be alert for any vehicles that might cause you injury.
• The Incident Commander should perform a size-up.

Arrival and Size-Up: Fire Hazards

• Look for spilled fuels and other flammable hazards.
• Look for the presence of fire.
• Fire may trap the vehicle occupants and require suppression.

Arrival and Size-Up: Electrical Hazards

• Look for downed or damaged power lines.
• Determine whether the crash has damaged any electrical power poles.
Arrival and Size-Up:
Other Hazards

• Rain, sleet, ice, or snow
• Hazardous materials
• Infectious bodily fluids
• Sharp edges and objects
• Violent behavior by vehicle occupants
• Family pets

Stabilization: Traffic Hazards

• Traffic hazards
  – Need to be handled quickly
  – Are best handled by a law enforcement agency
    • If not on scene, verify that police have been dispatched

Stabilization: Fire Hazards

• Advance a charged hose line close to a damaged vehicle.
• Crashes that pose large fire hazards or actual fires may require additional fire suppression resources.
• Small spills can be handled by using an absorbent material.
Stabilization: Electrical Hazards

- Disconnecting the vehicle’s power source should be done following your local standard operating procedure.
- Downed power lines should be handled by the power company.

Stabilization: Other Hazards

- Heat and cold
- Lighting at night
- Wet and icy surfaces
- Sharp objects
- Infectious bodily fluids
- Animals

Cribbing

- Cribbing
  - Is used to stabilize a vehicle
  - Is lengths of wood used to prevent a vehicle from moving backward and forward.
Step Chocks

• Stop chocks are placed under the side of the vehicle
  – One toward front of vehicle
  – One toward rear of vehicle

Box Crib

• Standard cribbing can be used to form a box crib.
• Place cribbing at right angles to the preceding layer of cribbing.

Wedges

• Wedges
  – Are used to snug up loose cribbing or when using lift airbags
  – Should be the same width as the cribbing
Rescue Lift Air Bags

- Rescue lift air bags are used to lift a vehicle or object off a victim
- Always use cribbing when using rescue lift air bags.

Low-Pressure Lift Air Bags

- Low-pressure lift air bags
  - Are often used in recovery operations
  - Are sometimes used for vehicle rescue operations
  - Come in many shapes and sizes
  - Can be less stable until fully inflated

Medium-Pressure Lift Air Bags

- Medium-pressure lift air bags
  - Have either two or three cells inside their design
  - Work best when used in aircraft or truck rescue
High-Pressure Lift Air Bags

- High-pressure lift air bags
  - Are the most common air bags used by the fire service for rescue work
  - Are heavily constructed
  - Are generally made of vulcanized rubber mats reinforced by steel

Gaining Access to the Victim

- Open the door
  - Opening the door is the easiest and simplest way to gain access.
  - Try all doors.
  - Try the outside and inside handles at the same time if possible.

- Break tempered glass
  - Do not try to break through the windshield.
  - Side and rear windows will easily break.
  - If possible, break a window away from the victim
Gaining Access to the Victim

- Break tempered glass
  - Use a gloved hand to remove as much of the broken glass as possible to avoid injuring rescuers.
  - When glass is removed, try to unlock door.
  - Breaking the rear window will sometimes provide an opening large enough to gain access to the victim.

Gaining Access to the Victim

- Force the door
  - Door displacement may be difficult.
  - Choose a door that will not endanger the victim.
  - Use hand tools to bend the sheet metal away.

Provide Initial Medical Care

- As soon as you have secured access, provide emergency medical care.
- Care can be provided during extrication
- Get the victim stabilized and removed.
Disentangling the Victim

- The purpose of this step is to remove the parts of the vehicle that are trapping the victim.
- Perform only those procedures that are necessary to remove the victim safely.
- Protect the victim at all times.

Displace the Seat

- Attempt simplest steps first.
  - Move seat back on its track
  - Lower adjustable seat
- Perform a dash displacement if moving the seat back does not work.

Displace the Seat

- As a last resort, use a manual hydraulic spreader or a powered hydraulic tool to move the seat back.
- Remove seatback in some cases.
Remove the Windshield

- Windshields cannot be broken by spring-loaded center punches.
- Remove the windshield in one large piece.

Remove the Windshield

- The most common technique is using an axe.
  - Cut at the top of windshield.
  - Cut down the side next to the A post.
  - Lift window out of the frame.

Remove the Steering Wheel

- Removal of the entire steering wheel is possible using hand or power tools.
- One method is to cut the spokes as close to the hub as possible.
- The second method is to cut the hoop or ring.
- The steering wheel can be removed completely or by section.
Displace the Dashboard

• The objective is to lift the dash up and move it forward.
• Dash displacement requires a cutting tool, a mechanical high lift jack or hydraulic ram, and cribbing.

Displace the Roof

• Removing the roof has several advantages
  – Equipment can be passed to the provider.
  – The amount of space available is increased.
  – Visibility and fresh air supply are improved.
  – Feelings of panic are reduced.
  – A large exit route for the victim is provided.

One method is to cut the “A” posts and fold the roof back.
• Roof displacement can be accomplished with hand tools and power tools.
• Most new vehicles contain additional reinforcement beams.
Removing and Transporting the Victim

• The victim needs to be stabilized and packaged in preparation for removal.
• The amount of stabilization while in the vehicle should be limited.

Removing and Transporting the Victim

• Develop a plan for removal.
  – Needs to be directed by a designated person
• Make the process as seamless as possible.
• Transport to an appropriate medical facility.

Summary

• There are six main parts of a vehicle.
• Extrication should follow a series of steps.
• Four types of tools are commonly used to stabilize a vehicle.
• Four techniques may be used for gaining access to and disentangling the victim.
Summary

- There are six techniques that can be used to disentangle a victim from the vehicle.
- The last phase of extrication is removing and transporting the victim to the hospital.
Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe how firefighters assist and support special rescue teams.

Fire Fighter II Objectives

• Define the types of special rescues encountered by fire fighters.
• Describe the steps of a special rescue.
• Describe the general procedures at a special rescue scene.
Fire Fighter II Objectives

• Describe how to safely approach and assist at a vehicle or machinery rescue incident.
• Describe how to safely approach and assist at a confined-space rescue incident.
• Describe how to safely approach and assist at a rope rescue incident.

Fire Fighter II Objectives

• Describe how to safely approach and assist at a trench and excavation rescue incident.
• Describe how to safely approach and assist at a structural collapse rescue incident.
• Describe how to safely approach and assist at a water or ice rescue incident.

Fire Fighter II Objectives

• Describe how to safely approach and assist at a wilderness search and rescue (SAR) incident.
• Describe how to safely approach and assist at a hazardous materials rescue incident.
• Describe how to safely respond to an elevator or escalator rescue.
Introduction

• Fire departments have taken on added roles as the number of fires and amount of loss from fire have decreased.
  – Emergency medical services
  – Hazardous materials response
  – Technical rescue responses

Introduction

• A technical rescue incident (TRI) involves:
  – Vehicles or machinery
  – Water or ice
  – Rope techniques
  – Trench, excavation, or structural collapse
  – Confined spaces or hazardous materials
  – Wilderness search and rescue

Introduction

• Training in TRI is conducted at three levels:
  – Awareness
  – Operations
  – Technician
Types of Rescues

- Machinery and vehicle rescue
- Confined-space rescue
- Rope rescue
- Trench and excavation rescue
- Structural collapse rescue
- Water and ice rescue
- Wilderness rescue
- Hazardous materials incidents
- Energized electrical line emergencies

It is important for awareness-level responders to have an understanding of special rescues.
- A formal course is required to gain proficiency.

Guidelines for Operations

- When assisting rescue team members, follow five guidelines:
  - Be safe.
  - Follow orders.
  - Work as a team.
  - Think.
  - Follow the Golden Rule of public service.
Be Safe

- Look for hidden hazards.
- Have the knowledge and training to recognize a situation as hazardous.
- Determine the necessary actions to ensure safety of yourself, your team members, victims of the incident, and bystanders.

Follow Orders

- Your officers and the rescue teams have received extensive training.
- It is critical that you follow orders exactly as they are given.
- Grasping paramilitary attitudes will facilitate understanding of the command and control aspect of fire departments.

Work as a Team

- Team members must work together to complete the goal.
- Rescue is a different goal but requires the same team effort.
- Your role in the team rescue effort is essential.
Think

- Constantly assess and reassess the scene.
- As a firefighter, bring the following observations to a superior officer’s attention:
  - Changing weather conditions
  - Suspicious packages or other items
  - Broken equipment

Follow the Golden Rule of Public Service

- Remember that the victim needs your emotional support and encouragement.
- It is helpful to tell the victim what actions will be performed during the rescue process.

Steps of Special Rescue

- Preparation
- Response
- Arrival and size-up
- Stabilization
- Access
- Disentanglement
- Removal
- Transport
- Security of the scene and preparation for the next call
- Postincident analysis
Preparation

- Know the terms used in the field.
- Know the hazards in your response area.
- Before responding, address:
  - Whether the department is equipped to do so
  - Whether the department meets NFPA and OSHA standards for TRI calls
  - How the department will respond

Response

- A TRI should have a dispatch protocol.
- An agency with its own TRI team:
  - Responds with rescue squad
- An agency without a TRI team:
  - The authority with jurisdiction should arrange for necessary resources and personnel

Response

- Many technical rescues involve factors, such as electricity or sewer pipes, that may require heavy equipment to which utility companies have ready access.
Arrival and Size-Up

- The first company officer assumes command
- The most important part of any rescue is:
  - Identification of hazards
  - Decision of recovery versus rescue

Arrival and Size-Up

- Do not rush into the incident.
  - Stop and think about possible dangers.
  - Do not make yourself part of the problem.
- Be alert for invisible dangers
  - Electrical hazards
  - Oxygen deficient/poisonous atmospheres

Stabilization

- Once resources are on the way and the scene is safe to enter:
  - An outer perimeter is established to keep out media and the public (cold zone).
  - A smaller perimeter is set up around the rescue (warm and hot zones).
- Rescue area surrounds the incident site.
Stabilization

• Hot zone
  – For entry teams and rescue teams only
• Warm zone:
  – For properly trained and equipped personnel
• Cold zone:
  – For staging vehicles and equipment

Stabilization

• Zones should be established by identifying and evaluating hazards at the scene:
  – Observe the geographical area.
  – Note the routes of access and exit.
  – Observe weather and wind conditions.
  – Consider evacuation problems and transport distances.

Stabilization

• Lockout/tagout systems should be used to secure a safe environment.
  – Ensures that electricity has been shut down and electrical switches are “locked” so they cannot be switched on.
Stabilization

- Be alert for electrical hazards.
- Atmospheric monitoring should also be started to identify situations immediately dangerous to life and health (IDLH) of rescuers and victims.

Access

- Communicate with victim at all times during rescue.
- Initiate emergency medical care as soon as access is made to the victim.

Disentanglement

- Free victim as safely as possible.
- A team member should remain with the victim to direct rescuers during disentanglement.
Removal

• Prepare the victim for removal by packaging the victim.
• Consider rapid extrication.
• Maintain safety throughout removal.

Transport

• Remove victim from hazard area.
• Transport to proper medical facility.
  – The type of transport will depend on the severity of the injuries and the distance to the nearest medical facility.
• Address rehabilitation needs of rescue personnel.

Postincident Duties

• Secure the scene and prepare for next call.
• Repair or replace equipment.
• Do the recordkeeping.
• Perform a postincident analysis.
General Rescue Scene Procedures

- Evaluate the situation before approaching the victim or accident area.
- Consider the hazards
  - Utilities
  - Hazardous materials
  - Confined spaces
  - Environmental conditions

Approaching the Scene

- From the initial dispatch of the rescue call, the firefighter should be compiling facts from the call.
- Size-up begins with the information gained from the person reporting the incident and then from the bystanders at the scene on arrival.
- Information received in an emergency call is important to the overall success of the rescue operation.

Approaching the Scene

- Information received in an emergency call:
  - Location of incident
  - Nature of incident
  - Condition and position of victims, vehicles, building, structure, terrain
  - Number of victims
  - Any specific or special hazard information
  - Name and number of person calling
Approaching the Scene

- A size-up should include:
  - Scope and magnitude of the incident
  - Risk-benefit analysis
  - Hazards
  - Access to the scene
  - Environmental factors
  - Available and necessary resources
  - Establishment of control perimeter

Utility Hazards

- The Incident Commander (IC) should ensure proper procedures have been taken to shut off utilities.

Utility Hazards

- For electrical hazards:
  - Park at least one truck span away.
  - Do not touch any wires, power lines, or other electrical sources until they have been deactivated by a power company representative.
  - Remember that it is not just the wires that are hazardous; any metal that they touch is also energized.
Utility Hazards

• Both natural gas and liquefied petroleum gas are nontoxic but classified as asphyxiants.
  – They displace breathing air.
  – Both are explosive.
• Call the gas company.
• Take appropriate measures if a victim has been overcome by leaking gas.

Scene Security

• IC should coordinate with law enforcement to secure and control the scene.
• Maintain a strict accountability system to control access to the rescue scene.

Protective Equipment

• Firefighting gear restricts movement.
• Most specialist teams carry harnesses; small, light helmets; and jumpsuits, which are easier to move in.
Incident Command System (ICS)

- The first-arriving officer assumes command and starts using the ICS.

Accountability

- Accountability
  - Should be practiced at all emergencies
  - Ensures safety
  - Tracks personnel on scene
    - Identities
    - Assignment
    - Location

Making Victim Contact

- Attempt communication with victim.
- Reassure the victim of his or her safety.
Making Victim Contact

• To help keep a victim calm:
  – Make and keep eye contact with the victim.
  – Tell the truth.
  – Communicate at a level he or she can understand.
  – Be aware of your own body language.
  – Always speak slowly, clearly, and distinctly.

• To help keep a victim calm (cont’d):
  – Use the victim’s proper name.
  – Speak clearly and directly to the victim.
  – Allow time for the victim to respond to your questions.
  – Try to make the victim comfortable and relaxed.

• Many victims require medical care.
  – Medical care should only be given if it can be done so safely.
  – Do not become a victim during a rescue attempt.
Assisting Rescue Crews

- Train with rescue teams.
- Three factors apply to all scenes:
  - Approach cautiously.
  - Position apparatus properly.
  - Assist the specialized team as needed.

Vehicles and Machinery

- Motor vehicle crashes are common incidents.
  - Safely approach the vehicle.
  - Maintain safety of incident.

Vehicles and Machinery

- You may have to assist with extrication and treatment of victims.
- Victims should be protected when equipment is being operated.
- You may be asked to do many other tasks.
- Many tools are required for a successful vehicle or machinery rescue situation.
Confined Space

- A confined space
  - Is an enclosed area that is not designed for people to occupy
  - May be oxygen deficient or contain poisonous gases
- An IDLH atmosphere should always be assumed.
- Confined space rescues take time.

Confined Space

- Your role is to secure the scene.
- Share information with other arriving companies.
  - Complete a size-up on arrival.
  - Observe conditions.
  - Note items of importance.

Confined Space

- A supplied air respirator system is a key component in a confined space rescue.
- Many tools are used in confined space rescue.
Rope Rescue

- Rope rescue skills
  - May be used in a variety of incidents.
  - Are divided into two categories.
    - Low-angle operations
    - High-angle operations

Trench and Excavation Collapse

- Trench and excavation collapse occurs when earth has been removed and sides collapse.
- Being near the edge can cause further collapsing of sides.

- The soil pile is the soil removed from excavation and placed in a pile.
- Contact should be attempted with victims.
- Various tasks may be assigned to you and your company during the rescue.
- Many different tools will be used.
Structural Collapse

- Structural collapse is the sudden and unplanned fall of a building
  - Collapse can occur for numerous reasons.
  - Building construction should be considered.
  - The dynamics of a building change.
  - Firefighters should always be alert for secondary collapse.

Be aware of safety when approaching.
- Shutting off utilities to the structure should be considered.
- IC makes the decision regarding whether a building is safe to enter.

Rescue operations vary due to the size of the structure and the amount of damage.
Many tools are used during a building collapse incident.
Water and Ice Rescue

- Almost all fire departments have the potential to be called to perform a water rescue.
- Safety is key.
  - Turnout gear is not designed for water rescue.
  - Gear designed for water rescue should be used.
  - If you are within 10 feet of water, wear a personal flotation device (PFD).

Water and Ice Rescue

- Communication with the victim should be attempted.
- Ice rescues are common in colder climates.
- There are many ways to assist.
- The fire fighter should be familiar with the tools used.

Wilderness Search and Rescue

- Wilderness search and rescue is conducted by a limited number of fire departments.
  - Search is defined as looking for a lost or overdue person.
- Rescue, in the SAR context, is defined as removing a victim from a hostile environment.
- Wilderness can include many varied environments.
Wilderness Search and Rescue

• There are many opportunities to assist with SAR.
• Always work in teams of two or more.
• Tools used for SAR are often tools used with other rescue situations.

Hazardous Materials Incidents

• Hazardous materials
  – Are any material or substance that poses a significant risk to the health and safety of persons or to the environment if it is not properly handled
  – Often involve petroleum products
• Many retail businesses contain hazardous materials.

Hazardous Materials Incidents

• Fire departments are trained to recognize incidents.
• Safety is paramount when dealing with a hazardous materials incident.
Hazardous Materials Incidents

• You must have proper training to assist with a hazardous materials incident.
• Hazardous materials incidents require the use of many tools.

Summary

• A technical rescue incident (TRI) is a complex rescue incident.
• Training in technical rescue areas is conducted at three levels: awareness, operations, and technician.
• Several types of TRIs are encountered by fire fighters.

Summary

• Fire fighters should take formal courses to gain specialized knowledge and skills.
• Five guidelines must be kept in mind when assisting rescue teams.
• Fire fighters should know the basic steps of special rescue operations.
Summary

• Facts and factors should be collected starting with the initial dispatch.
• Size-ups should include initial and continuous evaluation of several main issues.
• Special precautions should be taken after sizing up the scene.

Summary

• Orders of the company officer should always be followed at any type of TRI.
• Vehicle and machinery rescues occur in many settings.
• Adequate air supply should be ensured when working in a confined space.

Summary

• Low- and high-angle rope rescues require safe equipment and adequate training.
• Trench and excavation rescues are hazardous.
• A damaged building is prone to structural collapse.
• Water rescue training is necessary.
Summary

- Wilderness rescue is necessary even when initial access to a lost or stranded individual occurs quickly.
- Hazardous materials incidents are not always dispatched as such.
- Never attempt to move or relocate an elevator.
Lesson 11-2 Fire Prevention and Public Education

Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe how to conduct fire prevention and public education activities.

Fire Fighter II Objectives

• Describe the activities that prevent fires and limit their consequences if fire occurs.
• Identify elements of public fire safety education programs covering stop, drop, and roll; exit drills in the home (EDITH); the selection and use of portable fire extinguishers; and the importance of smoke alarms and residential sprinkler systems in preventing fire deaths.
Fire Fighter II Objectives

• Explain the importance of residential sprinkler systems in preventing residential fire deaths.
• Stress the importance of having portable fire extinguishers.

Fire Fighter II Objectives

• Recognize hazards during a fire safety survey of an occupied structure.
• Describe the steps in conducting a fire station tour.

Introduction

• Fire prevention is critical.
• Most fires are caused by
  – Unsafe or careless acts, equipment failure, arson, or acts of nature
• Many fires can be prevented.
What Is Fire Prevention?

- Fire prevention is a range of activities that are intended to prevent the outbreak of fires or to limit the consequences if a fire occurs
  - Enacting and enforcing fire codes
  - Conducting property inspections
  - Presenting fire safety education
  - Performing fire cause investigation

Enactment of Fire Codes

- Fire Codes
  - Are regulations that have been legally adopted by a governmental body
  - Are enacted to ensure a minimum level of fire safety in the home and workplace environments
  - Are enforced through a legal process

Enactment of Fire Codes

- Fire codes address a wide range of issues relating to fire and safety.
- Most communities adopt and enforce a full set of codes.
- The fire code generally includes regulations designed to prevent fires from occurring, to eliminate fire hazards, to protect lives, and to limit fire losses.
Enactment of Fire Codes

• Fire codes
  – Are closely related to building codes
  – Apply to all buildings and to many different situations

Inspection and Code Enforcement

• Citizens have a legal obligation to comply with the rules and regulations.
• Fire codes usually specify the types of occupancies and frequency of inspections.
  – The agency responsible for inspection and enforcement is usually named in the fire code.
• In many cases the fire code does not apply to the interior of a private dwelling.

Public Fire and Life Safety Education

• The goal of public fire and life safety education is to help people understand how to prevent fires from occurring and teach them how to react if a fire occurs.
  – Also teaches techniques to reduce the risk of death or injury
  – Is designed to prevent other types of unintentional incidents and injuries
Public Fire and Life Safety Education

• Fire safety education programs:
  – Stop, drop, and roll
  – Exit Drills In The Home (EDITH)
  – Installation and maintenance of smoke alarms
  – Advantages of residential sprinkler systems

Public Fire and Life Safety Education

• Fire safety education programs (cont'd):
  – Selection and use of portable extinguishers
  – Learn Not to Burn
  – Change Your Clock—Change Your Battery
  – Fire safety for special populations
  – Bike safety
  – Fall prevention
  – Wildland fire prevention

Public Fire and Life Safety Education

• A fire station tour
  – Is another common fire safety education activity.
  – Is enjoyed by both children and adults
  – Is an excellent opportunity to promote fire prevention
Education Programs—Stop, Drop, and Roll

- Stop, Drop and Roll is designed to instruct people what to do if their clothing catches fire.
  - Stress each step of the sequence.
  - Stress prevention techniques.
  - Remind students that a blanket and a garden hose can be used to extinguish the fire.

Education Programs—Exit Drills in the Home (EDITH)

- EDITH teaches residents how to safely exit the home in the event of a fire or other emergency
  - Stress the importance of
    - Properly working smoke alarms
    - Keeping bedroom doors shut during sleeping hours
    - Having two escape routes from every bedroom
    - Occupants alerting other occupants
    - Touching a closed door to see if it is hot

Education Programs—Smoke Alarms

- Properly installing and maintaining smoke alarms
  - Stress the importance of
    - Having a working smoke detector on each floor
    - Having a smoke detector outside each sleeping area
    - Testing alarms once a month
    - Changing the battery twice a year
Education Programs—Residential Fire Sprinkler Systems

- The combination of smoke alarms and residential fire sprinklers can reduce the risk of fire death by 82%.

Education Programs—Selection and Use of Portable Fire Extinguishers

- Many groups visiting the fire station will have questions about what type of fire extinguishers should be installed.

Conducting a Fire Safety Survey in a Private Dwelling

- Conducting a fire safety survey in a private dwelling
  - Helps identify fire and life-safety hazards and provides the homeowner or occupants with recommendations
  - Cannot be conducted without the owner’s or occupant’s permission
  - Is a joint effort by the fire department and the homeowner or occupant
Getting Started

- Present a neat, professional image.
- Identify yourself.
- Inform the homeowner of the purpose.
- Remember that you are a guest.

Getting Started

- Concentrate on the hazard categories that most often cause residential fires.
- Look for fire protection equipment.
- Conduct the survey in a systematic fashion.

Outside Hazards

- Ensure the house number is visible.
- Look for accumulated trash.
- Note any flammable materials.
Outside Hazards

• Consider shrubs and vegetation that need to be trimmed or removed.
• Determine the condition of the mortar in the chimney.
• Ask if the chimney has been cleaned.

Inside Hazards

• Explain potential fire risks and hazards.
• Identify alternate escape routes.
• Mention the importance of EDITH involving all family members.

Inside Hazards: Smoke Alarms

• Verify and test all smoke alarms.
• Give residents a copy of the National Fire Protection Association (NFPA) fact sheet on smoke alarms.
Inside Hazards: Smoke Alarms

• Smoke alarm tips:
  – Install in or near every bedroom.
  – Mount on ceiling or high on a wall.
  – Do not locate near windows, exterior doors, or duct vents.
  – Have only qualified electricians install or replace AC-powered alarms.

Inside Hazards: Smoke Alarms

• Smoke alarm tips (cont’d):
  – Test at least once a month by using the “test” button.
  – Dust and vacuum regularly.
  – Replace alkaline batteries twice a year.

Inside Hazards: Bedrooms

• Common causes of fires in bedrooms:
  – Defective wiring
  – Improper use of heating devices
  – Improper use of candles
  – Children playing with matches
  – Smoking in bed
Inside Hazards: Kitchens

- Kitchen fires are often caused by leaving cooking food on the stove unattended and by faulty electric appliances.
- An approved ABC-rated fire extinguisher should be in the kitchen.

Inside Hazards: Living Rooms

- Primary causes of fires in living rooms are smoking and electrical equipment.
- If the room contains a fireplace or wood stove, ensure that no flammable or easily ignited materials are stored nearby.

Inside Hazards: Garages, Basements, and Storage Areas

- Clearing accumulated junk from garages, basements, and storage areas is important.
- Gasoline and other flammable substances should be stored only in approved containers.
- A fully charged fire extinguisher is recommended for basements and garages.
Inside Hazards: Closing Review

- Listen carefully to any questions from the homeowner or occupant.
- Complete the inspection form and give a copy to the family.
- Review the findings and describe the steps that need to be taken.
- Talk to the entire family.

Inside Hazards: Closing Review

- Emphasize the importance of smoke alarms, home exit plans, and fire drills.
- File your report according to the standard operating procedures of your department.
- Identify hazards that require further action or follow-up.

Conducting Fire Station Tours

- Help people learn how the fire department operates and how it prevents fires.
- Remember that you will represent your department.
- In your welcome, tell the visitors what they should do if the station receives an alarm.
Conducting Fire Station Tours

• The tour format will vary, depending on the age and interests of the group.
  – Young children like to see action.

Courtesy of Captain David Jackson, Saginaw Township Fire Department

Conducting Fire Station Tours

• Teenagers are ready for lessons that they can apply in everyday life.
• Adults are probably more interested in home fire safety.

Conducting Fire Station Tours

• Leave every tour group with both a message and materials.
Summary

• Fire prevention is as important as fire suppression.
• Fire prevention includes a range of activities intended to prevent the outbreak of fires or limit the consequences if a fire occurs.
• The highest priority is to prevent fires.

Summary

• Fire codes ensure a minimum level of fire safety in the home and workplace.
• Public education techniques reduce fire injury or death.
• Public fire and life safety education programs are based on a variety of topics.

Summary

• The stop, drop, and roll program instruct people what to do if their clothing catches on fire.
• EDITH teaches residents how to safely get out of their homes in the event of a fire or emergency.
• Safety presentations also cover installation and maintenance of fire alarms.
Summary

- Many fire departments conduct safety surveys in public dwellings.
- During a home fire safety survey, consider several types of hazards and issues.
- Most fire departments have a set format for conducting fire station tours.
- Leave every tour group with both fire prevention message and materials.
Lesson 12-1 Fire Cause Determination

Student Performance Objective

• Given information from handouts, text, and discussion the student will be able to describe the role of the firefighter in determining fire cause, protecting evidence, and securing and protecting a fire scene.

Fire Fighter II Objectives

• Describe the point of origin.
• Define the chain of custody.
• Describe the role and relationship of the Fire Fighter II to criminal investigators and insurance investigators.
• Describe how to assist the fire investigators in the process of digging out the fire scene.
• Describe the types of evidence that may be uncovered at a fire scene.
Fire Fighter II Objectives

- Describe techniques for preserving fire-cause evidence.
- Describe the steps needed to secure a property.
- Explain the importance of protecting a fire scene to aid in cause determination.
- Describe the common motives of an arsonist.

Who Conducts Fire Investigations?

- The chief of the department has a legal responsibility to determine the causes of fires.
- Many departments automatically dispatch an investigator to structure fires and any other unusual fire.

- Other departments may require an investigator only when damage exceeds a predetermined level or when there are injuries or fatalities.
- The incident commander may be expected to conduct a preliminary investigation and decide whether an investigator is needed.
Who Conducts Fire Investigations?

- Fire fighters must serve as the eyes and ears of the investigator.
- Fire cause investigation should not be confused with a criminal investigation.
- The investigator should never have a preconceived idea about what started the fire.

Law Enforcement Authority

- Investigation determines:
  - Cause and origin of the fire
  - Who was responsible for starting the fire
  - What sequence of events led up to the fire
- Whether a fire investigations unit has police powers depends on state and local laws.

Investigation Assistance

- A state fire marshal or similar authority may have an investigations unit.
- Federal resources are also available for major investigations.
- Insurance companies often investigate fires.
Determining the Origin and Cause of a Fire

• A scientific method and systematic analysis are needed to determine origin and cause of a fire.

Identifying the Point of Origin

• Depth of char
  – Depth of char is related to the intensity of the fire at a particular location
  – Charring is usually deepest at the point of origin.

Identifying the Point of Origin

• Burn patterns and smoke residue can be helpful in identifying the area of origin.
  – A charred V-pattern indicates that the fire spread up and out from something at the base of the V.
Digging Out

- Digging out is the process of carefully looking for evidence within the debris
  - Remove and inspect the debris, layer by layer, from the top of the pile down to the bottom.

- Removing and inspecting debris enables the investigator to determine:
  - The sequence in which items burned
  - If an item burned from the top down or from the bottom up
  - How long the item burned

Evidence

- Evidence
  - Is all information gathered and used by an investigator in determining cause
  - Can be used in a legal process to establish a fact or prove a point
Physical Evidence

• Physical evidence is items that can be observed, photographed, measured, collected, examined in a laboratory, and presented in court
• Example: Burn pattern

Trace Evidence

• Trace evidence
  – Is also called transfer evidence
  – Is a minute quantity of physical evidence that is conveyed from one place to another

Demonstrative Evidence

• Demonstrative evidence is anything that can be used to validate a theory or to show how something could have occurred
Direct and Circumstantial Evidence

- Direct evidence
  - Facts that can be observed or reported firsthand
- Circumstantial evidence
  - Information that can be used to prove a theory

Preservation of Evidence

- Firefighters who discover something that could be evidence should:
  - Leave it in place.
  - Make sure that no one interferes with it or the surrounding area.
  - Notify a company officer or fire investigator immediately.

Preservation of Evidence

- If evidence could be damaged or destroyed during fire suppression, cover it with some type of protection.
- Evidence should not be contaminated or altered from its original state in any way.
Chain of Custody

- Chain of custody
  - Is also known as chain of evidence or chain of possession
  - Is a legal term that describes the process of maintaining continuous possession and control of the evidence from the time it is discovered until it is presented in court

- Every step involving evidence must be properly documented.
- Each successive transfer of possession must be recorded.

- Collecting and processing evidence
  - Take photographs of each piece of evidence.
  - Sketch, mark, and label location of evidence.
  - Place evidence in appropriate containers.
  - Tag all evidence.
  - Record the time found, location, and name.
  - Keep a constant watch on the evidence.
  - Preserve the chain of custody.
Identifying Witnesses

- People who were on the scene when fire fighters arrived could have invaluable information about the fire.
- Interviews with witnesses should be conducted by the fire investigator or by a police officer.

Do not make statements of accusation, personal opinion, or probable cause to anyone other than the investigator.
Never make jesting remarks or jokes.

Securing and Transferring the Property

- Maintaining site integrity is critical to the fire investigation.
- A fire fighter should accompany anyone who enters the premises for any reason until the scene is released.
Securing and Transferring the Property

• Until the investigator arrives on the scene:
  – Suspend salvage and overhaul, and secure the scene.
  – Photograph the fire scene extensively.
  – If factors could destroy the evidence, take steps to preserve it in the best way possible.

Securing and Transferring the Property

• The property should be secured by cordonning off the area with fire- or police-line tape.
• Before leaving the scene, make sure that the building is properly secured and no hazards to public safety exist.

Securing and Transferring the Property

• When fire department operations are over, the property will be returned to the owner.
  – This should not be done until the investigation is complete and all evidence is collected.
Incendiary Fires

- Arson fires have several distinct, recognizable patterns or indications.
  - Multiple points of origin or simultaneous fires
  - Trailers made from combustible materials
- An incendiary device is a device used to start a fire or explosion.

Incendiary Fires

- Evidence of an ignitable liquid often indicates an incendiary fire.
  - Extensive burn damage on a floor could indicate that an ignitable liquid was poured and ignited.
- Sometimes the first indications of a possible arson fire are circumstantial.

Cause Determination

- Fire investigation involves more than determining cause and origin.
- Fire investigation also determines
  - Whether the fire code had been followed by the owner.
  - If the fire protection equipment operated properly.
  - Whether codes may need to be changed or updated.
Arsonists

- Two groups are responsible for a large number of fires:
  - Pyromaniacs
  - Juvenile fire-setters.
- Many other arsonists start fires.

Pyromaniacs

- Pathological fire-setters
  - Are more often adult males, often loners
  - Are usually introverted, polite, timid
  - May have difficulty relating to other people

Juvenile Fire-Setters

- Juvenile fire-setters are usually divided into three groups:
  - 8 years old and younger
  - 9 to 12 years old (pre-adolescent)
  - 13 to 17 years old (adolescent)
- Children younger than 8 years are seldom criminally motivated when they set fires.
Pre-adolescent Fire-Setters

- Pre-adolescent fire-setters
  - Do not venture far from home
  - Usually do not use elaborate trailers or incendiary devices
  - May use fire to cover vandalism and theft

Adolescent Fire-Setters

- Adolescent fire-setters
  - Set fires similar to those set by adults.
  - Have the same motivations of adult fire-setters.
  - Are responsible for two-thirds of fires set in vacant buildings.
  - May vandalize the scene.

Arsonist Motives

- Vandalism
- Excitement
- Revenge
- Crime concealment
- Profit
- Extremism
Summary

• Determining the causes of fires allows fire departments to prevent future fires.
• The size of the fire department and fire determines who performs the investigation.
• Fire fighters must be careful to preserve evidence.
• Fire investigation includes locating the point of origin, determining the fuel used, and identifying the ignition source.

Summary

• Fire investigation should be performed by specific individuals.
• Origin and cause determine where, why, and how the fire originated.
• Points of origin indicate where an ignition source comes into contact with the fuel supply.

Summary

• Fire investigation prevents future fires.
• Most fires and fire deaths occur in residential occupancies.
• Sometimes a fire destroys evidence.
• According to NFPA 921, a scientific method and systematic analysis are needed to determine origin and cause of a fire.
Summary

- Fire investigators look for clues to determine the cause of the fire.
- Depth of char, burn patterns, and smoke residue are not conclusive evidence.
- Fire fighters may be asked to assist in digging out the fire scene.
- There are five types of evidence.

Summary

- Fire fighters have a responsibility to preserve evidence.
- Physical evidence must be protected.
- The fire investigator must follow five specific steps.
- Fire fighters can identify fire witnesses.

Summary

- Fire fighters must take into account 13 factors in identifying and preserving evidence.
- The building and premises must be secured and guarded until the fire investigator has finished gathering evidence.
Summary

• If a fire investigator is not immediately available, the premises should be guarded.
• Incendiary fires are those that are started for malicious or criminal intent.
• Arson fires have distinct, recognizable patterns or indications.

Summary

• Fire fighters have more involvement than determining the cause of the fire.
• Arsonists deliberately start fires with criminal intent.
• NFPA 921 identifies six common motives of arsonists.
Lesson 13-1 Command, Response, and Size-Up

Student Performance Objective

- Given information from handouts, text and discussion, the student will be able to describe how to size-up an emergency incident, assume command, and institute an Incident Action Plan.

Enabling Objectives

- Describe the process of performing an Initial Size-up
- List the two basic categories of information used in the size-up process
- Explain how the size-up process determines the resources required at the emergency incident.
- List the five objectives of an Incident Action Plan
Assuming Command
• The officer or acting officer of the first-arriving unit is responsible for taking initial actions and assuming command of the incident
  – This individual is responsible for managing the operation until relieved by a senior officer
• The individual who assumes command must formally announce over the radio

Brief Initial Report (BIR)
• The BIR is a size up report of the situation upon arrival at the incident
  – Initial status report
  – Initial actions being taken
  – Additional resources required
  – Individual assuming command

Brief Initial Report (BIR)
• Example: “Engine 4 is on location, 123 Main Street with fire showing from Side B of a 2-story frame dwelling. Engine 4 is making an interior attack. Request police for traffic control. Engine 4 assuming Main Street command.”
Size-Up

- Size-up
  - Is the systematic process of gathering information and evaluating the incident
  - Is the first step in making plans to bring the incident under control
  - Can be revised as additional information is gathered
  - Relies on two categories:
    - Facts
    - Probabilities

Facts

- Initial dispatch information
  - Location
  - Nature of the incident
- Time of day, day of week
- Temperature
- Weather conditions
- Pre-incident plan
  - Building construction, layout occupancy
  - Age of building and special hazards

Facts

- On-scene observations – the initial company officer must do a 360-degree observation for fire and smoke conditions
  - Reading smoke
    - Volume
    - Velocity
    - Density
    - Color
  - Size and location of fire
  - Immediate life hazards
Probabilities

- Probabilities are events that can be reasonably assumed, predicted, or expected to occur.
  - Need for the rescue of occupants
  - Predicted fire spread due to building construction
  - Possibility of explosion or collapse
  - Change in weather conditions

Probabilities

- Resources needed to conduct emergency operations
  - Apparatus
  - Personnel
  - Water supply
  - Special extinguishing agents
  - Other agencies/equipment/logistics

Incident Action Plan (IAP)

- Based on the information obtained during size-up, the IC must develop an Incident Action Plan (IAP) that outlines his/her strategy to control the situation.
- The IAP should be based on the five basic fireground objectives which are listed in order of priority.
  - Life Safety
  - Protecting exposures
  - Confinement of the fire
  - Extinguishment
  - Salvage and overhaul
Incident Action Plan (IAP)

- These objectives are not separate and exclusive. More than one of objective can be addressed at the same time and some activities may achieve more than one objective.

Incident Action Plan (IAP)

- Life Safety—rescue is the first consideration at any fire or other emergency incident; this includes the emergency personnel
  - The need for rescue depends upon the number of people in danger, the degree of risk, and survivability profile.

Incident Action Plan (IAP)

- Exposure protection—keep the fire from spreading beyond the area of origin or involvement upon your arrival
  - Room
  - Floor
  - Building
Incident Action Plan (IAP)

• Confinement—confine the area of involvement
  – Room
  – Floor
  – Building

Incident Action Plan (IAP)

• Extinguishment—apply the proper extinguishing agent in the proper quantity and method to extinguish the fire
  – Offensive attack versus defensive attack
  – Size of attack lines/types of nozzles

Tactical Objectives

• Tactical objectives are the assignment of tasks to various engine and truck companies to meet the planned strategies
  – Fire situation: Two-story framed dwelling—room and contents fire
    • Engine 1—advance 1¾” line to the second floor to attack the fire
    • Truck 2—horizontal ventilation of roof to support fire attack
    • Engine 2—primary search of residence to account for all occupants
    • Engine 3—RIT team duties
Incident Management System

• Safety Officer
• Divisions/Groups
• Staging Officer
• Water Supply Officer

Scenarios

• Scenario #1
  – Vehicle Fire with Exposure
  – Single Engine Company Response

Scenario #1
Scenarios

• Scenario #2
  – Dwelling Fire – fire reported in the kitchen
  – Box Alarm response

Scenario #2

Scenarios

• Scenario #3
  – Townhouse Fire – room and contents
  – Box Alarm response
Scenario #3

Scenarios

- Scenario #4
  - Fire alarm sounding – Holiday Inn
  - Box Alarm response
Scenarios

• Scenario # 5
  – Smoke Investigation – smoke coming from dwelling across the street
  – Single engine company response

• Scenario # 6
  – Fire involving large LPG storage tank
  – Box Alarm/HazMat Response
Scenario #6

FIRE 201-PPT-13-1-30

Scenarios

- Scenario #7
  - Dwelling Fire – fire reported in the bedroom
  - Box Alarm

Scenario #7

FIRE 201-PPT-13-1-32
Review

- Describe the process of performing an Initial Size-up
- List the two basic categories of information used in the size-up process
- Explain how the size-up process determines the resources required at the emergency incident.
- List the five objectives of an Incident Action Plan

Student Performance Objective

- Given information from handouts, text and discussion, the student will be able to describe how to size-up an emergency incident, assume command, and institute an Incident Action Plan.