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.
Truck Company Fireground Operations

Lesson 1-1
Introduction to Truck Company Fireground Operations

Maryland Fire and Rescue Institute

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe truck company fireground operations.

Overview

- Truck Company Responsibilities
- Fire Spread
- Truck Company Operations
Truck Company Responsibilities

- Duties of the truck company are
  - Challenging
  - Dangerous

Performing tasks requires
- Training
- Equipment
- Staffing

Assignments of the truck company
- Primary search
- Rescuing victims
- Forcing entry
- Ventilation techniques
- Salvage and overhaul
Truck Company Responsibilities

- Personnel of the truck company must
  - Be disciplined
  - Follow SOGs
  - Work within the IMS
  - Be accountable to command
  - Follow direct orders

Truck Company Responsibilities

- Operations of the truck company
  - Support the six basic objectives of a firefighting operation
    - Rescue victims
    - Protect exposures
    - Confine the fire
    - Extinguish the fire
    - Provide property conservation
    - Overhaul the fire

Truck Company Responsibilities

- Operations of the truck company
  - Include property conservation
    - May be assigned to any firefighter
    - Is often tasked to the truck company
Fire Spread

**Convection**
- Is the travel of heat through the motion of heated matter
- Moves products of combustion in predictable patterns
- Is the main reason for ventilation activities in fire department operations
- Allows for rapid fire spread

Fire Spread

**Convection**
- Is the reason for fire codes in older buildings over 75 feet tall
- Is the reason for modern fire codes in structures over three stories
- Eventually fills an area with super heated gases

Fire Spread

**Radiation**
- Is the travel of heat through space
- Causes heat to travel away from the fire in a straight line
- Is unaffected by wind
- Spreads heat evenly in all directions
- Spreads heat which forces firefighters back
Fire Spread

Radiation
- May force the use of master streams
- Creates a greater exposure hazard than convection or conduction
- May cause flashover long before flames reach fuel
- Maintains a high heat presence even after proper ventilation

Fire Spread

Conduction
- Is the travel of heat through a solid body
- Is the least of the fireground problems
- Can take heat through walls and floors
- Is dependent on the time that heat is applied to a structural member

Fire Spread

Conduction
- Works in all directions
- May cause steel components and roof supports to fail/collapse
- May be stopped by hose streams
- Must be considered as a source of fire spread during firefighting operations
Fire Spread

Flashover
- Is the ignition of combustibles in an area heated by convection, radiation, or a combination of the two
- Can be a sudden ignition in a particular location

Fire Spread

Flashover
- May exhibit rapid fire spread or a “flash” of an entire area
- May be caused by convection at the top of a structure
- Is not usually caused by radiation alone

Fire Spread

Smoldering fire
- Is a result of the products of combustion filling the compartment
- Creates a very dangerous situation
Fire Spread

- Backdraft
  - Is a rapid spread of fire or a violent explosion
  - Is caused by the improper addition of oxygen
  - Can be prevented through proper ventilation and attack procedures

Truck Company Operations

- Truck companies go by many different names
  - Ladder companies
  - Hook and ladder companies
  - Aerial companies
  - Elevating platform companies
  - Tower ladder companies
  - Snorkel companies

Truck Company Operations

- Truck companies have many tasks
  - Conduct the primary search
  - Rescue trapped victims
  - Ventilate the building
  - Ladder the building
  - Force entry
Truck Company Operations

- Truck companies have many tasks
  - Check for fire extension
  - Provide property conservation
  - Control utilities
  - Perform overhaul
  - Perform salvage
  - Operate elevated master streams

Truck Company Operations

- A defensive fire attack may require very few tasks; a working fire with a rescue may involve many

Truck Company Operations

- Truck companies follow and develop SOGs and preplans
  - Truck companies should have a good knowledge of first-due areas
  - Truck companies conduct a size-up of all fire scenes
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe the introduction to truck company fireground operations.

Review

- Truck Company Introduction
- Fire Spread
- Truck Company Operations
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe the initial assignments of a truck company.

Overview

- Truck Company Tools
- Truck Company Personnel
- Truck Company Coverage Response
- Truck Company Apparatus Positioning
Hand tools are usually categorized as:
- Cutting
- Prying
- Pushing/pulling

Hand tools used for forced entry work:
- Claw tools
- Crow bars
- Kelly tools
- Halligan bars
- Quick bars
- Lock pullers

Hand tools used for ventilation work:
- Pick-head axes
- Pike poles
- Plaster hooks
- Halligan bars
Truck Company Tools

- Power tools
  - Can be of great assistance when there is a lack of personnel
  - May be powered by a variety of means
    - Electricity
    - Gasoline
    - Air pressure
    - Hydraulic pressure

Truck Company Tools

- Power saws
  - Circular saws
  - Chain saws
  - Reciprocating saws

Truck Company Tools

- Powered hydraulic tools
  - Spreaders
  - Cutters
  - Rams
Truck Company Tools

- Power tools are faster than hand tools
- Power tools have a few disadvantages
  - Heavier and larger than hand tools
  - More difficult to operate

Both hand and power tools are required on the truck.

Training
- Truck company crews must be familiar with the use of their equipment
- Acquired properties may be used
- Training requires supervision, and safety measures must be in place
Truck Company Personnel

- Tool assignments are communicated to personnel
  - As part of pre-incident planning
  - Based on tool locations on the truck
  - Based on riding locations

Tool assignments may reflect a forcible entry task

- Manpower is assigned
- Tools are carried
  - Claw tool
  - Halligan tool
  - Flathead ax
  - Hydraulic spreaders

Tool assignments are required on almost every call
Truck Company Coverage Response
- Respond according to
  - Type of structure
  - Construction features
  - Occupancy of the fire
  - Exposed buildings

Truck Company Coverage Response
- Respond according to
  - Time of day
  - Traffic conditions
  - Road conditions
  - Weather conditions

Truck Company Coverage Response
- Operate within the Incident Command System
  - Work within the strategic plan
  - Follow the direction of the incident commander
  - Do not freelance
  - Follow standard operating guidelines
Truck Company Coverage Response

- Cover the four primary tasks of a truck company at an offensive operation
  - Primary search
  - Rescuing victims
  - Ventilation
  - Forcible entry

Truck Company Coverage Response

- Provide for front and rear coverage of the structure
  - Cover the front of the building if first due
  - Cover the rear of the building if second due
  - Assess what is happening on the sides of the building

Truck Company Coverage Response

- Relay changes in the plan via radio
- Access the rear of the building, if necessary, by going through adjoining buildings, lower levels of the fire building, or alleys and walkways
- Place the apparatus at the rear of the structure for the use of the aerial device, for rescue, and for access
Truck Company Coverage Response

- Notify the dispatcher immediately if the company is out of quarters when called

Truck Company Coverage Response

- Keep in mind that truck companies must
  - Refrain from duplicating efforts when working with engine companies
  - Follow the risk-versus-benefit SOGs

Truck Company Coverage Response

- Begin size-up
  - Reconnoiter the building
  - Obtain information from firefighters, occupants, and bystanders
  - Relay information by radio to the incident commander
Truck Company Coverage Response

- Begin size-up (continued)
  - Ensure priorities are established
  - Perform tasks according to personnel available
  - Identify the need for additional resources
  - Return to service unneeded apparatus

Truck Company Apparatus Positioning

- Positioning effectively
  - SOGs and preplans must not dictate a position
  - If the aerial is not needed, the truck need not be positioned

Truck Company Apparatus Positioning

- Approaching the scene
  - May simply mean going to staging
  - May be difficult
  - Should be slow and deliberate
  - Should be done in light of the fact that the repositioning of apparatus is very difficult
Truck Company Apparatus Positioning

- Following fire department rules
  - Be aware of the positioning needs of other fire apparatus
  - Allow room for engine companies to work in
  - Do not block hydrants or standpipe or sprinkler connections
  - Do not compromise egress from a building

- Check for overhead wires, tree branches or other obstructions before final positioning
- Make sure that the ground under the truck will carry the weight
- Make sure that the tires are not on supply lines
- Make sure that ground jacks will fully extend

- Meeting operational and manufacturer requirements
  - The proper reach for the task
  - A safe operating angle
  - No interference with fireground operations
Truck Company Apparatus Positioning

- Relocating the apparatus during operations
  - To accomplish other tasks
  - Because of deteriorating conditions
  - To back away from the fire building
  - To back away from exposures

Truck Company Apparatus Positioning

- Positioning on one- and two-story buildings
  - Aerial devices will probably not be used in low-rise buildings, so the truck company can position to one side of the building
  - Engine companies will have priority positions

Truck Company Apparatus Positioning

- Positioning on buildings taller than two stories
  - Allow for aerial device operations
  - Allow for the rapid deployment of ground ladders
Truck Company Apparatus Positioning

- Positioning on buildings taller than two stories (continued)
  - Coordinate with responding engine companies
    - If the engine is in front of the truck it should pull past the structure
      - To allow truck positioning
      - To allow the engine officer to see three sides of the building

- If the engine and the truck are approaching from opposite directions the engine should stop short
  - To allow for truck positioning
  - To communicate size-up

- Positioning on large apartment or commercial buildings
  - Allow for the engine to position at the entrance
  - Position truck to perform rescue, ventilation, or other truck company operations
Truck Company Apparatus Positioning
- Allowing for the use of master streams
- Positioning apparatus some distance from the fire building
- Allowing the ladder to access an adjoining building

Student Performance Objective
- Given information from discussion, handouts, and reading materials, describe the initial assignments of a truck company.

Review
- Truck Company Tools
- Truck Company Personnel
- Truck Company Coverage Response
- Truck Company Apparatus Positioning
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe rescue.

Overview

- Rescue
- The Chronology of Rescue Operations
- Rescue Considerations
- Search
Rescue
- Includes the primary search and the rescue of victims
- Is the first and highest priority at an incident
- Requires a risk-versus-benefit analysis
- Is no place for freelancing
- Requires adherence to the two-in, two-out rule

Rescue
- Requires a rapid intervention crew
- Requires full PPE and SCBA
- Requires the proper tools and equipment
- Requires planned searches
- Must be coordinated with fire attack

Rescue
- Requires locating and removing the victims
- Requires adequate personnel
- Requires progress reports
- Requires an accountability system
- Is assisted by other truck company tasks
- Is a complex operation
The Chronology of Rescue Operations

Before the alarm
- Inspect buildings
- Continually examine the company’s district
- Know occupancies

The Chronology of Rescue Operations

At the alarm
- Initial information received with an alarm includes an address or general location
- Truck company personnel must recognize clues indicating the possible presence of victims in the fire building
  - Day of week/time of day
  - Was caller a passerby?

The Chronology of Rescue Operations

On the fire ground
- Begin with size-up
- Reconnoiter the area and communicate with other firefighters
- Perform immediate rescue in extreme cases
- Place hose lines
- Perform search
- Ventilate
Rescue Considerations

Factors to be considered in rescue
- The number of people in the fire building
- The paths by which the fire and smoke can reach the victims
- The routes available to firefighters for reaching people and removing them

Rescue Considerations

In residential occupancies
- Single-family dwellings
- Apartment houses
- Hotels and motels

Rescue Considerations

Industrial Occupancies
- Present the greatest rescue problems during daytime working hours
- May have 24-hour operations
- May have employees who are physically handicapped or who have special needs
Rescue Considerations

Industrial Occupancies (continued)
- May contain burning chemicals and hazardous materials
- May require the use of search ropes
- May require special SOGs

Rescue Considerations

Hospitals, schools, and institutions
- Are handled much like fires in multiple-family housing
- May be inhabited by all age groups
- May have non-ambulatory and physically and/or mentally challenged patients

Rescue Considerations

Hospitals, schools, and institutions (continued)
- May have smaller staffs at night
- May require special procedures for bedfast patients
Rescue Considerations

- Retail stores
  - May have varying hours of operations
  - May be vast, covering many acres
  - May contain a variety of occupancy types
    - Restaurants and theatres
    - Large chain stores
    - Places of assembly

Retail stores (continued)

- May be sprinklered
- May have limited exits
- Must be thoroughly searched

Search Basics

- Coordinate movements of all firefighters
- Use easy-to-follow search patterns
- Begin search by looking for occupants in the greatest danger
Search

- Duties
  - Locate and remove trapped occupants
  - Ventilate where needed
  - Temporarily prevent extension of fire by closing doors and windows
  - Check for interior and exterior fire extension
  - Help locate the seat of the fire when necessary

Search

- Standard search procedure
  - Immediate search
    - Requires a rapid sizeup
    - Requires engine duties
    - Requires truck duties

Search

- Right-handed search
- Left-handed search
- Actions performed by two firefighters
- Reversing direction in searches
Search

• Areas to be searched
  ■ Corridors and halls
  ■ Each room
  ■ Bathrooms
  ■ Closets
  ■ The space behind large chairs
  ■ Behind and under beds
  ■ Areas near windows

Search

• Firefighters may carry
  ■ Axes
  ■ Halligan bars
  ■ Claw tools
  ■ Hand lights
  ■ Search ropes
  ■ PASS devices
  ■ Thermal imager

Search

• Search of the fire room
• Search of non-fire rooms
• Indicating that a room has been searched
Search

- Other structures
  - Firefighters follow standard search procedures
  - Large buildings with complex floor plans may require additional resources

Search techniques

- Checking for fire extension
- Checking doors
- Removing victims
- Working in limited visibility
  - Stay low and move on hands and knees
  - Use a tool to sound the floor
  - Use a 40- to 50-foot-long rescue rope

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe rescue.
Review

- Rescue
- The Chronology of Rescue Operations
- Rescue Considerations
- Search
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe ventilation techniques.

Overview

- The Basic Benefits of Ventilation
- The Basic Principles of Ventilation
- The Use of Natural Openings in Ventilation
- Cutting Through Roofs as Part of Ventilation
- Forced Ventilation
The Basic Benefits of Ventilation

- Reduces danger from heat and smoke
- Increases visibility
- Decreases the danger inherent in fireground operations
- Increases fireground efficiency
- Permits quicker and easier entry and search

The Basic Benefits of Ventilation

- Allows the advance of attack lines into the building
- Minimizes time to locate the seat of the fire
- Minimizes time to identify fire extension
- Decreases or stops the extension of fire
- Reduces the chance of flashover or a backdraft explosion

The Basic Principles of Ventilation

- The products of combustion
  - Limit visibility
  - Cause death by asphyxiation
  - Ignite secondary fires
  - Create mushrooming
The Basic Principles of Ventilation

- Make at least one ventilation opening at the top of the building directly above the fire
  - In the roof
  - At the tops of vertical shafts

The Basic Principles of Ventilation

- The products of combustion must be removed
  - The accumulation of heat
  - Toxic gases
  - Smoke

The Basic Principles of Ventilation

- Windows and doors can be controlled to help with
  - Search and rescue
  - Fire attack
  - Locating the seat of the fire
  - Checking for fire extension
The Basic Principles of Ventilation

- The general rule: “Open the fire building in such a way that all accumulations of heat and the products of combustion will leave the building by natural convection.”

The Use of Natural Openings in Ventilation

- Windows
  - Windows can usually be opened in one- or two-family dwellings as opposed to venting the roof
  - Double-hung windows should be opened
    - Two thirds down from the top
    - One third up from the bottom
  - Storm windows may be opened
    - Conventionally
    - By breaking

The Use of Natural Openings in Ventilation (continued)

- Windows (continued)
  - Remove window coverings
  - When action must be taken quickly, use the proper tools and break the windows
  - When wind conditions are a factor open windows on the leeward side of the building first
  - Windows can be opened in conjunction with roof ventilation
The Use of Natural Openings in Ventilation

- **Roof openings**
  - **Vertical shafts**
    - Are usually capped on the roof
    - Often have heat and pressure buildup in fire situations
    - Must be ventilated to prevent the products of combustion from spreading out to other areas of the building

- **Skylights**
  - Skylights may provide an idea of the layout of the building
  - Skylights may allow access to the cockloft area
  - Removing a skylight requires coordination between firefighters
  - Skylights may be opened three different ways

- **Skylights (continued)**
  - Plastic "bubble-type" skylights
  - Plastic panels on corrugated metal roofs
  - Windy conditions
  - Swinging transoms or glass panels found below the skylight
The Use of Natural Openings in Ventilation

- Roof scuttles
  - Are placed in roofs to allow access to the roof from inside the building
  - May have built-in ladders
  - May be located at one end of a corridor
  - May be located at the rear of the building
  - Vary in size and shape
  - May consist of a metal or wooden cover encased in roofing metal or may be tarred

The Use of Natural Openings in Ventilation

- Roof scuttles (continued)
  - May have rust, corrosion, grit, or dirt holding them shut
  - May be secured with bolts or padlocks
  - May have steel bars below
  - May be cut off or pried up with a variety of tools
  - May have enclosed areas below the hatch similar to the skylight

The Use of Natural Openings in Ventilation

- Ventilators
  - Come in many different sizes and shapes
  - May have one of many functional uses
  - Must be opened or removed if smoke is issuing from them
  - Include sheet metal shafts
  - Must be checked for heat
  - When opened may allow fire and heat to be drawn up and out, preventing lateral fire spread
The Use of Natural Openings in Ventilation

- Plumbing system vent pipes
  - Are present for each plumbing system
  - Are about two inches in diameter
  - May run vertically through walls or partitions
  - Are considered channels for fire spread
  - Should be checked for heat and smoke at the roof opening
  - Require the opening of the roof if fire conditions are present

The Use of Natural Openings in Ventilation

- Penthouses
  - Are small hut-like enclosures built over a stairwell allowing the stairs to extend to the roof
  - May have a full-sized door at the top as well as windows and skylights
  - May be used to ventilate the entire height of the stairwell
  - Should be opened as soon as possible
  - May have doors that are locked or unlocked

The Use of Natural Openings in Ventilation

- Machinery covers
  - Are small box-like enclosures sometimes found on roofs
  - May cover dumbwaiter pulleys and motors, valves for heating and cooling systems, and other items
  - Are usually made of wood and covered with roofing material or tarred
  - May be equipped with ventilators
  - Should be ventilated as necessary
The Use of Natural Openings in Ventilation

- Elevator penthouses
  - Contain the motors and electric switches that control the elevators
  - Are directly above the elevator shaft
  - Are open to the elevator shaft
  - May contain exterior doors, windows and skylights
  - Can be extremely dangerous to work in
  - Should be ventilated

- Air Shafts
  - Are usually found in older buildings
  - Allow light and air to enter the inner rooms
  - May have skylight-type coverings on the roof which may need to be opened or broken

- Pre-incident planning
  - Make pre-incident inspections to gain familiarity with the building
  - Remember that features of one building within a housing project will be similar to other buildings' features within the project
Cutting Through Roofs as Part of Ventilation

- Perform with hand or power tools
- Make one large hole rather than several small holes if possible
- Open ceiling below with the same size hole

Cutting Through Roofs as Part of Ventilation

- Cut all roofing material before any material is removed
- Keep back to the wind
- Make hole as close to the hot spot as possible

Cutting Through Roofs as Part of Ventilation

- Use PPE and SCBA
- Be aware of the location and extent of the fire
- Have a secondary means of escape from the roof
Cutting Through Roofs as Part of Ventilation

- Work from a ladder
- Take care not to weaken the structure supporting HVAC and other heavy items
- Identify lightweight construction and warn others

Forced Ventilation

- Smoke ejectors
  - Supplement natural convection ventilation
  - Speed the removal of smoke and toxic gases from the contaminated area
  - May introduce air under pressure causing the fire to intensify
  - Require a power source

Forced Ventilation

- Limitations of smoke ejectors
  - Do not use in confined spaces such as attics, corridors, or closed-up basements where there is a working fire
    - May cause lateral fire spread
    - May fan embers into open flame
Forced Ventilation

- Placement of smoke ejectors
  - Supplement natural airflow
  - Position in windows, doorways, roof openings, basement openings, and other openings
  - Place high in a window due to the accumulation of the products of combustion

Forced Ventilation

- Placement of smoke ejectors (continued)
  - Use in pairs for effectiveness
  - Remove window treatments
  - Close the area around the smoke ejector
  - Keep the flow of air in a straight path if possible
  - Do not eject smoke into a congested area

Forced Ventilation

- Positive-pressure ventilation
  - Uses forced air at a airflow to create pressure differentials
  - Uses a much larger volume fan than smoke ejectors
  - Forces the products of combustion outside the building
Forced Ventilation

- Positive pressure ventilation (continued)
  - Usually is placed in front of an exterior door
  - Requires an exit opening opposite the fan
  - Requires the controlling of interior doors and windows to ventilate rooms
  - Has been the object of discussion for years

Forced Ventilation

- Advantages of positive-pressure ventilation
  - May be set up outside without entry
  - Will ventilate an area more efficiently than smoke ejectors
  - Can be used in large buildings
  - Will work with horizontal and vertical ventilation

Forced Ventilation

- Disadvantages of positive-pressure ventilation
  - PPV requires coordination of the operation
  - PPV is not as effective if vertical ventilation has taken place beforehand
  - Some believe that positive-pressure ventilation may intensify the fire
Forced Ventilation

- Hydraulic ventilation
  - Perform after the fire is out
  - Perform using a fog nozzle on a wide pattern setting
  - Point out of a window to draw smoke and hot gases outside
  - Cover about 90% of the window opening

Forced Ventilation (continued)

- Do not perform in certain situations
- Operate short term
- Replace with another method of ventilation

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe ventilation techniques.
Review

- The Basic Benefits of Ventilation
- The Basic Principles of Ventilation
- The Use of Natural Openings in Ventilation
- Cutting Through Roofs as Part of Ventilation
- Forced Ventilation
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe ventilation operations.

Overview

- Coordinated Fire Attack
- One- and Two-Story Dwellings
- Multiple Use Residential and Business Buildings
- Shopping Centers, Row Stores, and Other One-Story Buildings
- Basement Fires in Large Structures
- Fire-Resistant Structures
- Using Elevators to Approach the Fire Floor
- Smoldering Fires
Coordinated Fire Attack

- When the fire is free burning
  - Ventilation should begin at the same time as the initial attack or as soon as possible after the initial attack

Coordinated Fire Attack

- When the fire is smoldering
  - Begin ventilation before entering building
  - Do not make matters more dangerous for firefighters

One- and Two-Story Dwellings

- One-story dwellings
  - Open or remove windows close to the fire while engine crews begin fire attack
  - Perform a quick primary search
  - Locate fire extension
  - Check the attic or cockloft for fire spread
One- and Two-Story Dwellings

- Two-story dwellings
  - When fire is on the first floor
    - Open the first floor windows closest to the fire first
    - Open the windows that show smoke or fire
    - Open second floor windows after first floor windows and search for victims and fire extension

One- and Two-Story Dwellings

- When fire is on the second floor
  - The second-floor windows should be opened closest to the fire
  - The windows may be opened from the outside or inside

One- and Two-Story Dwellings

- Attic fires
  - Attack from within the building
  - Remove windows or louvers at each end of attic
  - Open the roof above the hot spot
**One- and Two-Story Dwellings**

- Basement fires
  - Ventilate through all available basement openings
  - Ventilate the first floor
  - Coordinate with attack lines

**One- and Two-Story Dwellings**

- Basement fires (continued)
  - Attack through interior and exterior stairwells
  - Attack from the unburned area of the basement whenever possible

- Basement fires may travel upward throughout the entire building and attic

**Multiple-Use Residential and Business Buildings**

- Roof operations
  - Access
    - Is quickest using an aerial device
    - Should be performed with caution when using interior stairs
    - Could be obtained through an abutting building
    - May be via a fire escape
Multiple-Use Residential and Business Buildings

- Roof operations (continued)
  - Ladders
    - Should extend above the roof several rungs
      - Aerial devices should be lighted
    - Should remain in place until firefighters leave the roof
    - Must be placed in coordination with teams on the roof

Multiple-Use Residential and Business Buildings

- Roof operations (continued)
  - In poor visibility
    - Probe for the roof
    - Sound the roof
    - Locate an emergency exit off of the roof

Multiple-Use Residential and Business Buildings

- Roof operations (continued)
  - Personnel
    - Form teams of at least two
    - Keep track of each other
    - Continue by joining another team
    - Carry individual radios
Multiple-Use Residential and Business Buildings

Roof operations (continued)
- Venting
  - Should begin with available natural openings
  - Should include any roof feature that shows smoke
  - Requires the hot spot be opened, if possible

Multiple-Use Residential and Business Buildings

Venting (continued)
- Check vertical shafts
- Do from the top floor down
- Perform in conjunction with search operations
- Perform while checking for fire extension

Multiple-Use Residential and Business Buildings

Ground floor stores
- Are often structurally separated from upper floors
- May still require rooftop ventilation
- May still require ventilating upper floors
- Must be searched
- Must be checked for fire extension
Multiple-Use Residential and Business Buildings

- Adjoining buildings
  - Occupancies on either side should be ventilated
  - Cocklofts and attics should be checked for fire extension
  - Adjoining buildings may have fire extension

Shopping Centers, Row Stores, and Other One-Story Buildings

- Roof operations
  - Always assume there is no firewall protection
  - Use natural roof features if they are close to the hot spot, or ventilate over the hot spot
  - Check for hazardous roof conditions

Shopping Centers, Row Stores, and Other One-Story Buildings

- Attached occupancies
  - Ventilate through natural roof features
  - Open roof over hot spot, pull ceiling, and attack fire from below
Shopping Centers, Row Stores, and Other One-Story Buildings

- Ground level ventilation
  - Some stores may be ventilated through front and rear windows and doors
  - Some display windows have smaller window lights at the top
  - Main windows should be broken if the situation dictates

Basement Fires in Large Structures

- Basements in large structures are the worst possible places for working fires
- The entire building and all of the occupants are exposed

- Vent basement
  - Through doors, windows, chute covers, bulkheads, or sidewalk doors
  - Opposite of fire attack
  - Through storefront walls if possible
  - Through windows on the first floor
  - Through roof
Fire-Resistant Structures

- Fire-resistant structures have similar characteristics
  - Special coatings to protect main structural members
  - Doors made of steel that may be self closing
  - Concrete floors

Fire-Resistant Structures (continued)

- Enclosed stairways and elevator shafts
- Utility shafts and heating and air conditioning ducts with high protective ratings
- Interior stairways that serve as enclosed fire escapes
- Features that restrict fire spread

Fire-Resistant Structures

- Fire-resistant structures are best ventilated through windows
  - Truck companies force entry to gain access
  - Truck companies accompany engine companies when fire controls the corridor
  - Smoke ejectors and positive-pressure fans may be used
  - The fire floor should be ventilated and searched first followed by the floor above
Fire-Resistant Structures

- Fire-resistant structures
  - Only use stairway venting when the building is empty
  - Open stairwell door and penthouse openings
  - Relieve physical strain on engine companies
  - Truck company duties regarding fire-resistant structures

Using Elevators to Approach the Fire Floor

- Know your fire department’s SOPs
- Have information about elevators in the first due area
- Do not go to the fire floor by mistake
- Wear full PPE and equipment
- Exit two to four floors below the fire floor

- Use elevator to transport equipment to staging area
- Carry forcible entry tools
- Understand that occupants may be using elevators or that electricity may be off
Smoldering Fires

- Indications of smoldering fires
  - A lot of smoke is visible, but no open fire can be seen or heard
  - Smoke is rising rapidly from the building, an indication that it is hot
  - Smoke is leaving the building in puffs or at intervals
  - Smoke is being drawn back into the building around windows, doors, and eaves

Smoldering Fires

- Indications of smoldering fires (continued)
  - Smoke is a gray or yellow color
  - Pressurized smoke is coming from cracks or openings
  - Windows are stained brown or darkened from the intense heat
  - Window glass is hot to the touch

Smoldering Fires

- Smoldering fires
  - Have the heat and fuel to be free burning
  - Have a high carbon monoxide level
  - Lack oxygen
  - Can be found in any size or type of building
Smoldering Fires

- Backdraft
  - Carbon monoxide must be removed before fire attack
  - The addition of oxygen to the heat and fuel will lead to immediate ignition

- Venting
  - Do before fire attack
  - Vent as high on the building as safely possible
  - Use natural roof openings or make cuts
  - Break the tops of the highest windows if roof venting is too dangerous

- Approach
  - Avoid approaching the building directly
  - Approach at an oblique angle or parallel to the building
  - Avoid blast injuries
Smoldering Fires

- Coordination
  - Attack lines should be charged and ready
  - crews should be in safe positions
  - Apparatus should be properly positioned

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe ventilation operations.

Review

- Coordinated Fire Attack
- One- and Two-Story Dwellings
- Multiple-Use Residential and Business Buildings
- Shopping Centers, Row Stores, and Other One-Story Buildings
- Basement Fires in Large Structures
- Fire-Resistant Structures
- Using Elevators to Approach the Fire Floor
- Smoldering Fires
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe checking for fire extension.

Overview

- Interior Fire Extension
- Exterior Exposures
Interior Fire Extension

- Safety considerations
  - Anticipate rapid fire spread
  - Base manpower on the situation
  - Be properly equipped
  - Obtain preplan information and information on hazards
  - Put exposure protection second only to rescue

Interior Fire Extension

- Fire in concealed spaces
  - May not have signs indicating its presence
  - May not be present in all locations
  - Must be uncovered by opening shafts, walls, partitions, ceiling, or floors
  - Will only be extinguished with sufficient water
  - Follows predictable patterns of spread

Interior Fire Extension

- Vertical fire spread
  - Many structures may share
    - Walls and partitions
    - Utility shafts
    - Dumbwaiters
    - Air shafts
    - Exhaust ducts
Interior Fire Extension

- Vertical fire spread (continued)
  - One- and two-family dwellings may share
    - Water lines
    - Gas lines
    - Electrical lines
    - Sewer system vent pipes
    - HVAC vents
    - Chimney fixtures

Interior Fire Extension

- Vertical fire spread (continued)
  - In commercial buildings, retail stores, and shopping centers
  - In apartment buildings
    - Follow building layouts
    - Shafts near kitchens
    - Shafts near bathrooms

Interior Fire Extension

- Indications of vertical fire spread
  - Assumptions should be made about fire spread until determined otherwise
  - Roof features may show obvious extension
  - Interior walls may show signs of extension
Interior Fire Extension

- Checking walls for vertical fire spread
  - Begin directly over the fire on the floor above
  - Check baseboard for heat and blackened areas running up the walls
  - If the fire has traveled the entire height of the wall check for extension above the wall after putting out the fire

Interior Fire Extension

- Checking a vertical shaft
  - Rooms
    - Kitchens
    - Bathrooms
    - Workshop areas
    - Laboratories
    - Janitor closets

Interior Fire Extension

- Built-in cabinets
- Exhaust ducts
- Ductwork
- Pipe shafts
Interior Fire Extension

• Checking stairways
  - Check storage rooms or framed-out dead spaces under stairways
  - Check ceilings below stairways
  - Keep stairways intact

• Checking doors and windows

Interior Fire Extension

• Horizontal fire spread
  - Thoroughly check
    - The space between ceilings and floors
    - False or hanging ceilings
    - Cocklofts
    - Ductwork
    - Utility conduits
    - Conveyor tunnels

Interior Fire Extension

• Indications of horizontal fire spread
  - Smoke
  - Fire
  - Discoloration
  - Hot spots
  - Blistering paint
  - Black heat streaks
  - The sound of fire
Interior Fire Extension

- Check ceilings for horizontal fire spread
  - Use a pike pole or plaster hook
  - Extinguish fire with a hose stream
  - Protect property with salvage covers if time and personnel permit
  - Check for multiple levels of ceilings
  - Check for storage, lighting, HVAC equipment, or other hazards

Interior Fire Extension

- Check attached structures
  - Cocklofts and attics
  - Basements
  - Party walls
  - Adjoining structures

Interior Fire Extension

- Open interior spread
  - Is common in supermarkets, warehouses, and garages
  - Requires the shutting of interior windows, doors, and service openings
Interior Fire Extension

- Trench cut
  - Is a procedure used to stop the spread of fire across the length of a building
  - Is a defensive line separating the burned area of a building from the unburned
  - Is usually used in narrow buildings

Interior Fire Extension (continued)

- Trench cut (continued)
  - Is usually performed on flat roofs
  - Is performed well in advance of the fire
  - Is made at least four feet wide and the width of the building

Exterior Exposures

- Close windows and exterior doors
- Remove curtains, drapes, and shades
- Evacuate the building
- Use any available means to protect the building
- Perform search and rescue operations
- Handle as a fire building when fire is found, not as an exposure
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe checking for fire extension.

Review

- Interior Fire Extension
- Exterior Exposures
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe forcible entry.

Overview

- Forcible Entry Pre-incident Planning
- Forcible Entry Size-up
- Forcible Entry Tools
- Forcible Entry Through Windows
- Forcible Entry Through Doorways
- Forcible Entry Through Walls
Forcible Entry Pre-incident Planning

- When are buildings secure: day or night?
- Which buildings are always open at the street level but not interior?
- Which buildings are locked at the street and at the inner lobby?
- Which doors would be easy or difficult to force?

Forcible Entry Pre-incident Planning

- Which buildings have multiple entries? Which entry would be the easiest to force?
- Which buildings have security or maintenance personnel to allow entry?
- How can a keyholder be contacted?
- Which buildings have a fire department key box system?

Forcible Entry Pre-incident Planning

- Which exposures would pose forcible problems?
- What is the best way to force entry into a building?
- Which buildings require special forcible entry tools?
- What is the best way to enter a building with unusual or extremely difficult entry problems?
Forcible Entry Size-up

- The basics
  - The type of occupancy
  - The life safety hazard
  - The location and extent of the fire

Forcible Entry Size-up

- The fire building
  - If there are no signs of fire
    - Firefighters may have time to determine the easiest way to gain entry
  - Firefighters may have time to carefully force entry

Forcible Entry Size-up

- If there is a working fire
  - Assume there are trapped occupants
  - Force entry immediately without consideration for damage
Forcible Entry Size-up

- If the fire is or is suspected to be a smoldering fire
  - Do not enter without ventilation
  - Make a coordinated attack

Forcible Entry Size-up

- Once inside the fire building
  - Force entry to interior doors if necessary
  - Search
  - Begin other truck duties

Forcible Entry Size-up

- Exposed buildings
  - When there is a row of attached buildings
    - Buildings on either side of the burning building should be opened
    - Buildings should be opened even if access is not needed yet
Forcible Entry Size-up

• When buildings are occupied
  ■ Gain the assistance of occupants
  – See if bystanders have access or keys for access
  – Try to minimize damage
  ■ When opening doors and windows remember to “try before you pry”

Forcible Entry Tools

■ Basic rules of forcible entry
  • Remember that speed is important
  • Create as little damage as possible
  • Wear full PPE

Forcible Entry Tools

■ Cutting tools
  • Are designed to cut specific types of material
  • May be hand tools
    ■ Axes
    ■ Hatchets
    ■ Saws
    ■ Bolt cutters
Forcible Entry Tools

- Cutting tools may be power tools
  - Circular saws
  - Chain saws
  - Reciprocating saws
  - Hydraulic cutters
  - Metal cutters
  - Oxyacetylene and exothermic cutting torches

Forcible Entry Tools

- Frequently used cutting tools:
  - Pick head axes
  - Flat head axes
  - Bolt cutters
  - Power saws
  - Air operated and hydraulic cutters
  - The adz ends of Halligan bars
  - Kelly tools

Forcible Entry Tools

- Prying and forcing tools
  - Provide a mechanical advantage using leverage to force objects
  - Include hand tools
    - Halligan bars
    - Claw tools
    - Kelly tools
    - Quick-bars
    - Pry-axes
Forcible Entry Tools

- Prying and forcing tools (continued)
  - Crow bars
  - Duckbill lock breakers
  - Large pipe wrenches
  - Flathead axes
  - Mauls or sledgehammers

Forcible Entry Tools

- Prying and forcing tools include air and hydraulic powered tools
  - Rabbit tools
  - Heavy rescue tools
    - Combination tools
    - Rams
    - Spreaders

Forcible Entry Tools

- Striking tools
  - Are used in conjunction with other hand tools
  - Are usually used to drive another tool
  - Include a variety of different tools
Forcible Entry Tools

- Striking tools
  - Flathead axes
  - Hammers
  - Mallets
  - Mauls
  - Sledgehammers
  - Battering rams
  - Lock pullers
  - Pushing and pulling tools

Forcible Entry Through Windows

- General window information
  - Windows are usually easier to force than doors
  - Windows on the second floor may be unlocked or pose less of a security risk when removed
  - During a working fire access must be made the quickest way possible

Forcible Entry Through Windows

- Specific window information
  - Double-hung windows
    - Allow the simplest and quickest access
    - Can be forced by prying up the bottom section at the center of the window
    - May be unlocked, when the top section is made of small panes, after removing the pane nearest the lock
    - Must be broken out if they cannot be quickly forced
Forcible Entry Through Windows

- Lexan windows
  - Can be cut with a circular power saw with a carbide tip
  - May be knocked completely out on a wooden frame
  - May be removed by striking the corner with a pick from an axe
  - May not be the best place to force entry

Forcible Entry Through Windows

- Hurricane windows
  - Are designed to resist hurricane-force winds
  - Are intended to keep the building intact
  - Are probably not the best place to force entry

Forcible Entry Through Windows

- Security windows
  - May have very heavy metal frames
  - May have wire within the glass
  - May have horizontally hinged sections
  - May have center swing-out sections surrounded by stationary panes
Forcible Entry Through Windows

- Casement windows
  - Swing outward
  - Are usually large enough for firefighter entry
  - May be broken and unlocked, then opened

Forcible Entry Through Windows

- Small windows
  - Projected windows
    - Are made of heavy glass in a metal frame
    - Pivot at the top or bottom

Forcible Entry Through Windows

- Jalousie windows
  - Are made of heavy glass
  - Have a wooden or metal frame
  - Have a cranking mechanism to open
  - Are not a good entry location
Forcible Entry Through Windows

- Large windows
  - Are expensive to replace
  - Should be removed if damaged by heat or smoke

Forcible Entry Through Windows

- Storm windows or screens
  - Must be removed, if present, before built-in windows can be opened
  - May have hooks or clips holding them in
  - May need to be broken at a working fire for quick entry

Forcible Entry Through Windows

- Barred windows and doors
  - Iron barriers may be overcome with a variety of tools
    - Prying tools
    - Striking tools
    - Hydraulic cutters and/or spreaders
    - Oxyacetylene torches
  - Rolldown barriers may be secured with a padlock
Forcible Entry Through Doorways

- Door size-up
  - How is the door constructed?
  - What is its use?
  - How is the door hung?
  - How is the door locked?
  - Are the proper tools available to force the door open?

Forcible Entry Through Doorways

- Commercial Occupancies: Front
  - General information
  - Front doors are usually easier to force than rear doors
  - Front doors may be constructed of
    - Wood
    - Wood frame surrounding an ordinary glass plate
    - Tempered glass with or without a frame

Forcible Entry Through Doorways

- Front doors may be constructed of
  - Heavy plate glass in a strong metal frame
  - Steel, or reinforced with steel
  - Single or double doors
- Front doors may be protected by
  - Metal shutters
  - Barred gratings
Forcible Entry Through Doorways

- Tempered-glass doors
  - Are much stronger than glass plate
  - Are resistant to shock, impacts, and temperatures
  - Are a last-resort point of entry
  - May be forced at the lock
  - Are broken by striking a lower corner of the window with the pick end of an axe

Forcible Entry Through Doorways

- Heavy plate-glass doors
  - Treat the same way as tempered glass doors
  - Remove the glass if necessary
  - Force at the lock if necessary

Forcible Entry Through Doorways

- Wooden doors
  - Are usually solid core construction
  - Usually swing inward if they are residential
  - Usually swing outward on public buildings
  - May or may not have cylinder locks
  - Usually have a deadbolt
  - May be single or double doors
Forcible Entry Through Doorways

• Revolving doors
  ■ Will usually have a swinging door on each side
  ■ Are difficult to force
  ■ Should be examined during pre-incident planning

Forcible Entry Through Doorways

• Sliding doors
  ■ In businesses are heavy and expensive
  ■ In homes may be protected with burglar blocks

Forcible Entry Through Doorways

Commercial Occupancies: Rear
• Metal doors
  ■ Are usually not solid metal
  ■ May be set in concrete, brick, or masonry
  ■ Should be checked for exposed locks or hinges
  ■ May be secured by a bar in hangers
  ■ May be secured by a fox lock
  ■ May be unlocked
  ■ May swing in or out
Forcible Entry Through Doorways

- Overhead doors
  - Are made of varying construction materials
  - Are categorized into different types
  - Are locked in different ways
  - May be cut through with a power saw or an axe

- Overhead doors
  - May need a panel removed to access the padlock on a rail
  - May be secured through the chain system on manual doors
  - May be secured through the motorized system on automatic doors
  - Need to be pried up on both sides if metal

- Light doors
  - May be made of wood or light metal
  - May be reinforced with bars
  - May be fitted with several locks
  - May have glass panes
Forcible Entry Through Doorways

- Dwellings and apartments
  - Are more easily entered than commercial structures
  - May have similar front and rear doors
  - May have lobby doors

Forcible Entry Through Doorways

- Individual apartment doors are usually easily forced with lock pullers, hand tools, or rabbit tools

Forcible Entry Through Doorways

- Floor locks
  - Are used in high crime areas
  - Are heavy bars that are secured to the door and the floor
  - Are very difficult to force
  - May be easier to force on the hinge side
Forcible Entry Through Doorways

- Sliding doors may have
  - Cylinder locks
  - Bolts
  - Bars or rods at floor level

Office buildings

- Usually have the same entry problems as apartments
- May be open during the day
- May have maintenance or security personnel on the perimeter after hours
- May have been remodeled

Warehouses and factories

- May have overhead doors at loading platforms
- May have heavy wooden or steel pedestrian doors
- May have barred windows
- May be surrounded by fences
- May have guard dogs on the perimeter
Forcible Entry Through Doorways

- Combination occupancies
  - Are almost always a double-entry problem
  - May be heavily barred and bolted

Forcible Entry Through Doorways

- Sidewalk basement entrances
  - Usually provide a large opening into the basement
  - May be manual type
  - May be automatic type

Forcible Entry Through Walls

- Breaching exterior masonry walls
  - May be quicker than forcing reinforced metal doors
  - May be accomplished by using mauls, battering rams, or power tools
  - Should be performed near a doorway
  - Show allow for fire stream to enter, access to unlock the door, or firefighter entry if necessary
Forcible Entry Through Walls

- Breaching interior partition walls
  - May be easier than opening a door
  - May be necessary when a door is not available
  - May have to be done to see what is behind the wall
  - May require prying tools, pike poles, or plaster hooks

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe forcible entry.

Review

- Forcible Entry Pre-incident Planning
- Forcible Entry Size-up
- Forcible Entry Tools
- Forcible Entry Through Windows
- Forcible Entry Through Doorways
- Forcible Entry Through Walls
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe aerial operations.

Overview

- NFPA 1901, Standard for Automotive Fire Apparatus
- Safety Considerations in Aerial Operations
- Aerial Apparatus Positioning
- Aerial Rescue
- Ventilation in Aerial Operations
- Using Hose in Aerial Operations
NFPA 1901, *Standard for Automotive Fire Apparatus*

Definition of an aerial apparatus – “a vehicle equipped with an aerial ladder, elevating platform, aerial ladder platform, or water tower that is designed and equipped to support firefighting and rescue operations by positioning personnel, handling materials, providing continuous egress, or discharging water at positions elevated from the ground”

Types of aerial apparatus
- Aerial ladder
- Quint
- Elevating platform
- Water tower

Working height of an aerial apparatus: From the ground to the maximum elevation and extension
NFPA 1901, *Standard for Automotive Fire Apparatus*

- Tasks assigned to aerial apparatus
  - Access upper floors
  - Rescue
  - Ventilate
  - Advance hoselines
  - Use elevated master streams
  - Transport tools and equipment to upper floors

Safety Considerations in Aerial Operations

- Contractor responsibilities
  - Supply a qualified representative
  - Demonstrate apparatus
  - Provide initial instruction

Safety Considerations in Aerial Operations

- Purchaser responsibilities
  - Ongoing training of personnel
  - Meet and reference NFPA 1002
  - Meet and reference NFPA 1500
  - Meet and reference NFPA 1451
Aerial Apparatus Positioning

- Positioning is based on manufacturers’ specifications and is based on recommendations, not rules
- Stressors in positioning apparatus
  - Improper stabilization
  - Operations on unparallel locations such as uphill or downhill grades
  - The angle at which the device must be positioned for rescue (if excessive, could tip apparatus)

Aerial Apparatus Positioning

- Stressors in positioning apparatus (continued)
  - The length of the extension
  - Weight on the aerial device
  - Wind effects
  - Icing conditions
  - Exposure to heat
  - Potential contact or collision with objects
  - Nozzle reaction from elevated streams

Aerial Apparatus Positioning

- Base apparatus position on the condition of the fire building or exposures
- Stabilize the apparatus by
  - Locking the breaks
  - Chocking the wheels
  - Setting the stabilizers or outriggers
Aerial Apparatus Positioning

- When working on a grade
  - Position apparatus downhill from the point of operation, reducing stress on the aerial device
  - If approach is from downhill raise the device over the cab
  - If the approach is from uphill raise the device over the back of the apparatus

Aerial Apparatus Positioning

- When positioning around electric wires
  - No part of the apparatus should come close to the wires
  - No firefighter should touch the apparatus while the aerial device is in motion

Aerial Apparatus Positioning

- Overload hazards may be created with
  - Personnel
  - Equipment
  - Flowing water
  - Ice
  - Supported or unsupported operations
Aerial Rescue

- Rescue is the first priority on the fire scene
  - Rescue
    - Is best accomplished through interior stairways or fire escapes
    - May necessitate the use of ground ladders or aerial devices
    - May require positioning of the apparatus
    - Requires a system of priorities
    - Requires awareness of changing conditions

Aerial Rescue

- Spotting the turntable
  - Consider the maximum length of the device
  - Consider the most effective position
    - Perpendicular to the objective if possible
    - Close to the victims
    - Upwind
    - For multiple rescues
    - Between victims that are far apart

Aerial Rescue

- Spotting the turntable (continued)
  - Work two sides on a corner of the building
  - Perform size-up
  - Reposition if necessary
Aerial Rescue

- Raising the aerial device
  - Consider possible jumpers
  - Approach from above and then lower into position

- Placing the device
  - Aerial ladders
    - Place so that the first rung is even with the window
    - Place to the side and about six feet above a balcony or fire escape with fire below
    - Place about six feet above a flat roof

- Elevating Platforms
  - The top of the rail should be even with the window
  - When the fire is below the balcony or fire escape the platform should be to the safest side and even with the rail
  - On a flat roof the platform should be positioned just above and over the edge of the roof
Aerial Rescue

- Imperfectly spotted turntables
  - A good final approach may be impossible
  - Spot the turntable for the best possible access

Aerial Rescue

- Aerial devices
  - If only one beam of the device would contact the sill or balcony keep the device back about six inches
  - A firefighter should be positioned with the victims in the building
  - A firefighter should accompany victims down the ladder

Aerial Rescue

- Aerial devices (continued)
  - A second firefighter should provide backup on the ladder
  - The ladder should not be overloaded
  - Firefighters must carry unresponsive victims or children down the ladder
  - The ladder should not be moved while people are on it
Aerial Rescue

- Elevating platforms
  - Provide greater safety and ease than that provided by climbing down an aerial ladder
  - Require two firefighters to operate

Aerial Rescue

- Elevating platforms provide better protection for victims than that provided by ladder rescue
  - Remove unconscious victims first if possible
  - Keep children low in the basket and keep them from panicking

Aerial Rescue

- Removing victims by litter
  - May be necessary for injured or unconscious victims
  - May be done
    - Via interior stairs
    - By aerial ladder
    - Via elevating platform
Ventilation in Aerial Operations

- Begin at the roof
  - The aerial ladder should extend 6 feet over the roof
  - The elevated platform should be even with the roof or slightly over the edge
  - The roof should be sounded with a tool
  - The weight of devices must not be placed on a parapet wall

Ventilation in Aerial Operations

- Break windows if necessary
  - Wear a belt or harness
  - Use a pike pole, plaster hook, or other tool
  - Position above the window and upwind
  - Open the farthest downwind window first

Ventilation in Aerial Operations

- Vent with a stream if necessary
  - A solid stream should be used
  - Begin at the farthest downwind window
Ventilation in Aerial Operations

- Vent using an aerial ladder
  - Spot for the best possible position
  - Begin at the farthest downwind window
  - Work from the top floors down

Ventilation in Aerial Operations

- Safety precautions
  - Be above glass and debris
  - Clear the area below
  - If glass and debris is falling toward you do not look up, keep your arms close by your side, and seek shelter

Using Hose in Aerial Operations

- Moving equipment and personnel
  - Firefighters can carry items up the aerial device
  - Firefighters can climb the aerial ladder then raise items by rope
  - Items may be lifted by elevated platforms
Using Hose in Aerial Operations

- When placing a ladder at a window for a hoseline the tip of the ladder should be even with the sill and the ladder should be to one side of the window
- Firefighters should not block the window opening
- Firefighters should choose a window large enough for easy access

Using Hose in Aerial Operations

- Supplying water
  - Aerial devices can be used as portable standpipes
  - Prepiped waterways eliminate the need to advance hoselines up the ladder
  - Nozzles may be permanently affixed at the end
  - Some platforms have one or two 2½ inch discharge outlets

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe aerial operations.
Review

- NFPA 1901, Standard for Automotive Fire Apparatus
- Safety Considerations in Aerial Operations
- Aerial Apparatus Positioning
- Aerial Rescue
- Ventilation in Aerial Operations
- Using Hose in Aerial Operations
Truck Company Fireground Operations

Lesson 4-2
Ground Ladders

Maryland Fire and Rescue Institute

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe ground ladders.

Overview

- Basic Information
- Types of Ground Ladders
- Ground Ladder Operations
- Rescue Using Ground Ladders
- Ventilation Using Ground Ladders
- Advancing Hoselines from Ground Ladders
- Positioning Firefighting Streams from Ground Ladders
- Other Ladder Issues
Basic Information

- Ladder safety
  - Look for obstructions and wires when placing ladders
  - Remember that ladders conduct electricity
  - Place ladders on a firm dry surface
  - Secure ladders

Basic Information

- Foot ladders when raising
- Heel ladders when in use
- Raise to the proper angle
- Do not overload ladders
- Use a leg lock or fall protection when working from a ladder

Basic Information

- Ladders may be damaged because they have
  - Come into direct contact with fire
  - Been dropped
  - Been overloaded
Basic Information

- Ladder maintenance
  - Inspect
  - Clean
  - Test

Types of Ground Ladders

- Construction features
  - Aluminum
    - Solid beam
    - Truss construction
  - Wood
  - Fiberglass

- Classification features
  - Single or wall ladders
    - Have only one section
    - Are nonadjustable
    - Come in heights of 10, 12, 14, 16, 18, 20, and 24 feet
Types of Ground Ladders

- Roof ladders
  - Have folding hooks
  - Have only one section
  - Are nonadjustable
  - Come in heights of 10, 12, 14, 16, 18, and 20 feet
  - May function as single ladders

- Extension ladders
  - Have adjustable heights
  - Have a base ladder
  - Have one or more fly sections
  - With two sections are usually 20’ to 50’
  - With three sections are usually 24’ to 50’
  - That are 40-50’ are equipped with staypoles

- Folding ladders
  - Are single ladders with hinged rungs
  - Are used in tight spaces
  - Come in heights of 8, 10, 12, and 14 feet
Types of Ground Ladders

• Combination ladders
  ■ Have a variety of applications
    – Single ladder
    – Extension ladder
    – A-frame ladder
  ■ Come in heights of 10, 12, 14, and 16 feet

Types of Ground Ladders

• Pompier ladders
  ■ Have a single beam with rungs protruding from the sides
  ■ Have a large hook at the top
  ■ Are used to climb floor to floor
  ■ Are not easy to use
  ■ Are usually 16 feet long
  ■ Are rarely used today

Ground Ladder Operations

■ Accomplishing tasks
  • Remove trapped victims
  • Advance hoselines
  • Replace damaged stairways
  • Provide access from one roof level to another
Ground Ladder Operations

- Accomplishing tasks (continued)
  - Access fences and other obstacles
  - Provide for ventilation
  - Transport an injured victim
  - Assist in salvage and overhaul operations

Ground Ladder Operations

- Carrying ladders
  - Carry may depend on location of the ladder
    - On sides of apparatus
    - Above reach and lowered mechanically
    - Nested on runners
    - On the ground

Ground Ladder Operations

- Carry depends on the size and weight of the ladder
  - One-firefighter carry
    - Low shoulder carry
    - High shoulder carry
**Ground Ladder Operations**

- Two-firefighter carry
  - Low shoulder carry
  - High shoulder carry
  - Underarm technique carry
  - Arm’s length carry

- Three-firefighter carry
  - Low shoulder carry
  - High shoulder carry
  - Underarm technique carry
  - Arm’s length carry
  - Flat shoulder carry
  - Flat arm’s length carry

- Four- and six-firefighter carry
  - Is similar to the other carries
  - Allows firefighters to fill in where needed
Ground Ladder Operations

- Raising ground ladders
  - Single-firefighter raises
    - Flat raise
    - Beam raise
  - Two-firefighter raises
    - Flat raise
    - Beam raise

Ground Ladder Operations

- Three-firefighter raises
  - Flat raise
  - Beam raise
  - Four-firefighter raises

Ground Ladder Operations

- Angle of inclination
  - The angle of inclination should be between 70° and 76°
  - The base should be a distance of ¼ the working distance of the ladder from the structure
  - While standing upright on the bottom rung, the firefighter’s hands should comfortably reach a rung
Ground Ladder Operations

- Safety considerations
  - Fire department ladders should only be used for rescue, firefighting operations, and training
  - Ladders should be set on a firm level base
  - Avoid electricity
  - Avoid obstructions

Ground Ladder Operations

- Watch the tip and not the butt
- Secure the ladder at the top and butt, if possible
- Heel ladders when in use
- Do not overload ladders
- Leave ladders in place for an exit

Rescue Using Ground Ladders

- Ladder priorities
  - Those in the most danger
  - Those closest to the fire
  - Those on or directly above the fire floor
  - Those endangered by smoke and the products of combustion
Rescue Using Ground Ladders

Ladder placement
- The ladder
  - Should be the proper length for the task
  - Must initially be kept out of reach of those being removed
  - Should be at or slightly above the sill of the window
  - Should extend into the window, by two or three rungs on large windows
  - Should extend four rungs above balconies, fire escapes, or roofs

Ground ladders as exits
- Provide emergency exits
- Provide additional exits
- Provide alternative exits
- Should be placed at windows, balconies, porches, and roofs
- Must be replaced when moved

Rescuing victims from a ladder
- Conscious victims
  - Usually are very anxious
  - Require constant reassurance
  - Should be assisted from inside the structure by a firefighter
  - Should be assisted down the ladder by a firefighter
Rescue Using Ground Ladders

• Unconscious victims
  ■ Are very difficult to manage
  ■ Are lowered with their weight on the firefighter's knee
  ■ Are lowered feet first either facing the ladder or facing the firefighter

Rescue Using Ground Ladders

• Unconscious victims (continued)
  ■ May be lowered with a firefighter's arm under the armpit and the other arm between the legs
  ■ May be lowered by two firefighters on two ladders
  ■ May be removed via interior stairways, aerial ladders, fire escapes, or adjacent roofs

Ventilation Using Ground Ladders

■ Ventilation from windows
  • Ladders should be placed alongside the window with the tip of the ladders even with the top of the window
  • Ladders should be placed on the windward side of the window
Ventilation Using Ground Ladders

- Ventilation from roofs
  - Ground ladders should extend four or five rungs above the roof line
    - To serve as handholds
    - To be easily located
  - Roof ladders should be used on the roof
    - To distribute the firefighters’ weight
    - To serve as secure work platforms

Advancing Hoselines from Ground Ladders

- Rational for placing ladders
  - Occupants may be using stairways
  - Engine companies may be using stairways
  - Stairways may be unsuitably located
  - Interior passageways may be overcrowded

- Placing ladders
  - Place ladders as to be useful to overall fireground operations
  - Do not place ladders in front of entrances
  - Do not tangle ladders in hoselines
Advancing Hoselines from Ground Ladders

- Climbing ladders with a hoseline
  - The firefighter climbs with uncharged hose
  - No more than one firefighter stands on a ladder section
  - The lead firefighter drapes the hose over the shoulder and advances up to the next ladder section
  - The second firefighter drapes a large loop of hose over the shoulder and advances to the next ladder section

Advancing Hoselines from Ground Ladders (continued)

- Climbing ladders with a hoseline (continued)
  - The third firefighter drapes a large loop of hose over the shoulder and advances to the next ladder section
  - A firefighter on the ground heels or secures the ladder
  - A firefighter on the ground assists the movement of the hoseline up the ladder

Positioning Firefighting Streams from Ground Ladders

- Positioning firefighting streams
  - Allow three or four rungs to extend into the window and direct the stream or raise the ladder above the window to the sill or window above
  - Secure the ladder with a rope hose tool or a dog chain
Positioning Firefighting Streams from Ground Ladders

- Positioning firefighting streams (continued)
  - Tie the hoseline to the ladder
  - Move or advance the hoseline when necessary
  - Secure the firefighter with a leg lock, a harness, or a belt

Other Ladder Issues

- Hoisting a ladder by rope
  - Hoisting a ladder by rope may be faster than bringing it through the interior
  - The rope should be secured several rungs down from the top

Other Ladder Issues

- Do not bridge with a ladder
  - Including between buildings, roofs, balconies, air shafts, elevator shafts, or other locations
Other Ladder Issues

- Raising ladders from roofs can be done from the roof of an attached or nearby building
  - First ladder the shorter building
  - If the building is over three stories raise the ladder with a rope

Other Ladder Issues

- Covering weakened areas
  - Stairways
  - Weakened floors or roofs

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe ground ladders.
Review

- Basic Information
- Types of Ground Ladders
- Ground Ladder Operations
- Rescue Using Ground Ladders
- Ventilation Using Ground Ladders
- Advancing Hoselines from Ground Ladders
- Positioning Firefighting Streams from Ground Ladders
- Other Ladder Issues
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe property conservation.

Overview

- Water and Property Conservation
- Protecting Building Contents
- Removing Water from Buildings
- Smoke and Property Conservation
Water and Property Conservation
- Start conservation efforts as soon as possible
- Protect the contents
- Remove the water
- Control the standpipe valve
- Use sprinkler stops

Protecting the Building Contents
- Salvage covers
  - Are sheets of waterproof material
  - Are available in several materials, dimensions, and shapes
  - May be fire resistant

Protecting the Building Contents
- Salvage covers may be made of
  - Plastic sheets
  - Heavy canvas tarps
  - Disposable lightweight plastic sheets
Protecting the Building Contents

- Salvage covers are stored using the
  - One firefighter spread
  - Two or more firefighter spread
- Salvage covers should be spread using techniques that are
  - Standardized
  - Interchangeable with neighboring departments

Protecting the Building Contents

- Covering the building contents
  - Cover items that could suffer the most damage because of position or value
    - Items under the fire floor
    - Items sensitive to water

Protecting the Building Contents

- Consider spreading the salvage cover
  - Over items on the floor
  - Over shelves or walls
  - Underneath a ceiling that is about to be pulled
  - Over a large pile of items that has been grouped together
Protecting the Building Contents

- Controlling the water flow
  - Use salvage covers to block doorways
  - Use salvage covers as conduits to direct water
    - Downstairs and outside
    - Out to balconies or porches
    - Away from walls and off of floors
      - Against walls on watertight floors
      - Spread flat with a roll on each side on porous floors
  - Use squeegees and brooms to guide the water

Protecting the Building Contents

- Catchalls
  - Are salvage covers rigged as basins
  - Are used to hold dripping water
  - Are constructed many ways
  - May be used in conjunction with pike poles to localize ceiling damage
  - Must be carefully drained
  - May require portable pumps to empty

Removing Water from Buildings

- Removing water with chutes
  - Makeshift devices
    - Place salvage covers over pike poles or pipes
    - Rig salvage covers on ladders or other items
    - Direct water out of the structure
Removing Water from Buildings

- Funnels and hoses
  - Place directly beneath a hole
  - Use to carry water out of the structure

Removing Water from Buildings

- Removing water with drains
  - Use a drain if the accumulation of water is close to the drain
  - Use a drain if it is large enough to handle the water
  - Keep the drain clean

Removing Water from Buildings

- Removing water with toilets
  - Unbolt and remove the toilet
  - Direct water down the waste pipe opening
  - Prevent leakage around the pipe with a rag or cloth
  - Fabricate screens to cover waste pipe openings
  - Check the ceiling below for leaks
  - Remove toilets on several floors if necessary
Removing Water from Buildings

- Removing water with waste pipes
  - Break pipes to utilize
  - Repeat on several floors if necessary
  - Only from the top down and only after the upper floor is clear of water
  - Place a strainer to keep pipes clear

Removing Water from Buildings

- Removing water by opening walls
  - Do only in extreme conditions
  - Remove the wall below a window

Removing Water from Buildings

- Removing water with pumps
  - Pumps come in various types and sizes
  - Pumps may be electric or gas powered
  - Pumps are not for the quick removal of a large amount of water
  - Pumps may be used in basements, elevator or shaft pits, or other low areas
  - Pumpers should not be used due to possible damage to the pump
  - Venturi siphons may be used
Removing Water from Buildings

- Dangers in removing water
  - Water will give the floor a level appearance
  - The water may be deep
    - Firefighters should not put their faces under water
    - A tool should be used to clear clogs

Smoke and Property Conservation

- Smoke damage may exceed damage from water
- Ventilation tactics will reduce damage
  - Using windows and doors
  - Using existing roof openings
  - Opening the roof
  - Using PPV fans and blowers

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe property conservation.
Review
- Water and Property Conservation
- Protecting Building Contents
- Removing Water from Buildings
- Smoke and Property Conservation
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe elevated streams.

Overview

- Elevated Stream Basics
- Providing a Water Supply
- Elevated Streams for Fire Attack
- Elevated Streams for Exposure Coverage
- Elevated Hose Lines
Elevated Stream Basics

- The purpose of elevated master streams
  - Direct fire attack
  - Exposure protection
  - Combination of fire attack and exposure control

Elevated Stream Basics

- Safety factors for elevated streams
  - Position the truck for safety
  - Use elevated streams defensively
  - Do not direct an elevated stream into a ventilation hole created by firefighting operations or the fire
  - Use fall protection
  - Do not reposition the ladder with a firefighter on the device
  - Operate the device in compliance with manufacturer recommendations

Elevated Stream Basics

- Delivery of water from aerial devices
  - From the elevated master stream device
  - From handlines
Providing a Water Supply

**Spotting the aerial ladder**
- Plan for a favorable position
  - Be ready for a change from offensive to defensive
  - Position wisely around engines and other apparatus
  - Reposition if the situation dictates it
  - Position for the best location if operations begin with a defensive attack

Providing a Water Supply

**Spotting the aerial for buildings**
- For maximum coverage of the fire area
- Based on the location of the fire and its direction of travel
- Between the fire and the exposures

Providing a Water Supply

**Spotting for open storage areas**
- Based on the location of the fire and the direction of travel
- At the flank of the fire if wind is a factor
- To protect firefighters advancing hose lines
Providing a Water Supply

- Spotting for flammable liquid-handling facilities
  - The device should never be spotted in line with either end of a horizontal tank or cylinder
  - The device should be spotted at the sides of the tank or cylinder

Providing a Water Supply

- Water supply
  - Is often obtained in cooperation with engine companies
  - Requires coordination between the engine and ladder companies
  - Requires the use of large diameter hose

Providing a Water Supply

- Water delivery systems for aerial ladders
  - Rigging a pipe system
    - Use a 3-inch hose or larger
    - A 2½- or 3-inch hose requires a valved 3 or 4 inlet siamese for supply
    - A hose strap should secure the hose at each section
    - Halyards allow for control of the nozzle from the ground
    - Is a time intensive operation
Providing a Water Supply

- Prepiped systems
  - Are permanently mounted systems
  - Provide for rapid application
  - Come in two types
    - Telescoping waterways
    - Nonteleoping systems

Water delivery systems for elevating platforms

- Are supplied by a permanent water system
- Have a master stream in the platform
- May have a second master stream device
- Must be charged before being extended toward the fire
- Require fall protection

Elevated Streams for Fire Attack

- Nozzles
  - Require the proper operation pressure
  - Require a continuous water supply
Elevated Streams for Fire Attack

- Solid-bore nozzles
  - Provide better reach
  - Allow the apparatus to be positioned further from the fire
  - Are not as affected by wind
  - Are less affected by steam conversion

Elevated Streams for Fire Attack

- Spray nozzles
  - Have the ability to provide a straight stream to a wide-angle fog
  - Are more affected by wind
  - Provides less reach and penetration
  - Requires closer positioning of the apparatus

Elevated Streams for Fire Attack

- Stream placement
  - Spray nozzle streams
    - Should enter the center of the window
    - Should be set at a 30° angle
    - Should first be aimed at the upper part of the window
    - Should then sweep downward
    - Should repeat movements as necessary
Elevated Streams for Fire Attack

- Solid-bore nozzle streams
  - Should enter the window at an upward angle
  - Should not hit the contents before hitting the ceiling
  - Should not be aimed down to the floor

- Should be moved around for best coverage
- May unintentionally push fire
- May be difficult to aim into a window in heavy smoke conditions

Wind and thermal-updraft effects
- Are more of a problem in a large free burning fire
- Are more of a problem with fog patterns
- May require the nozzle being positioned closer to the fire
- Are less of a problem with solid-bore nozzles
Elevated Streams for Fire Attack

- Weakened structures
  - May show signs of being weakened
  - May have heavy items on the roof
  - May require the moving of the apparatus

Elevated Streams for Fire Attack

- Shutdown
  - Elevated streams should be shut down when no longer needed
  - Unneeded elevated master streams add unnecessary weight to the structure
  - Unneeded elevated master streams waste water

Elevated Streams for Fire Attack

- Improper use of streams
  - Roof openings
    - Improperly used
      - Elevated streams directed into roof openings destroy the venting action
      - Elevated streams directed into roof openings drive heat, smoke, and gases back into the structure
Elevated Streams for Fire Attack

- Properly used
  - Elevated master streams may protect a roof by hitting close to a hole and allowing water to flow into an opening
  - May be used after the roof has collapsed

Elevated Streams for Fire Attack

- Offensive operations inside of a structure
  - Elevated master streams should never be used while firefighters are attacking the fire inside of the structure
  - Hoselines in operation should be defensive only
  - If the operation switches from defensive to offensive the elevated master stream must be shut down

Elevated Streams for Exposure Coverage

- Outside exposures
  - Descriptions
    - Fire spread from one structure to another
    - Fire spread from one independent part of a building to another
Elevated Streams for Exposure Coverage

- Deterrents
  - Spaces between buildings
  - Unpierced fire walls
  - Outside sprinklers and spray systems
  - Truck company efforts

Elevated Streams for Exposure Coverage

- Exposure hazards
  - Factors
    - Recent weather
    - Present weather, especially wind
    - Spacing between the fire and the exposures
    - Building construction materials and design

Elevated Streams for Exposure Coverage

- Intensity and size of the fire
- Location of the fire
- Potential for trapped victims
- Availability and combustibility of fuel
- Size of the initial fire force and additional resources
- Firefighting equipment on hand
Elevated Streams for Exposure Coverage

- Worst case scenario
  - Recent dry weather
  - Strong winds blowing toward exposures
  - Closely spaced frame buildings
  - Severe fire that is difficult to reach
  - Abundant fuels
  - Limited personnel and apparatus
  - Poor access
  - Poor water supply
  - Being unable to reach trapped victims

Elevated Streams for Exposure Coverage

- Exposure protection
  - Should include those structures down wind from embers
  - Requires choosing a stream
  - Requires directing the stream

Elevated Hose Lines

- Operating from an elevating platform
  - Usually provide separate outlets for hose lines
  - Hose lines can be operated from the platform
  - Requires the use of fall protection
Elevated Hose Lines

- May use a short section of hose with a nozzle
- May be used to advance hoselines into the structure
- May be used as a standpipe

Elevated Hose Lines

- Operating from an aerial ladder
  - The hose may be advanced over the ladder
  - Requires the use of hose straps
  - Requires the use of fall protection
  - Requires not extending or retracting the ladder with a firefighter on it
  - Requires working within the manufacturers recommendations

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe elevated streams.
Review

- Elevated Stream Basics
- Providing a Water Supply
- Elevated Streams for Fire Attack
- Elevated Streams for Exposure Coverage
- Elevated Hose Lines
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe the control of utilities.

Overview

- Pre-incident Planning for Utility Control
- Forced Air Systems
- Heating Units and Fuels
- Electric Service
- Water Pipes
Pre-incident Planning for Utility Control

Truck company responsibilities
- Know the district
- Be aware of unusual, complex, or difficult utility systems
- Understand the associated hazards with each type of utility
- Know who to call in an emergency
- Know how to call the utility company

Operating controls
- Are operated by power switches, breakers, and shutoff valves
- Depend on the type, size, and age of the system
- Require time to learn in large complex systems
- Should be identified on preplan floor plans
- May be found in similar locations of a “like structure” neighborhood

Building codes
- Can be helpful in determining the locations of operating controls
- May require that controls be placed in designated positions
Forced Air Systems

- Forced Air Systems
  - Operate through a series of ducts and blowers
  - May spread heat, smoke, gases, and flame both horizontally and vertically
  - May contain a thick mat of combustible dust which could flash in fire situations

Forced Air Systems

- Forced-air blowers will
  - Increase the efficiency of the ducts as channels for fire spread
  - Draw fire and heated gases into the ductwork through the return air inlets
  - Force hot combustion products from involved areas to uninvolved areas through the air ducts

Forced Air Systems

- Forced-air blower actions
  - The system may shut down automatically
  - The system should be shut down
- Smoke detectors
  - Monitor air in the ductwork
  - Sense smoke
  - Shut down the system
Forced Air Systems

- Dampers
  - Close automatically to seal off ducts and isolate fire
  - May be spring loaded and held by fusible links
  - Are located where ducts pierce through fire walls or other major walls
  - Have access plates
  - May allow large amounts of smoke and gas to pass before activating

Forced Air Systems

- Heating systems
  - One- and two-family dwellings
    - Typically use a furnace
      - Heat warms air in a plenum
      - A blower forces air through the ducts
      - Thermostats control the burner and the blower
      - In a fire the burner thermostat will shut down and the hot air returning to the plenum will cause the blower to continue to operate

Forced Air Systems

- Large and complex systems
  - Operate on the same basic principle as residential systems
  - Are divided into separate sections or zones
    - The entire ceiling may be an air-return system
  - May contribute to fire spread
Forced Air Systems

- Medium- and high-rise buildings
  - A single duct may serve several floors
  - Smoke, heat, and gases will be carried to other floors

Forced Air Systems

- Cooling systems
  - A thermostat will continue to attempt to cool a warm environment
  - A fire will keep the thermostat activated
  - A fire would be drawn into the ducts and can spread

Forced Air Systems

- Air circulation systems
  - May be present in older structures
  - Are obsolete types of systems
  - Have large ducts
  - Have huge intakes and blowers
Forced Air Systems

- Air circulation systems
  - May have radiator-like cooling units
  - May spread fire
  - Are almost always manually controlled
  - Must be shut down in a fire
  - May be designed to exhaust smoke after a fire has been extinguished

Heating Units and Fuels

- Oil burners
  - Basic systems
    - Oil is stored in a tank
    - Oil is pumped to a burner in the furnace
    - In the burner the oil is vaporized, mixed with air, and burned
    - The burner, fuel pump, and heat-circulating device are operated electrically

Heating Units and Fuels

- Small oil burner systems
  - Burn number 2 fuel oil
  - Have a storage tank
  - Have a fuel line that carries fuel from the tank to the burner
  - Have a bright red emergency shutoff switch located at the top of the steps or just inside the building
Heating Units and Fuels

- Large oil burner systems
  - Are found in apartment houses, office buildings, factories, schools, and hospitals
  - Burn a heavy oil, usually number 6 fuel oil
  - Require fuel storage systems
  - Have an emergency shut off
  - May have siphons
  - Are sectionalized

Heating Units and Fuels

- Kerosene heaters and stoves
  - Are used for heating and cooking
  - Are found in rural areas and poorer urban areas
  - Are self-contained units
  - Have fuel tanks that may explode

Heating Units and Fuels

- Kerosene cook stoves
  - Resemble standard gas ranges
  - May contain fuel tanks or be fed from outside tanks
  - Do not usually have emergency shutoffs
## Heating Units and Fuels

**Gas units**
- Municipal gas shut off
  - May be located inside or outside of the building
  - May be marked a distinctive color and be marked "emergency gas shut off"
  - May have to be shut off at the street if the valve is in a fire area
    - May require the gas company's assistance

**Gas meters**
- Are usually the weakest link in the gas supply system
- Will usually fail before the piping
- Will usually be located in a bank for each apartment
- In a bank, may be involved in a fire
- May require special tools or keys to shut off street valves

**Bottled gas for home use**
- Is usually stored next to the house
- Is carried by copper lines
- Does not require a meter
- Has a gauge and a valve
- May be cooled in fire conditions with a hose stream
- Has a relief valve or plug to release pressure
### Heating Units and Fuels

- Bottled gas in a large industrial plant
  - May be stored above or below ground
  - May have buried piping
  - May have shutoffs at the cylinder or building
  - May have sectional valves throughout the plant
  - May have a bank of remote valves in an engineers station

### Electric Service

- Electric service
  - May need to be shut down to prevent electrical shock
  - May be left on in order to aid escaping victims; power lights, fans, and tools; or aid in search and rescue or fire attack

### Electric Service

- Main power switches in dwellings
  - Are usually 110- or 220-volt systems
  - Can be shut off by pulling the meter
  - Can be shut off by breakers or fuses
  - Can be shut off by cutting the electrical service line (only by the power utility)
Electric Service

- Main power switches in commercial and industrial structures
  - May be of much higher voltages
  - May have a main power switch and several sectional switches
  - May have panels or lines marked “high voltage”
    - Firefighters must stay out of high voltage areas
    - Building engineers must assist

Electric Service

- Main power switches in elevators
  - Are usually powered by their own electrical source
  - Require the use of SOGs
  - Require extreme caution
  - Should not be used at all if main power is lost

Water Pipes

- Damaged water pipes may
  - Spill water, adding to the floor load and causing structural damage and fall hazards
  - Add to electrocution hazard
Water Pipes

- Water shutoff valves
  - May have valves at meters at the street
  - May just have valves at the street
  - May require special keys
  - May be located in basements
  - May be located in interior utility rooms
  - Are present at most individual fixtures
  - May be divided into sections in large structures

Water Pipes

- Boilers and heating units require the heating source to be cut off if the water is cut off

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe the control of utilities.
Review

- Pre-incident Planning for Utility Control
- Forced Air Systems
- Heating Units and Fuels
- Electric Service
- Water Pipes
Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe overhaul operations.

Overview

- Pre-inspection and Overhaul
- Personnel and Overhaul
- Considerations when Performing Overhaul
- Areas of Possible Rekindling
- Chemicals and Other Hazards in Overhaul
- Searching for the Cause of the Fire
- Restoration and Protection of Property in Overhaul
Pre-inspection and Overhaul
- During pre-inspection
  - Determine structural integrity
  - Identify hazards
  - Eliminate or mark hazards
  - Determine lighting needs

Personnel and Overhaul
- Personnel readiness
  - Be rested
  - Be in the best physical condition

Personnel and Overhaul
- Control of personnel movements
  - Use the Incident Command System
  - Use an accountability system
  - Wear full PPE with SCBA
  - Operate under the supervision of a sector or company officer
  - Be aware of hazardous conditions
  - Have a firefighter assist and safety team (FAST)
Personnel and Overhaul

- Work assignments
  - Locate and expose existing fire, embers, and sparks
  - Work above, below, and adjacent to the fire area
  - Use proper tools and equipment

Considerations When Performing Overhaul

- Overhaul hazards
  - Weakened flooring
  - Weakened roofs
  - Weakened ceilings
  - Weakened stairways
  - Broken windows and glass

Considerations When Performing Overhaul

- Overhaul Hazards (continued)
  - Exposed electrical wiring
  - Accumulated water
  - Hanging debris
  - Hanging air conditioning units
  - Hanging metal flashing and gutters
  - Exposed and damaged utility piping
Considerations When Performing Overhaul

- Indications of rekindling
  - Flames
  - Smoke
  - Stronger-than-normal odor
  - Vertical black streaks
  - Blistering
  - Discoloration

Considerations When Performing Overhaul

- Helpful tools for locating rekindling
  - Portable lights
  - Thermal imaging devices
- If rekindling is discovered
  - Wet down the area
  - Open for a closer examination

Areas of Possible Rekindling

- Walls and ceilings
  - Must be thoroughly examined
  - Must be wet down if necessary
Areas of Possible Rekindling

- Above the fire
  - Remove baseboards
  - Wet down suspicious areas
  - Check insulation
  - Remove blown in insulation
  - Examine vertical openings
  - Use power tools to minimize damage
  - Use thermal imaging to minimize damage

Areas of Possible Rekindling

- Vertical passageways
- Cabinets and compartments
- Window and door mouldings
- Basement areas
- Walls between adjoining structures

Chemicals and Other Hazards in Overhaul

- Command makes decisions
- Personnel must be trained
- Special resources are used
- Hazardous materials response teams must be requested
Chemicals and Other Hazards in Overhaul

- SOGs must be in place
- An expanded Incident Command System must be in place
- Appropriate PPE must be worn
- Direct communication is required
- Decontamination is required
- A medical sector is required

Searching for the Cause of the Fire

- Preserve evidence
- Look for the signs of a deliberately set fire

Searching for the Cause of the Fire

- Evidence is easily destroyed
  - Accidentally thrown out
  - Burned
  - Washed away
Searching for the Cause of the Fire

- Evidence should be turned over to the appropriate personnel
  - Law enforcement
  - Fire department
    - Fire investigators
    - Arson investigators

Evidence must be identified
  - The location where the evidence was found
  - The presence of
    - Multiple fires
    - Unusual odors
    - Undue wood charring
    - Uneven burning
    - Holes made in walls and floors
    - Heating equipment in disrepair

Identifying evidence (continued)
  - The presence of
    - Empty accelerant containers
    - Residues of wax or paraffin
    - Opened or removed service doors or panels to shafts
    - Inoperative sprinkler systems
    - Inoperative fire doors
    - Inoperative protective systems
Searching for the Cause of the Fire

- Notify firefighters of suspicious fire
- Call investigators
  - When anything unusual is found
  - To discuss similarities between fires
  - To establish a cause of arson

Restoration and Protection of Property in Overhaul

- Protection
  - From the elements
  - From vandalism
- Control of the building
  - Police department
  - Owner
  - Authority having jurisdiction

Restoration and Protection of Property in Overhaul

- The building
  - Cover roof openings
    - Skylight frames returned to the original position
    - Holes covered with salvage covers wrapped in boards
  - Clear roof drains
  - Cover windows
Restoration and Protection of Property in Overhaul

- Furnishings and stock
  - Return to the building if possible
  - Cover inside if necessary
  - Cover with secure salvage covers if outside

Restoration and Protection of Property in Overhaul

- Make arrangements for protection
- Obtain a written release of responsibility

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe overhaul operations.
Review

- Pre-inspection and Overhaul
- Personnel and Overhaul
- Considerations when Performing Overhaul
- Areas of Possible Rekindling
- Chemicals and Other Hazards in Overhaul
- Searching for the Cause of the Fire
- Restoration and Protection of Property in Overhaul