VENTILATION

Trimester Training
• Trimester Training is designed to provide training to all firefighters at the company level.

This training will be based on the Lincoln Fire Department operations policies and procedures, IFSTA, essentials, fire protection, publications, NFPA standards or others.
• All firefighters need to have an understanding of fire department uses both PPV, negative, horizontal, vertical and hydraulic types of ventilation.

This drill is intended to have all personnel review ventilation principles used by the Lincoln Fire Department.
• The firefighter given a presentation on ventilation based on IFSTA Essentials and LFD procedures shall describe knowledge, application and use of ventilation procedures to the satisfaction of the company officer.
• The firefighter shall define ventilation and explain the advantages and effects of ventilation.

• The firefighter shall identify the safety considerations and precautions to be taken in performing ventilation.

• The firefighter shall describe types of equipment used during ventilation.
• The firefighter shall describe the advantages and disadvantages of the following types of ventilation.
  a) vertical
  b) horizontal
  c) trench/strip
  d) mechanical
  e) mechanical pressurization
  f) hydraulic
The firefighter shall identify the signs, causes and effects of backdraft explosions. The firefighter shall identify methods of preventing a backdraft explosion.
The firefighter shall recognize the characteristics of, and list necessary precautions when ventilating the following roof types:

- flat
- pitched
- arched
- shed
• The firefighter shall determine the integrity of a roof system by sounding.

• The firefighter shall describe how the following factors are used to determine the integrity of a roof system:
  a) construction
  b) visual observation
  c) elapsed time of fire
• The firefighter shall define procedures for the following types of ventilation:
  a) vertical
  b) horizontal
  c) trench/strip
  d) mechanical
  e) mechanical pressurization
  f) hydraulic
The firefighter shall explain opening various types of windows from inside and outside, with and without the use of tools.

The firefighter shall explain breaking window or door glass and removing obstructions.

The firefighter using both hand and power tools, shall demonstrate the ventilation for pitched and flat roofs.
• The firefighter shall identify considerations that must be made when determining the location and size of a ventilation opening including:
  a) availability of natural openings
  b) location of fire
  c) direction in which the fire will be drawn
  d) type of building construction
  e) wind direction
  f) progress of fire
OBJECTIVES

g ) condition of the building
h ) obstructions
i ) relative efficiency of large vs. small openings

• The firefighter shall identify the location of the opening, the method to be used, and the precautions to be taken when ventilating a basement
Ventilation is the systematic removal of heated air, smoke and gases from a structure, followed by the replacement of a supply of cooler air, which facilitates other firefighting priorities.
**ADVANTAGES OF VENTILATION**

A) Aids lifesaving and rescue operations

B) Speeds fire attack and extinguishment
   - Makes firefighting easier
   - Permits easier salvage operations

C) Property conservation
   - Reduces fire and water damage
   - Reduces smoke and heat damage

D) Fire spread control
   - Reduces mushrooming
ADVANTAGES OF VENTILATION

– Helps provide confinement

E) Reduction of flashover potential

F) Reducing the danger of backdraft

– Proper ventilation at highest point, this removes unburned carbon and heat, then the addition of oxygen will not complete the fire triangle
Signs of possible backdraft
  ) Puffing/sucking/or curling smoke
  ) Windows rattling
  ) Yellowish-gray-greenish smoke
  ) Windows darkened/thick smoke inside
  ) Exterior walls and doors hot to touch
  ) Hot unbroken glass
  ) Dull orange flame or no visible flame
  ) High temperature
  ) Tight building
PROcedures for Determining Ventilation Needs

A) Life safety Hazards
   – Establish need - Hazards
   – Use most desirable method

B) Fire protection requirements and precautions.
   – Exposures
   – Have charged hose lines in place
   – Provide secondary means of escape
Prevent personnel from walking on spongy roofs to help distribute weight of firefighters

) If necessary- lay ladder on roof to help distribute weight of firefighter
Secure lifeline to firefighter working on roof to protect from sliding or falling
Watch out for electrical wires
C) Dangers when performing ventilation

- Dense smoke
- Toxic gases
- Low oxygen
- Flammable or combustible gases
- Structural damage or weakness
- Large volume of fire
- Backdraft/flashovers
D) Ventilation Procedures

- Location and extent of fire
- When to ventilate
- What method of ventilation needed

) Ventilation Procedures
Location and extent of fire
Construction features- trusses
High- rise buildings
Basement and windowless buildings
Contents
Exposures
Wind direction
When to ventilate
Determined upon heat, smoke, gas, and buildup
When location of fire is known

What method of ventilation needed
Horizontal
Vertical
Forced (negative or positive)
TOP OR VERTICAL VENTILATION

- Picture Ventilation BK pg. 97
- Picture showing FF removing skylight

Selecting the place to ventilate

Availability of natural openings or installed ventilating devices.
  - Skylights- should be removed not broken
  - Ducts or Vents
  - Scuttles- are metal/wooden hatches that provide access into a attic or cockloft
  - Stairway doors

Location of fire, and the direction you want the fire to travel
• Picture Ventilation BK pg. 118
• Picture showing ventilation using K-12

Type of construction (various roof types and tools used to ventilate them)

Flat- sloped- mansard
   Axe, chain saw, pike pole, ladders, and/or K-12 saw

Pitched- gable, hip or gambrel
   Axe, chain saw, pike pole, ladders, and/or K-12 saw

Arched
   Axe, chain saw, pike pole, aerial ladder or snorkel preferred, and k-12 saw
TOP OR VERTICAL VENTILATION

– Picture Ventilation Bk pg. 105
– Picture showing FF venting roof using chain saw and axe for a foothold

Concrete
   Power K-12 saw (concrete blade), jack hammer, use existing openings
Metal deck
   Axe, K-12 saw (metal blade), ladder
Tiles/slate roofs
   Sledge hammer, axe, K-12 saw
Trench or strip ventilation
Basement fires
Ventilating a roof

- Sound roof for supports with axe
- Mark location of opening with pickhead
- Consider removing building or roofing
- Cut along roof support
- Use short strokes- order of cut
- Make all cuts before clearing opening pry up all roof material with pickhead or other tool to clear opening
- May need to push long handled tool down through opening to remove ceiling
- NEVER carry power saws up a ladder while the saw is running (K-12 or Chain saw)
TOP OR VERTICAL VENTILATION

- Wind direction
- The extent of fire progress
- Condition of building and contents
• Top level ventilation procedures
  – Coordinating with attack and ground crews
  – Observe wind direction relating to the exposures
  – Note the existence of obstructions or weights on the roof
  – Secure a lifeline to the roof
  – Utilize natural roof openings
Cut one large hole rather than several small ones
   4’ x  4’ for residential
   8’ x 8’ for commercial
Make hole at highest point of the building or directly over the fire
Work with the wind at your back
Push down the ceiling
Follow safety precautions
TOP OR VERTICAL VENTILATION

• Precautions (upsetting vertical ventilation)
  – DON’T put water into the vent opening
  – Improper use of forced ventilation
  – Excessive glass breakage
  – Explosions
  – Breakage of skylights
  – Hole burning through
  – Other openings between the attack team and upper openings
A) Where used
   – Residence where attic is not involved
   – Buildings with high windows
   – Attic with louvers
   – Floors of multi-storied structures
   – Buildings with large unsupported open spaces under the roof
B) Weather
   – Open leeward window at highest point first
   – Open windward window at lowest point second

C) Exposures
   – People
   – Buildings
D) Precautions (upsetting horizontal ventilation)
   – Opening doors and windows, on windward first may cause an upset of thermal layering
   – Opening doors and windows between firefighting crews and exists

E) Provide charged hose line
F ) Using windows for ventilation

– Remember “TRY BEFORE YOU PRY”

– Types of windows:
  1 ) Checkrail or Double hung
   – pry at center of lower sash
   – note this may break glass
  2 ) Casement or hinged
   – Difficult to enter due to latching mechanism and crank
  3 ) Projected and factory
   – Breaking pane at latch and open window
4 Awning or jalousie
   - Awning has larger panes of glass
   - Jalousie has narrow panes of glass avoid going through if possible

   - When breaking glass
     - Ordinary glass relatively inexpensive
     - Tempered glass should be broken only as a last resort
Things to remember:

- Stay on windward side
- Keep hands above point of impact
- Start at top of pane and work down
- Remain to side of opening so fire gases can escape
- Clear all jagged glass from frame
- LOOK for signs of backdraft
Open top on leeward, bottom on windward
Open 2/3 from top, 1/3 from bottom if windows only on one side
Remove all obstructions
  Screens
  Curtains
Coordinate with attack crew
Sometimes opening windows is sufficient, but often they must be broken for fast through ventilation
A) Fog Stream- Hydraulic Ventilation
   – Stream expansion
   – Entrainment of gases and smoke
   – Use 60% fog pattern and cover 85-90% of the window opening and approximately two feet from the window (inside to outside)
B) Smoke Ejectors- Negative Pressure Ventilation
   – Pull don’t push air
C) Positive Pressure Ventilation (PPV)
   – Using fan from outside of the structure to blow fresh air into the building
- Advantages
  - Keeps firefighters out of smoke
  - Doesn’t block entrances or exits
  - Can expel smoke out of voids by the pressure it creates
  - Requires less setup time
  - More efficient
  - Weather usually doesn’t affect it

- Disadvantages
  - Can cause fire to intensify
  - Dependent on a power source
  - Requires special equipment
(Heating, Ventilation, and Air Conditioning)

• Precautions
  – If the (HVAC) doesn't shut off it may cause smoke and fire to spread
VENTILATION THE "3 NEVERS"

A) Never ventilate before hose lines are in position and charged
B) Never put a hose into vent opening
C) Picture Ventilation BK pg. 67
Ventilation Trimester

• Name/ID_________________________

• Date__________________________

• Rig/Shift_______________________

• Captains Signature________________

1. The firefighter discusses or demonstrates positive pressure ventilation. Y_____ N_____

2. The firefighter discusses the advantages and disadvantages of positive and negative pressure ventilation. Y_____ N_____

3. The firefighter demonstrates horizontal, vertical, hydraulic and strip ventilation. Y_____ N_____ 

4. The firefighter discusses the different equipment required for the different types of ventilation. Y_____ N_____