



## VENTILATION (1.1)

Developed by Captain Jason M. Starck  
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- NFPA 1001

### TASK SKILL DESCRIPTION AND DETAIL

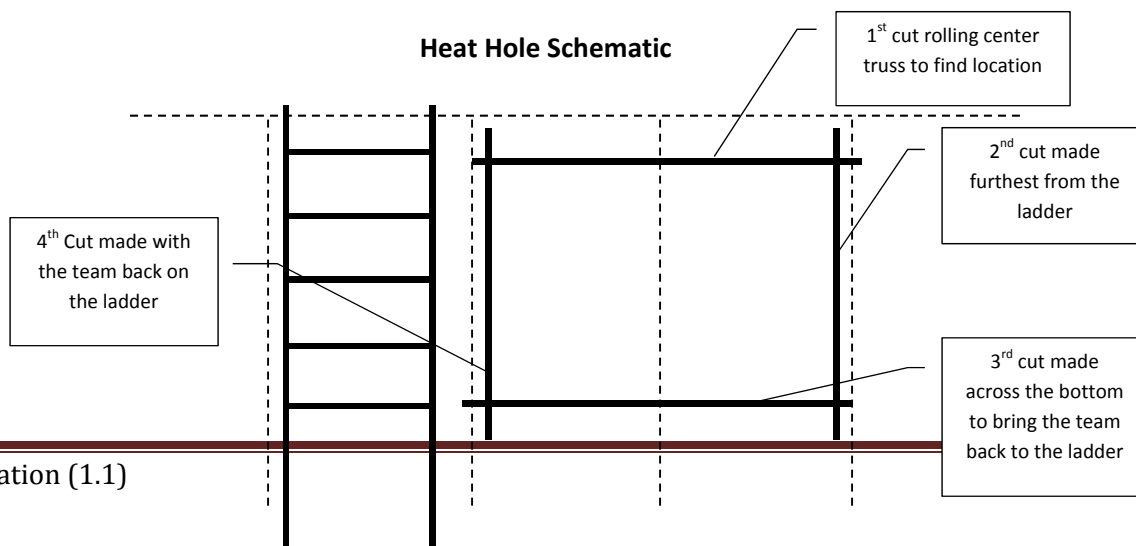
#### Residential Vertical Ventilation

**Heat Hole** Typical opening required to effectively vertically ventilate a standard residential structure. This opening should be made as close too directly over the fire location as possible. It should also be a minimum of a 4'x4' opening, or a total of 16sqft in size. The order in which the cut should be made either left or right of the roof ladder should be: TOP, FAR SIDE, BOTTOM, and CLOSE SIDE.

Steps:

- #1 The top cut is made first to locate the trusses in the roof
- #2 The Far Side cut is made next because it is the hardest to make and requires you to get the furthest off of the ladder to complete.
- #3 The bottom cut is made to bring you back to the ladder for the final cut.
- #4 The final cut is made next to the ladder so that both firefighters are on the

AT NO TIME during vertical ventilation operations should any of the team members find themselves with the opening between them and the egress points. All ventilation operations should work from the most dangerous area on the roof towards the point of egress.





**Caution:** When you decide to louver the opening, take note of wind direction in relation to your heat hole. Be sure to louver in the same direction as the smoke travel that way the louver is held open and not closed by the wind. In high wind scenarios (greater than 15mph) remove the louver either by putting it into the attic or removing it from the opening.

### Commercial Vertical Ventilation

The types of ventilation explained below are for commercial operations or large residential buildings. Officers assigned to these operations should have a minimum crew size of three. These cuts are too labor intensive for just two FF's. Remember that on strip and trench cuts in a peaked roof, a mirrored cut is taking place on the other pitch of the roof at the same time so that the cut extends from the peak to the outside wall on both sides of the ridge. Two saws are required for expediency of operations.

**Coffin Cut** Also referred to as a commercial cut. This offensive cut is designed as a heat hole type operation directly above the fire location. When completed it should be a minimum of a 4'x8' louvered opening. It should louver in two pieces and will resemble the lid of a coffin. This cut should be completed with a roof ladder in place (although in the videos no roof ladder was used). A roof ladder will provide the crew a place of refuge if the roof begins to collapse. The two key parts are the order in which the cuts are made and the ability to open the first half as soon as possible while the second half is still being cut. This begins the ventilation process much sooner.

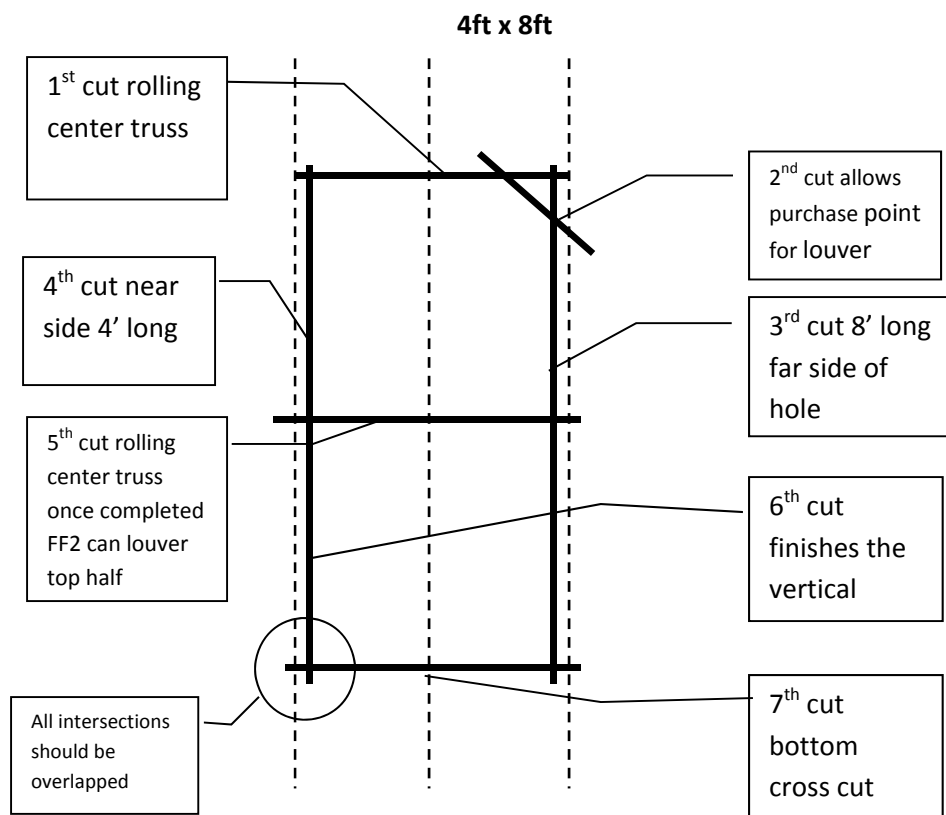
- #1 Make the top horizontal cut starting on the inside of one truss, crossing the center truss, and ending on the inside of the near truss.
- #2 Make a 45 degree cut across the far corner to make a purchase point.
- #3 Cut the far side, cutting 8' down the side.
- #4 Start the near cut at the top and cut 4' down and stop.
- #5 Make the center cut rolling the center truss, completing the top 4'x4' square.
- #6 Second Firefighter with a trash hook louvers the top square so that the hole begins to vent.



- #7 Complete the remaining 4' of the near cut to the bottom
- #8 Make your final cut across the bottom to complete the cut
- #9 Louver the bottom square
- #10 Due to commercial fire loads assess the progress of the ventilation and determine if the original hole is enough or another coffin cut needs to be completed.
- #11 Exit the roof away from the fire area

Note: In the video the coffin cuts were not completely 4x8 due to the truss spacing on the modular at 18 inches on center, which gave us a 3'x8' opening when the cut was completed.

#### Schematic of a Coffin Cut



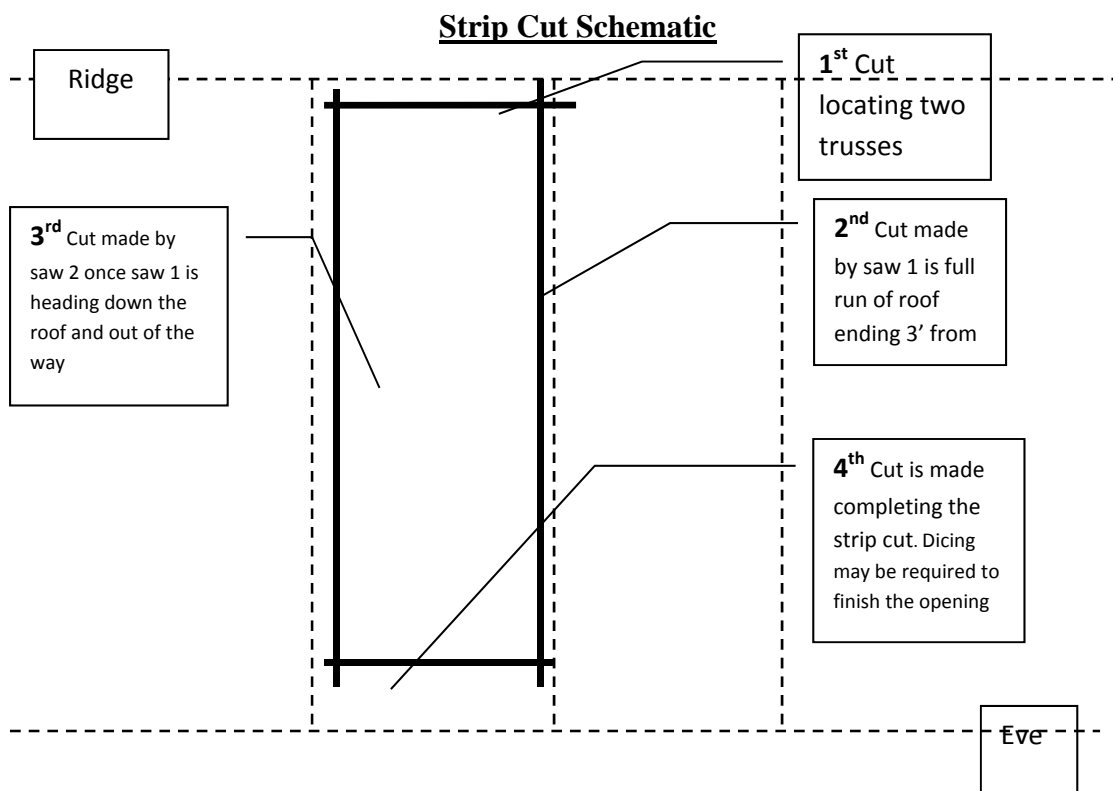


## Strip Cut

This is an offensive operation cut close to the original heat hole or fire location. It is designed to hinder horizontal spread of fire in the attic directly above the unit of origin. This cut could be made on commercial or large residential. It should begin at the peak and run down the roof to at least 3 feet from the eve. This cut should be fast and not require louver. It is designed to run between two trusses.

### Steps:

- #1 Sound the roof and access the peak where the cut will begin.
- #2 The trash hook will then be placed near the eve as a marker for firefighter to keep them from backing off the roof.
- #3 Top cut is made first to locate the two trusses that you will be cutting between.
- #4 Saw 1 will then start on the truss closest to the fire and cut down to the stopping point near the eve.
- #5 Once saw #1 is in operation, saw 2 will begin to cut down the truss opposite of the first cut.
- #6 Once saw #1 finishes its cut, the firefighter will return to the top of the cut near the peak and begin to dice the remaining roof materials in to smaller units so they can fall into the attic space.
- #7 Once saw #2 finishes the second long cut the firefighter will begin dicing from the bottom up until the two saw operators meet.
- #8 Repeat the operations on the opposite side of the peak.
- #9 Exit the roof away from the fire area.



**Trench Cuts** This operation is a defensive operation and is designed to compartmentalize large un-compartmentalized spaces in commercial buildings. This tactic is completed well ahead of the fire and is done without the use of a roof ladder. It is a two or more saw operation depending on the size and scope. These openings should be 4'x necessary length to accomplish the strategy. They should span the entire roof area that is being separated from the fire area. It is a louvered opening whether you are cutting parallel to the trusses or perpendicular to the trusses.

Steps: (Perpendicular trench to the trusses)

- #1 Determine location of trench and verify with command.
- #2 Sound the roof to area of operations
- #3 Saw #1 begins the top cut and every time he/she rolls a rafter they make a slash mark to identify the truss location.
- #4 Saw #2 follows in behind and begins to dice the sections for louver. This is where the slash marks come in! Each dice must fall between a slash mark,



cutting. This will cut the deck between the trusses and allow the sections to hinge on the truss.

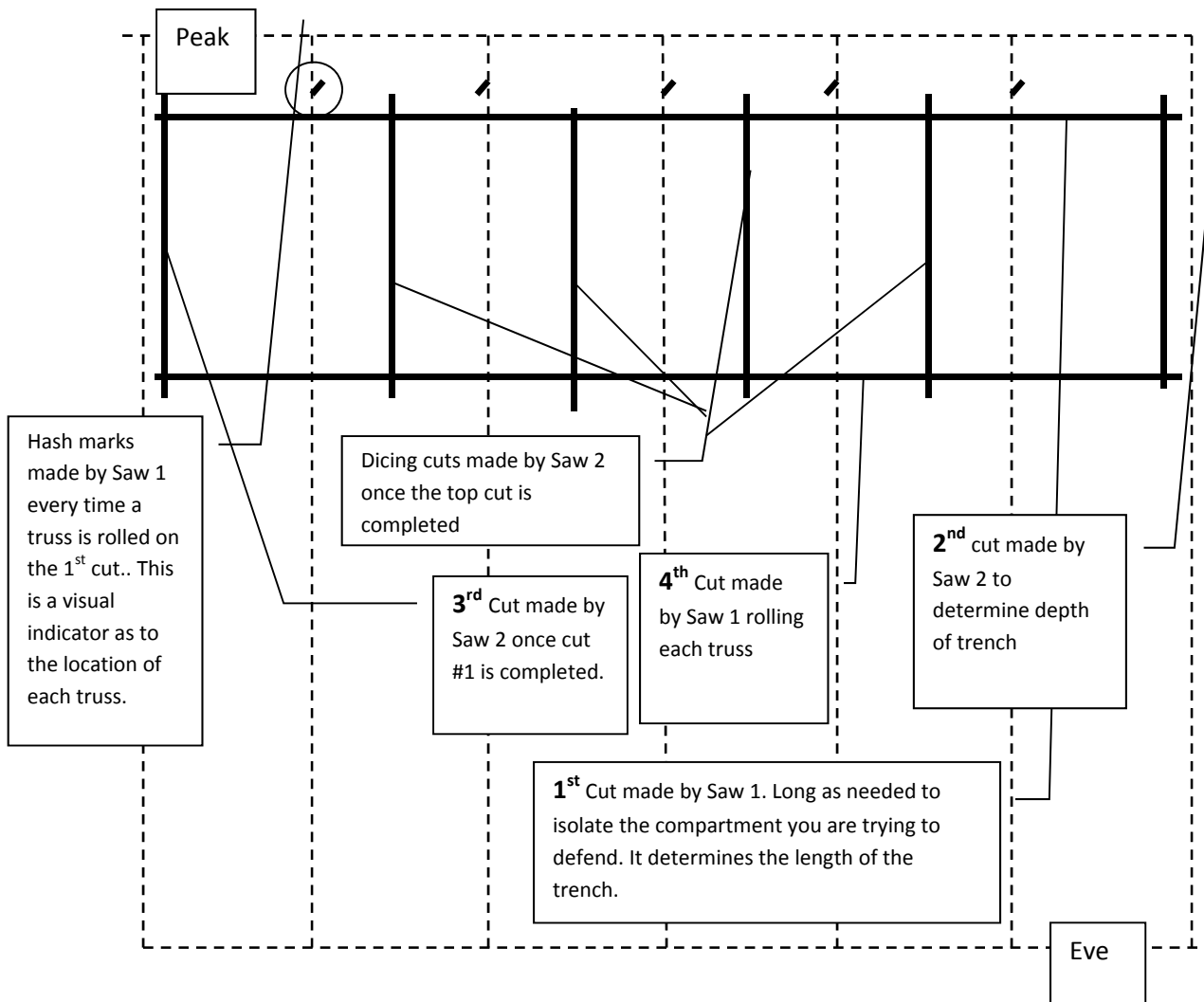
- #5 Saw #1 makes the bottom cut, rolling the rafters as they go (no need for the slash marks as in Step #3).
- #6 Once the saws meet they can store the saws and start opening up the louvers.
- #7 Care must be taken to make sure the louvers stay open if it is going to be awhile before the fire makes it to that location.

Steps: (Parallel to the trusses)

- #1 Make two long cuts from one end to the other in a similar fashion to how you would cut the sides of a heat hole, with a truss in the center for a pivot. These cuts should extend completely across the compartment to be cut off from the fire.
- #2 Saw 1 starts the far cut starting nearest to the fire.
- #3 Once Saw 1 has moved a few feet, Saw 2 will begin to dice the long strip into 4' or smaller pieces.
- #4 Saw 1 will make the near cut.
- 5# Louver each section like you would a standard heat hole or coffin cut.

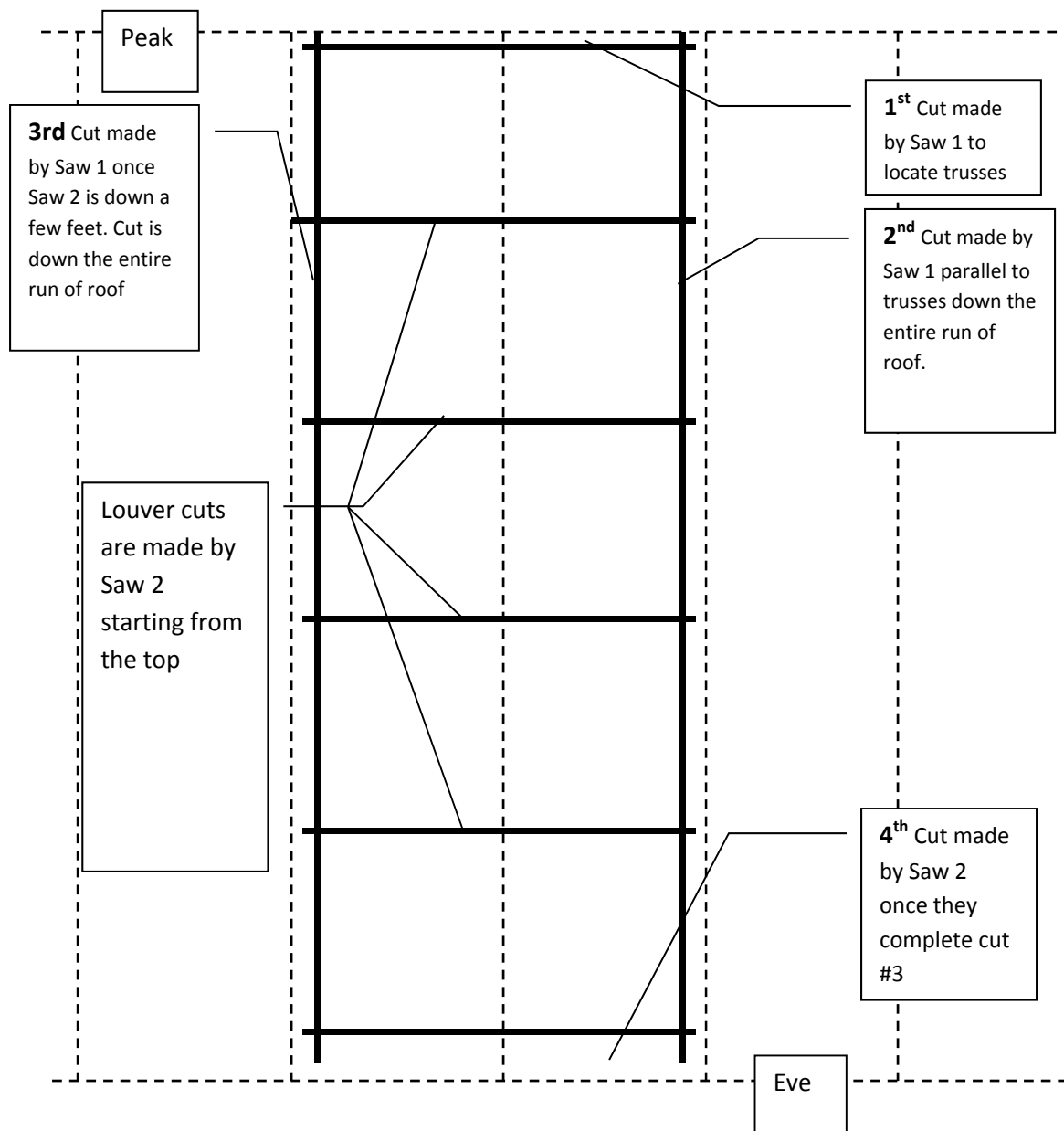


### Trench Cut Schematic perpendicular to run of trusses





### Trench Cut Schematic parallel to the trusses







## **Horizontal Ventilation**

Offensive maneuver made in coordination with fire attack entering the structure. Completed on the initial 360 of the first arriving officer or the first arriving truck officer's 360. This ventilation is designed to be an initial ventilation to improve conditions and provide some relief for attack crews while making the fire area. Horizontal ventilation should be monitored and evaluated to determine if follow up PPV or vertical ventilation is required. This form of ventilation provides limited relief for victims so quick application of additional ventilation is necessary to provide improved conditions for trapped victims.

Horizontal ventilation can either be done from a ladder with hand tools, from the ground with long handled tools, with a ladder, or with the aerial ladder for windows above 2 stories.

All horizontal ventilation should be done beginning at the top of the window and working your way down to prevent injury due to falling glass. All components of the window (glass, screens, window coverings, double hung frames, etc.) must be removed in order to provide sufficient ventilation for the structure and additional egress opportunities for interior crews.

Follow basic FFI task procedures for ventilating a window with long handle tools and off of a ladder.

### **Ladder Ventilation**

**Ground Ladder:** Single person throw in-line with the window opening required to be vented. Extend to a height just above the top of the window. Once extended, let the ladder fall into the window, being sure to follow the ladder into the building with your body weight to control the bounce. This technique should blow a majority of the glass into the structure, however be ready for falling glass when attempting this type of ventilation.

**Aerial Ladder:**

1. Ascertain the width of the area to be ventilated
2. Position the center of the turntable at the center of the span of windows
3. Time the ventilation; it is generally performed after the engine company has charged the line and is prepared to advance. Timing the ventilation is frequently critical. The Radio should be used for coordinating the operation. For example, when a difficult search is in progress, premature venting may precipitate fire extension and endanger fire fighters or civilians.
4. Aim at upper window panels, just above the sash, and extend without hitting the sides or tops of window frames.



- Caution:**
1. Only a slight extension through the window is required. This will avoid striking the ceiling, which could bind or damage the ladder. Lowering the ladder usually cracks the horizontal sash allowing for complete ventilation of the window. When the angle becomes extreme, just lower the ladder so that the inside of the beam breaks the window.
  2. Under no circumstances shall ventilation of windows be effected by exerting lateral pressure with the ladder. Ventilation shall only be performed by extending the ladder through the window or by lowering the ladder into the window.
  3. Be cognizant of creating an auto exposure which may allow fire to extend.
  4. Take necessary precautions to avoid injuries to people in the area. Glass may ride down the hand rails or fall on to the street.

#### **Positive Pressure Ventilation:**

Positive Pressure Ventilation (PPV) can be used as a primary means of ventilation or it can enhance ventilation that is already in place. Whatever the instance it is imperative that we have control or will gain control of the fire quickly once the PPV ventilation is in place. It is critical that PPV is Communicated, Coordinated, and Controlled for the duration of its application.

In order to achieve positive pressure ventilation in a structure you must be able to control not only the PPV fan but we must achieve control of the exit point as well. The exit point must be no larger than 2/3rds the opening point the fan is blowing into. If the opening is same size or larger Positive Pressure will not be achieved and the fan will just feed the fire with fresh air increasing its growth or triggering an extreme fire event.

Standard FFI procedures will apply to the application of this type of ventilation.

- Caution:**
1. Do not apply PPV when the fire has entered concealed spaces.
  2. Time the application of PPV when extended stretches for the attack team is required. Early PPV can exacerbate the fire conditions for the attack crew if applied too early.
  3. Communicate, Coordinate, and Control PPV at all times.



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## TASK SKILL INSTRUCTIONAL REQUIREMENTS AND IMPLEMENTATION

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This heading includes information about the following:

- Associated power point presentation and lesson plan for instructing on the task (locations on the V drive within *Training Materials of the Fire Training Division Folder*)
- Demonstration videos are located at:
- <V:\Fire\Fire Training Division\LFR Training Materials\Firefighter Training\Truck Company Training\Training Videos>
- Ventilation procedures are performed in a high hazards environments that require full structural PPE at all times including SCBA. During training hearing protection should be considered while working with power saws.

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## REFERENCE INFORMATION

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This heading includes information about the following:

- 5<sup>th</sup> Edition Essentials of Fire Fighting and Fire Department Operations. IFSTA/Bradey Copyright 2008
- Truck Company Operations. John Mittendorf/Fire Engineering Copyright 1998
- Firefighting Strategy and Tactics Delmar/Thompson Learning Copyright 2001
- Strategic and Tactical Considerations of the Fire Ground. Bradey Copyright 2002
- FDNY Ladder company operations and standard deployment guidelines
- <V:\Fire\Fire Training Division\LFR Training Materials\Firefighter Training\Truck Company Training\Training Videos>
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