Roof Sector Operations

Common FD procedures state:

- "Adequate-size ventilation holes must be cut and opened if ventilation is to be successful. Ventilation hole(s) of at least 10% of roof surface of the involved area is a rule of thumb to consider."
- "When you cut a hole in a roof, cut a big one."
- "Vertical ventilation, as close to directly over the fire as possible, is the most effective form of ventilation in working interior fire situations."

Initial and ongoing size-up

The size-up of the structure should take into account the following critical fireground factors:

- The Building:
  - Consider the size and the layout of the structure (small, medium or large; one story or two, etc.).
  - Estimate the age of the building in order to predict basic construction features.
  - Is the structure lightweight or conventional construction?
  - What are the interior arrangements?
  - Where is the garage?
  - Does the structure have open vaulted ceilings?
  - Does it have a middle hallway?
  - What type of roof does the building have and how will the construction of this roof affect ventilation.
  - Finally, does the building exhibit features that will prevent vertical ventilation?
- The Fire:
  - What's burning?
    - Is it a contents fire or is it structural?
  - For command size-up, all fires should be assumed structural until confirmed by crews that the fire has not extended.
  - Estimate what percentage of the structure is involved in fire—5%, 15%, 25%?
  - Where is the fire traveling and how will ventilation assist in slowing the extension?
  - What is the stage of the fire and where are the initial engine company's handlines positioned?
  - Ventilation should not be attempted for first-floor fires in a multi-story structure, fires that have extended well beyond the room of origin and/or advanced "structure" fires.
- Life Hazards:
  - What is rescue profile and survivability of any occupants?
  - Where are they located, how many people and what is their condition, if known?
- Type of Occupancy:
  - What is the fire load of the occupancy?
  - Are there any special hazards (e.g., hazardous and/or flammable/combustible contents) that crews need to be aware of?
- Exterior Arrangements:
  - Are all four sides of the exterior accessible?
  - Are there any exposures or barriers for apparatus positioning?
    - Will we need to work from Ground Ladders?
- Fireground Actions:
  - What is the status of the operation when the ventilation is assigned?
  - Where has the initial engine companies been deployed?
  - To coordinate ventilation, the interior crew should use a UCAN (unit/assignment-conditions-actions-needs) report to advise command of their location, their actions and what they need.
    - Once the ceiling is punched through, the heat and gases begin to rise and the engine crew can begin to put water on the fire.

Venting Operations

Once the initial size-up has been completed, the company will determine a safe working surface on the roof by sounding it with a flat-head axe or a pike pole. Factors to consider include the location and movement of the fire, whether the fire has extended to the attic, the effect the fire has had on the roof, and whether there are any dead loads affecting the roof structure.

The next steps happen in quick succession.

- Complete an adequately sized ventilation opening to achieve effective ventilation. Note: crews should attempt to cut at least a 4 x 4 or 4 x 8 hole
  - Consider:
    - Ventilation opening size (currently, we aim for 10% of the involved space)
    - The smoke volume, speed and pressure
    - Wind direction, speed and effects on ventilation
    - Ventilation completed toward the top of pitched roofs
- Coordinate roof ventilation with interior crews
  - Roof and interior crews should communicate about the fire's location.
  - Interior crews should communicate the effect ventilation has on interior conditions.
  - Interior and roof crews should then assess the need for additional ventilation.
- Coordinate roof and fire control operations as directed by command.
  - Handlines may be used for exposure protection.
  - During offensive attack, handlines should not be operated into a ventilation hole.
- Maintain rooftop monitoring of the structure and fire conditions. (*Note*: In some cases, this can be done from the ground. If it's not necessary for you to be on the roof, get down.)
  - Monitor the ventilation opening.
    - You will likely see fire as the smoke vents (rich, heated smoke mixes with O2 upon exiting, and immediately ignites), but this doesn't necessarily mean conditions are deteriorating.
    - If fire continues to exit through the hole, command must immediately check on the status of interior crews to determine if they've been able to put water on the fire.
  - Watch for deteriorating structural conditions of the roof.
- Communicate progress reports to command, including information on:
  - Roof conditions
  - Ventilation status (smoke vs. fire)
  - Improving vs. deteriorating conditions

Quick Step Anchor

The Quick Step Anchor (QSA) is a device that provides firefighters with a sturdy platform while conducting vertical-ventilation operations. It takes the place of the pickhead ax, trash hook and halligan bar.

The Quick Step anchor **WILL** be used for instructing Pitched Roof Ventilation. Focus should be made on proper saw use and ventilation cutting.

Saw Operating Team

The firefighter who operates the saw (Operator) will be assisted and/or guided by another member. A physical communication system between the Back-up firefighter and the Saw firefighter will be as follows:

- One slap on the back of Operator .....Stop Cut.
- Two slaps on the back of Operator .....Cut.
- Three slaps on the back of Operator .....Shut Down Saw.

High Pitched Roof Ventilation

Once on the roof, the decision as to where to open up must be based upon fire location and roof construction.

Open up as close to the seat of the fire as possible keeping in mind that truss roof construction will require backing off a distance to compensate for the possibility of partial roof collapse. Normally, venting a peaked roof does not occur unless the fire is on the top floor and/or attic space. An exception would be balloon frame construction. In this case the roof would have to be open regardless of the fire location. Look for indicators, which will assist you in choosing the location. Some of the signs, which will pinpoint the location of the fire, are:

- Bubbling roof tar
- Smoke pushing from shingles
- "Steam" rising from a specific location during rainy or wet conditions
- The obvious location of the fire itself as indicated by flames issuing from windows and/or roof vents

The side of the roof peak where the vent hole will be placed is usually determined by the direction of the wind. The vent hole should be placed on the leeward side of the peak.

Roof Slope:
The slope of the roof will, in large part, determine the ease in walking on its surface. The slope or pitch as it is sometimes called is expressed as the number of inches of vertical rise in 12 inches of horizontal run. If a roof rises 4 inches within this 12-inch run, the pitch of the roof is expressed as 4 in 12. When a roofs pitch exceeds 4 in 12, walking becomes difficult. Use of a roof ladder will be necessary. Ideally, the roof ladder should be long enough so that when the hooks are over the ridge, the base of the ladder reaches to and rests on the bearing wall. In this case the ladder not only provides footing but also in the event the roof deck collapses the ladder will stay intact, the ridge board and bearing wall providing support. If the roof is of truss construction and the roof deck collapses, the lack of a ridge board will cause the ladder and anyone on it to fall into the inferno below. If it is necessary to leave the safety of a roof ladder, straddle the peak while walking or while sitting and scooting across. When walking on a sloped roof do not walk using a normal heel-toe foot action, rather, walk flat-footed. Also, in order to quickly shift your body weight and to compensate for the uneven surface of the roof, bend both legs at the knees. You should not walk straight down the slope of a roof but rather walk across it at an angle. When walking towards the edge of a roof do so very carefully. At normal walking pace, the weight of equipment and protective clothing can increase your forward momentum and prevent you from stopping at the edge of the roof.

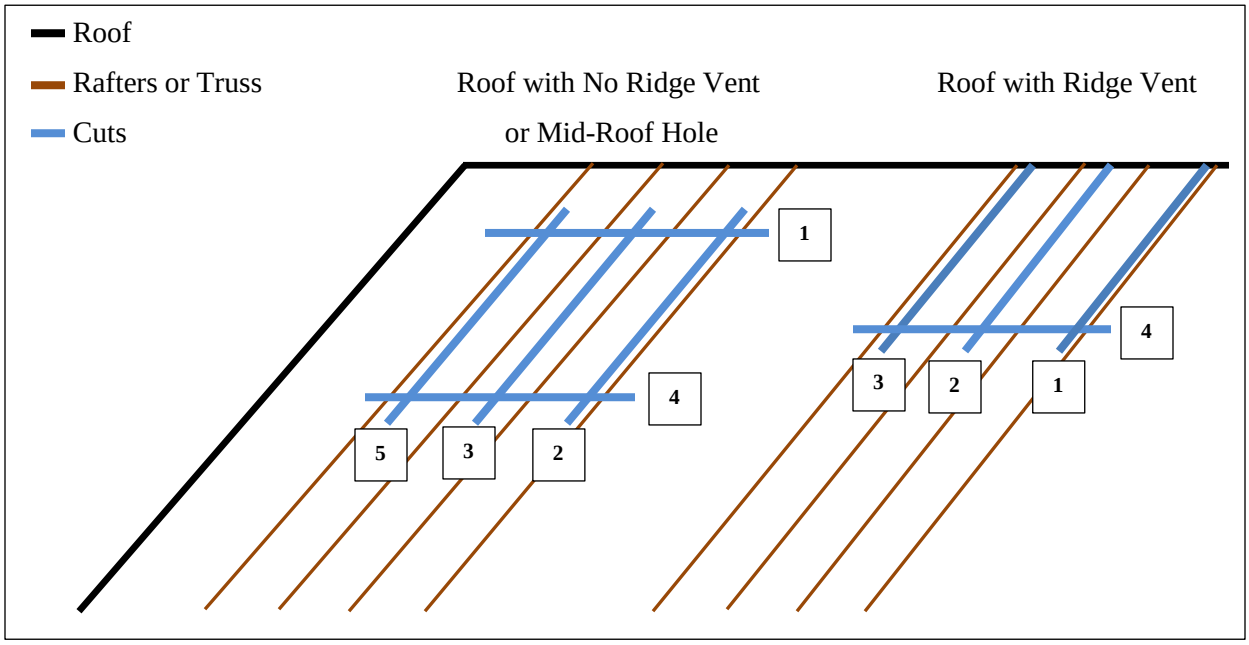
Deterioration of the roof deck and eaves will occur over a period of time when subjected to constant moisture, insects or neglect. While rotting may occur anywhere, the areas where it occurs most often are the roof edges, where the roof changes slope, and where a sloping roof abuts a vertical plane such as an additional story. Do not rely on chimneys or soil pipes to grab for stability or security. Often, they are in such a deteriorated state that your weight alone will be sufficient to cause them to fail.

The Louvered Cut

Removing a Ridge Vent at the peak of the roof will expose the roof construction type (Truss or Tradition rafter) and the location of those trusses and rafters. By sounding the roof to locate the roof rafters, cuts are placed between the rafter joists. New England homes are generally constructed with rafters 16" on center. This would indicate a two louver cut.

Then strike the roof next to the cut with the back of an axe or other striking tool. This will hinge the cut portion of the roof and provide a vent. Continue hinging the remaining cuts. Placing this cut as close as possible to the ridge will vent the attic most efficiently.

When roofs are covered with tiles such as those made from slate, cement or terra cotta, the tiles should be broken up and cleared from the roof surface before attempting to cut a hole.



Typical Pitched Roof Operational Sequence

Once roof ladder has been placed into position and roof hooks secured over ridge; ventilation team prepares to ascend ladders

Ventilation tools should consist of a long handle sounding tool (rubbish hook or pike pole), chain saw and set of Irons.

Preparing to Vent

- **Saw firefighter** climbs ground ladder to rung below the edge of the roof and sounds roof on both sides of the ground ladder and determines roof is safe. The hook or pike pole may be placed on a rung nearest the **Saw firefighter** during the deployment of the roof ladder.
- **Saw firefighter** steps off of ground ladder and onto roof ladder and sounds roof while proceeding to work area.
- The **Saw fire firefighter** will sound the roof on the left side, center (between rungs) and right side of roof ladder while advancing up the ladder.
- **Saw firefighter** sounds up to ridgeline and then counts down four rungs from the tip of the roof ladder and then measures out approximately 2 feet lateral from the fourth rung and marks the roof deck with the sounding tool to indicate the halligan placement.

- Saw firefighter aggressively and thoroughly sounds roof area where ventilation opening will be placed. **Saw firefighter** then secures sounding tool onto roof ladder or hooks sounding tool onto the roofs ridge.
- **Back-up firefighter** climbs ground ladder with Irons and hands off to **Saw firefighter**.
  - Descends to retrieve Ventilation Saw.
- **Back-up firefighter** climbs ground ladder with chain saw and transitions to roof ladder.
- **Back-up firefighter** hands chain saw to **Saw firefighter** who then starts the saw.
- **Back-up firefighter** retrieves halligan bar and swings/plants pike end deep into roof deck at designated mark (lateral to 4th rung). **Back-up firefighter** then rotates bar down slope of roof pitch.

  NOTE: The rubbish hook can also be used as a footing tool, but this tool may be difficult to place if there is substantial roofing material or solid decking.
- **Saw firefighter** steps onto roof and places side of one foot against halligan bar while keeping other foot on 3rd rung of roof ladder.
- **Back-up firefighter** grabs Saw firefighters Outside SCBA or GEMTOR Harness waist strap and provides safety.
- **Saw firefighter** reaches out makes head cut; cutting towards roof ladder.
  - This cut is eliminated when the ridge vent is used as cut.
- **Saw firefighter** then makes outside parallel cut and two louver cuts.
- **Saw firefighter** must now step down from the 3rd rung to the4th rung to facilitate the bottom cut

  NOTE: Stepping down one rung of the roof ladder prevents the saw from cutting in line with the body. At NO time should the saw be pulled between the legs.
- **Saw firefighter** now makes half of bottom cut
- **Saw firefighter** now moves back onto roof ladder and places foot that was against halligan onto the 5th rung of roof ladder
- **Back-up firefighter** removes halligan and secures it.
- **Saw firefighter** now completes bottom cut.
- **Saw fire fighter** now makes inside parallel cut close to the roof ladders beam.
- Once the cutting operation is complete the chain saw is turned off and handed to **Back-up firefighter.**
- **Saw firefighter** retrieves long handle sounding tool; louvers the cut roof deck and punches through the ceiling.

  NOTE: To ease punching the ceiling and to reduce the firefighter's exposure to venting heat and smoke the firefighter may want to kneel down onto the rungs/beams of the roof ladder below the bottom cut. Also due to the height of the roof pitch, reaching the interior ceiling maybe difficult. A 10' or 12' rubbish hook or pick pole may be necessary to punch in the ceiling.
- Once the ventilation operation is complete both firefighters descend roof ladder.