Operations on the Roof, Part III

Peaked Roofs

By Gerald R. Tracy

Statistics reveal that some 80 percent of Americans live in a private residence. So for the vast majority in the Fire Service, our calls are generally to fires in private dwellings, many of which have peaked roofs. Will we and should we provide vertical ventilation at every fire?

The decision over when and if to provide vertical ventilation should be weighed against other priorities that must be attended to and the size-up considerations met upon arrival.

The hazard to life should be our first priority! This includes the life hazard present within the dwelling and life hazard confronting our members upon entry. We have to be included in that equation! Then we can focus on the protection of property. One tool and resource that increases the odds of life safety is the operation and protection of a properly positioned hose line. Yet this does not *guarantee* life safety because of the many factors on the fire ground that we cannot control.

One major factor is the stability of a structure. The pre-burn time before our arrival can weaken the structural elements supporting a dwelling, causing collapse of floors, walls and roofs after our operations have begun! Other factors we cannot control are the fuel loads encountered and uncontrolled fire extension and ventilation present before our arrival. Our environment today is concentrated with goods manufactured with hydrocarbons, and public does not have the knowledge to shut all windows so we can institute selective ventilation for positive pressure attack!

Size-up and preplanning are vital to fire-fighting strategy. A water supply providing for continuous operations and good access for extinguishment, search, and rescue are higher priorities than providing vertical ventilation. It takes the resource of firefighters to ladder

and access a roof and then introduce a means of ventilation. Firefighters may best be used immediately upon arrival in establishing a water supply and placing a hose line or in the search for and removal of persons endangered by fire, rather than performing a function that takes time to implement. Our resources are further diminished by the new mandated "Two-in, Two-out" requirements to which we all must adhere! In a small dwelling, these priorities can at times be accomplished before a vent hole is introduced in a roof surface.

When our operations are conducted in a large dwelling and the time to fully search the entire building is extensive or without the benefit of vertical draft, the fire will extend laterally. Then we have reason to implement vertical ventilation. Again, we must have the resource of manpower to accomplish the task. The objective would be to increase survival time for occupants within the fire building. Limit the extension of fire by channeling the products of heat and flammable gases vertically. It is hoped that this will help to confine the fire to that area of the structure. By introducing ventilation, the search and rescue below will be enhanced with better visibility, reducing the smoke content, drawing in clean air, reducing the internal temperature and reducing or reversing the speed of fire spread. By reducing the heat, flammable smoke and other fire gases (fuel) within a structure, the ventilation can also reduce the incidence of backdraft and flashover.

The Roof Team

If the priorities of water and life-safety are being addressed, the incident commander can direct vertical ventilation. A team of firefighters should be dispatched to perform this function — one member to perform the work and at least one other to assist and act as a safety/guide member. Based upon size-up, can operations be conducted and what will be needed to perform them safely? What is the extent and volume of the fire? If it can be determined on scene or through prior knowledge that the roof supports are of common roof rafters and not lightweight trusses, then the members may have time to operate before failure from deterioration and collapse. When members are committed to the roof for the purpose of ventilation, time will be a factor concerning their safety. The members should already have a plan, which takes into account access/egress, the method of ventilation to be performed and the availability of equipment.

Can members walk upon the roof or not? The pitch (slope) of the roof will determine if the roof is capable of being walked upon A low-pitch roof can have a slope of up to two inches of rise per horizontal foot, a medium-pitch roof up to five inches and a high-pitch roof up to seven inches or more of rise per foot. It is possible to maneuver on a roof with a low-to-medium pitch without the aid and support of a ladder or tower platform. Weather and environmental conditions can also negate operating on lower-pitch roofs because of slippery conditions. For example, snow or ice may cover roofs in cold-weather areas or there may be moss in areas of the nation that are generally damp. When roofs are of a high pitch, slippery or of questionable stability, ladders must be used for added safety.

A portable ladder may be used to access the roof, and then a ladder (portable roof ladder) of sufficient size should be laid on the roof to provide support and footing. The ladder should be long enough to span the vertical supports present. Most generally that will be the distance between the bearing wall and the ridge pole/board supporting the rafters. Should the roof deck become weakened, the ladder will still be supported at the ridge and area of the bearing wall. Be aware that there will be no ridgepole present with lightweight truss construction. With no ridgepole support present, when the truss fails, it will drop a firefighter into the collapsed portion of the structure! The safest platform to work from would be that of a tower ladder. Members can be additionally supported/connected via a safety belt or rope to the railing of the platform.

Should a roof fail, the member is protected from toppling into jeopardy, although the platform may have to be moved to protect the member(s) from flames and heat erupting from below. Aerial ladders would be the next choice of support because of the stability of support they provide and the means of egress they afford back to safety. (See fig. 1, right.)

Fig. 1

Size-up

The size-up conducted by the members attempting vertical ventilation would include the volume and location of the fire and wind direction, if any. The volume of the fire has to raise the question of stability. If the roof is supported with lightweight trusses, then the roof is susceptible to early failure. The type of roof covering will also add to the equation. For example, slate, cement or terra cotta tiles add weight, which can cause premature collapse. Any vertical ventilation achieved should preferably be introduced on the leeward side of the roof. The venturi effect of the wind crossing over the roof will draw off the heat and smoke from that ventilation point. If it were to be located on the windward side of the roof the wind pressure would force the smoke and heat back into the structure.

Skylights may be present on the roof, and they may provide a quick means to achieve ventilation. If only the glass is removed from the skylight, then only the space (room) below will be relieved of smoke and heat. In order to vent the attic, the interior walls (returns) of the skylight area must be removed also. The same principle applies as to the skylight being located on the leeward or windward side of the roof.

Tools

The tools selected to perform the function of ventilation should be chosen for their efficiency and safety. Power tools being used on a high-pitched roof with unsure footing is dangerous, even with a firefighter trying to give you support. If the operator loses his balance, the power tool could cause major injury to the operator and/or safety firefighter! A hand tool (axe) would be the better choice — maybe not the most efficient, but the least dangerous. Power tools are best used from the stable platform of a tower ladder, aerial or lower-pitched roof. A safety/guide firefighter is still recommended.

When working with an axe on a high-pitch roof, the firefighter should straddle the ridge with the wind and egress to the rear. Introduce an angle cut in the roof deck just below the ridge, cutting down a foot or more. Then work two parallel cuts to the ridge back towards your position. (See fig. 2, right.) When working with power tools, there are two configurations of cuts that can be introduced with some efficiency.

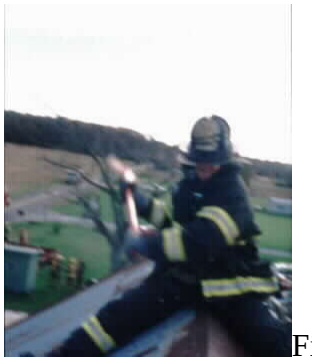
Fig. 2

- **The louvered cut.** (See fig. 3, right.) By sounding the roof to locate the roof rafters, cuts are placed between the rafter joist. 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.


Fig. 3

- **The triangle cut.** (See fig. 4, right.) The top cut is placed close to the ridge. The second cut is made at an angle down with one additional perpendicular cut from the ridge. A crosscut (knock out) is needed in order to pull the roof cut free from the rafters. If additional ventilation is required, place a similar cut opposite this cut.

Fig. 4

When first entering this vocation, we are barraged with the dangers and pitfalls of operating in uncontrolled environments. With enthusiasm we set out to learn and perform, as did the best of those before us. Then with a few years and fires added to our experiences, we become more confident of our limits and abilities. We can start to become lax with safeguards and disciplines of procedure. We listen to caution and recommendations like we listened to our mothers years ago, when she gave the advise "Never leave home without putting on clean underwear; you never know what might happen?" How many of you still adhere to that advice?

Well, the fireground is even more unpredictable today then it was in years past — for the many reasons you hear repeated from the likes of Vincent Dunn, John Mittendorf, Frank Brannigan, and other veterans. They speak of the increased fuel loading we encounter in ordinary residential occupancies, the inclusion of lightweight elements of construction in all types of structures being built today. The message of safety today was never as important. Our operations on peaked roofs should be deliberate. Before engagement, determine the stability of the roof and structure. How long will you be able to operate before roof stability and your safety are in question? Tools and proper equipment should be ready and available. Access and immediate egress must always be available and not blocked by fire. Attic space will not be occupied in most structures that use lightweight trusses as roof supports. The occupied spaces will be located below the roof area. The priority should be to have those rooms searched as soon as possible. Horizontal ventilation will suffice until members have made progress on the fire. If further ventilation is required, roof boards can be pushed out from the interior of the building, without placing a member on an unsafe roof. (See fig. 5, below.)

Fig. 5