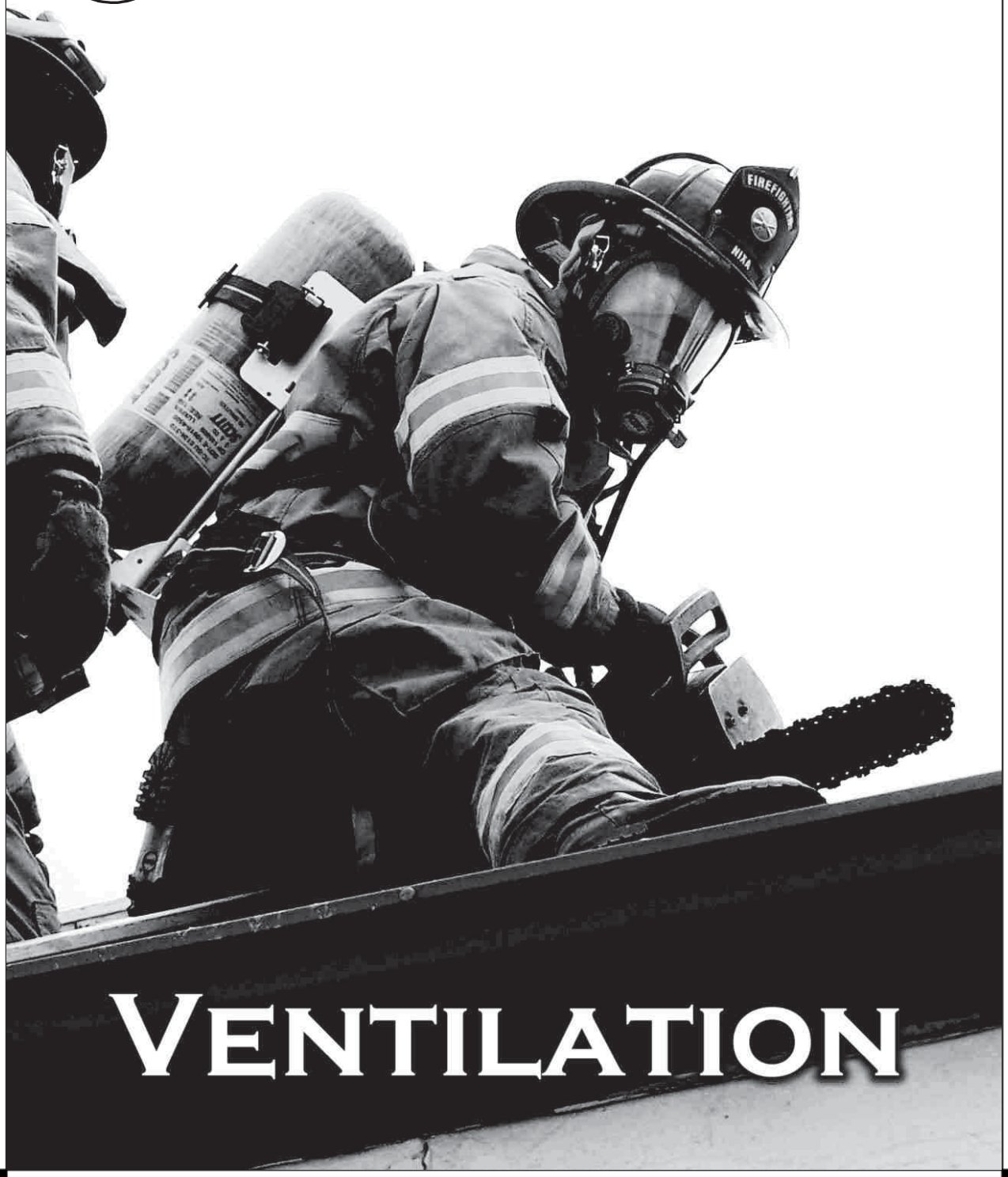
Missouri Division of Fire Safety

Fire Fighter I & II



Ventilation

UNIT OBJECTIVES

Upon completion of this unit of study, the student should be able to:

1. Explain the principles of ventilation including advantages and effects of proper ventilation.
2. Identify the possible dangers present and precautions to take in performing ventilation.
3. Describe the indications, causes and effects of a backdraft explosion.
4. Describe the advantages and disadvantages of the different types of ventilation.
5. Identify the various tools used in ventilation.
6. Describe the characteristics and precautions required when ventilating various types of roofs.
7. Describe how different factors can be used to check a roof's integrity.
8. Identify the considerations that need to be made to determine the location and size of a ventilation opening.
9. Describe the method and precautions used when ventilating a basement.
10. Identify the various types of manual and automatic venting devices found in structures.
11. Demonstrate how to sound a roof to determine its integrity.
12. Demonstrate ventilation procedures for a roof.
13. Demonstrate forced ventilation procedures.

NFPA STANDARDS

Successful completion of the information in this section is necessary to fulfill the requirements of the following sections of NFPA 1001-2008:

Fire Fighter I Standard

5.3.11 Perform horizontal ventilation on a structure operating as part of a team, given an assignment, personal protective equipment, ventilation tools, equipment, and ladders, so that the ventilation openings are free of obstructions, tools are used as designed, ladders are correctly placed, ventilation devices are correctly placed, and the structure is cleared of smoke.

(A) Requisite Knowledge. The principles, advantages, limitations, and effects of horizontal, mechanical, and hydraulic ventilation; safety considerations when venting a structure; fire behavior in a structure; the products of combustion found in a structure fire; the signs, causes, effects, and prevention of backdrafts; and the relationship of oxygen concentration to life safety and fire growth.

(B) Requisite Skills. The ability to transport and operate ventilation tools and equipment and ladders, and to use safe procedures for breaking window and door glass and removing obstructions.

5.3.12 Perform vertical ventilation on a structure as part of a team, given an assignment, personal protective equipment, ground and roof ladders, and tools, so that ladders are positioned for ventilation, a specified opening is created, all ventilation barriers are removed, structural integrity is not compromised, products of combustion are released from the structure, and the team retreats from the area when ventilation is accomplished.

(A) Requisite Knowledge. The methods of heat transfer; the principles of thermal layering within a structure on fire; the techniques and safety precautions for venting flat roofs, pitched roofs, and basements; basic indicators of potential collapse or roof failure; the effects of construction type and elapsed time under fire conditions on structural integrity; and the advantages and disadvantages of vertical and trench/strip ventilation.

(B) Requisite Skills. The ability to transport and operate ventilation tools and equipment; hoist ventilation tools to a roof; cut roofing and flooring materials to vent flat roofs, pitched roofs, and basements; sound a roof for integrity; clear an opening with hand tools; select, carry, deploy, and secure ground ladders for ventilation activities; deploy roof ladders on pitched roofs while secured to a ground ladder; and carry ventilation-related tools and equipment while ascending and descending ladders.

NFPA STANDARDS

Fire Fighter II Standard

6.3.2* Coordinate an interior attack line for a team's accomplishment of an assignment in a structure fire, given attack lines, personnel, personal protective equipment, and tools, so that crew integrity is established; attack techniques are selected for the given level of the fire (e.g., attic, grade level, upper levels, or basement); attack techniques are communicated to the attack teams; constant team coordination is maintained; fire growth and development is continuously evaluated; search, rescue, and ventilation requirements are communicated or managed; hazards are reported to the attack teams; and incident command is apprised of changing conditions.

(A) Requisite Knowledge. Selection of the nozzle and hose for fire attack, given different fire situations; selection of adapters and appliances to be used for specific fireground situations; dangerous building conditions created by fire and fire suppression activities; indicators of building collapse; the effects of fire and fire suppression activities on wood, masonry (brick, block, stone), cast iron, steel, reinforced concrete, gypsum wallboard, glass, and plaster on lath; search and rescue and ventilation procedures; indicators of structural instability; suppression approaches and practices for various types of structural fires; and the association between specific tools and special forcible entry needs.

(B) Requisite Skills. The ability to assemble a team, choose attack techniques for various levels of a fire (e.g., attic, grade level, upper levels, or basement), evaluate and forecast a fire's growth and development, select tools for forcible entry, incorporate search and rescue procedures and ventilation procedures in the completion of the attack team efforts, and determine developing hazardous building or fire conditions.

NOTES	STUDENT GUIDE
	I. The Importance of Ventilation *(Essentials p. 541)* A. Proper ventilation is not accomplished haphazardly 1. Inadequate ventilation can cause death or injury to fire victims and fire fighters and cause destruction of the building 2. Fire fighters must know ventilation principles and implement them promptly, thoroughly, and routinely B. C. Ventilation is the systematic release and removal of heated air, smoke, and gases from a structure and replacing them with cooler air D. Newer buildings have more built-in mechanical ventilation than older structures E. Modern insulation practices increase ventilation problems 1. Multiple pane windows 2. Insulated steel doors 3. Building vapor barriers 4. Heat from a fire is retained inside the building for longer periods, increasing the risks of flashover and backdraft F. The increasing use of plastics and synthetics has greatly increased the fuel load in buildings adding to the need for ventilation

NOTES	STUDENT GUIDE
	G. Advantages of proper ventilation 1. a. Removes smoke and gases that endanger the occupants b. Promotes fire fighter entry and improves visibility to speed rescue c. Reduces risk of steam burns to personnel 2. a. Speeds attack and extinguishment by helping to localize the fire b. Reduces fire and water damage by reducing the amount of water needed for extinguishment 3. a. Reduces mushrooming from heat and gases banking down and spreading laterally b. If crews are not ready to attack a fire, even proper ventilation will add air to the fire and allow it to grow 4. a. The potential for flashover is reduced by removing heat before flashover occurs b. Ventilation can remove the heated gases which are heating the contents to ignition to their ignition temperatures to create flashover

NOTES	STUDENT GUIDE
	c. However, ventilation can also increase flash-over potential by adding needed oxygen to a superheated area 5. Reduction of backdraft potential a. Flammable gases are vaporized from the combustibles burning (1) Oxygen has decreased by burning (2) The admission of air can cause the burning of gases with explosive force (3) The intensity depends on the degree of confinement, the amount of heated gases, and the rate and volume of fresh air admitted b. Carefully controlled ventilation must be done to direct the burning gases harmlessly and prevent backdraft conditions c. d. Fire fighters must stay away from doors and windows until ventilation reduces the severity of the situation e. Personnel must always be aware of the indications of backdraft potential (1) Confinement and excessive heat (2) Heavily smoke-stained windows (3) Smoke puffing at intervals from building

NOTES	STUDENT GUIDE
	(4) Smoke coming through cracks (5) Little visible flame (6) Gray-yellow colored smoke (7) Windows rattling (8) Walls extremely hot to the touch 6. Property conservation a. Since proper ventilation speeds extinguishment, fire damage is lessened b. With smoke and heat vented, salvage operations can be started outside of the fire area even while fire attack is progressing **II. Ventilation Considerations** *(Essentials p. 547)* A. B. The size and type of building will determine the type of ventilation required or if possible C. Before ventilation is started, a series of decisions must be made 1. Considerations for the need for ventilation: a. b. c.

NOTES	STUDENT GUIDE
	d. Structural conditions 2. Ventilation location considerations: a. Exposures which might be subject to fire and smoke released from the ventilation opening b. c. Location of fire and the direction which it will be drawn by ventilation d. Wind direction will influence the direction to which the fire will be drawn e. f. The availability of natural vertical and horizontal openings g. The condition of the building may have deteriorated beyond the point of safe ventilation procedures 3. The decision whether to do horizontal or vertical ventilation should be used based on the fire fighter's knowledge of the methods of ventilation 4. Considering whether fire and structural conditions allow for safe roof operations a. Roof integrity must be the first priority before vertical ventilation is performed b.

NOTES	STUDENT GUIDE
	5. Determining if the personnel assigned to do ventilation are properly trained and equipped to handle the job D. Life safety hazards 1. As in any emergency situation, the safety of both fire fighters and a building's occupants must be the first consideration of responders 2. Depending on fire conditions, ventilation may be needed before search and rescue operations a. If necessary, the fire may need to be attacked first b. 3. Potential hazards with the accumulation of smoke and gases: a. Visibility impairment b. Presence of toxic gases and flammable gases c. Lack of oxygen d. Potential for backdraft and flashover E. Visible smoke conditions 1. Many tactical and ventilation considerations are based on the visible smoke conditions at the scene a. Smoke conditions vary with the progress of burning

NOTES	STUDENT GUIDE
	b. Some fires in the early stages may produce light smoke c. If plastic and synthetic furnishings are involved the smoke may be very thick d. Smoke can hide that the structure has become well involved in fire e. F. Type of building involved 1. The type and design of the building involved are key factors when considering what type of ventilation to use a. Number and size of wall openings b. Number of stories and roof openings c. The roof construction d. Built-in fire protection systems 2. High-rise buildings a. Vertical openings, such as pipe shafts, stairways, elevator shafts, and air-handling systems, contribute to the "stacking effect" where smoke and fire gases create an updraft and layer smoke on floors above the fire b.

NOTES	STUDENT GUIDE
	(1) Four to six times as many fire fighters will be needed for a high-rise building compared to a residential fire (2) Ventilation may be accomplished horizontally with mechanical devices c. Vertical ventilation in high-rise buildings may involve only one roof stairwell opening (1) Before doors on fire floors are opened, the door leading to the roof must be blocked open or removed (2) Using stairwells or elevator shafts for evacuation and ventilation simultaneously is ineffective and dangerous (3) Opening a stairwell at the top will draw smoke and heat into it and to anyone in it (4) The safest and most effective method may be to pressurize stairways with positive pressure ventilation fans 3. Basements and windowless buildings a. Access to a basement is extremely difficult without effective ventilation (1) (2) If a ventilation opening is made opposite the entry point, fire and smoke can be pushed toward the opening with ventilation fans

NOTES	STUDENT GUIDE
	b. Many buildings may have windowless wall areas (1) (2) Creating ventilation openings can take a large amount of time (3) Windowless building usually require mechanical ventilation, which also can spread the fire (4) Personnel must also be aware of the steam created by fire fighting efforts until adequate ventilation is established G. Location and extent of fire 1. 2. The phase to which the fire has progressed is a primary consideration in determining ventilation procedures 3. Fire can spread vertically through: a. Stairwells and shafts b. Partitions and walls c. Windows and exterior openings d. Ceilings and floors by conduction through beams and pipes e. Collapse of floors and roofs

NOTES	STUDENT GUIDE
	f. Voids, concealed spaces, and ducts H. Selecting where to ventilate 1. There is no rule for selecting the point to open a roof to ventilation except as directly over the fire as possible 2. Factors to consider when selecting a vent location: a. Existing openings, such as skylights, vent shafts, and hatches b. Location of the fire and the direction the incident commander wants it to be drawn c. Type of construction d. e. Extent of the fire and building conditions f. Melting or bubbling roof tar g. h. The effect that ventilation will have on the fire i. j. Readiness of attack crews I. Before ventilating a building, there must be adequate resources to control the fire because the fire may increase when ventilation is performed 1. If wind direction permits, entry should be made as near the fire as possible

NOTES	STUDENT GUIDE
	2. Charged hoselines should be positioned at the entry point so attack can be started as soon as ventilation is done 3. Hoselines must also be in place at points to prevent fire from spreading to exposures **III. Vertical Ventilation** *(Essentials p. 556)* A. 1. Allows for natural convection of heat and gases upward 2. Improves interior visibility and lessens contaminated atmosphere B. Disadvantages of vertical ventilation 1. Possibility of weakened roofs 2. Time consuming 3. Some roofs may be difficult to ventilate 4. C. Roof styles which be encountered 1. Three basic styles a. b.

NOTES	STUDENT GUIDE
	c. 2. Common roofs a. Gable b. Mansard c. Gambrel d. Hip e. Shed f. Lantern g. Butterfly h. Dome i. Sawtooth D. Fire fighters should know how roofs in their response area are constructed 1. Lightweight building materials are more susceptible to early collapse 2. Collapse potential is affected by: a. b. How long the fire has burned c. d. The assembly fire-resistive rating e.

NOTES	STUDENT GUIDE
	E. Before ordering vertical ventilation, the Incident Commander must consider: 1. 2. The building's age and type of construction 3. The location, duration, and extent of the fire 4. Necessary safety precautions 5. 6. 7. How to move personnel and equipment to the roof F. The roof ventilation team leader's responsibilities include: 1. Maintaining constant communications with the supervisor 2. 3. Ensuring that only the required openings are made 4. Working to minimize damage caused by fire fighting operations 5. 6. Overseeing the safety of all personnel assisting with the roof operations 7. Ensuring the team leaves the roof as soon as their assignment is completed

NOTES	STUDENT GUIDE
	G. Vertical ventilation safety precautions 1. 2. Observe wind direction and exposures 3. 4. Note existence of holes, obstructions, or weights on the roof 5. Consider fire duration time factor 6. Consider type of roof structure 7. Provide a secondary means of escape 8. 9. If used, make sure a roof ladder is firmly secured over the roof's peak 10. 11. Evacuate the roof when ventilation work is done 12. 13. Keep other personnel away from those using axes and power saws 14. Start power tools on the ground to make sure they operate but shut them off before raising them to the roof 15. Extend ladders four to five rungs above the roof line and secure ladders

NOTES	STUDENT GUIDE
	16. Do not jump on a roof 17. 18. Always walk on bearing walls and strongest points of roof structure when possible 19. If working from aerial ladder platforms, the platform floor should be even with or slightly above roof level 20. Push down the ceiling using blunt end of pike pole to enhance ventilation 21. a. Melting asphalt or shingles b. "Spongy" roof c. Smoke coming from the roof d. Fire coming from the roof 22. Personnel must always work in teams of at least two on a roof but no more than necessary to get the job done 23. When cutting a ventilation hole in a roof: a. A large hole is better than several small ones b. c.

NOTES	STUDENT GUIDE
	H. Determine the integrity of the roof 1. The type of construction should alert personnel to the presence of truss construction 2. Look for obvious sagging or heat damage to the roof indicating possible weakened areas 3. a. The axe is held vertically with the top edge of the head downward b. The top is then struck on the roof to allow the fire fighter to hear the sound made c. Supported (over rafters/joists) and unsupported sections of a roof will sound differently when struck by the tool d. Roofs with several layers of roof coverings may sound solid even though they may be weakened by fire e. Roof covered with tiles or slates cannot be sounded until the coverings are removed I. Roof coverings 1. 2. Roof coverings may be: a. Wood shakes or shingles b. Metal or rubber tiles or imitation shakes

NOTES	STUDENT GUIDE
	c. Composition shingles d. Terra-cotta or concrete tile e. Synthetic membrane f. Built-up tar and gravel J. 1. It is usually faster to open a natural opening than to cut a hole 2. These openings may not be in the best location or large enough for adequate ventilation 3. Existing roof openings a. b. c. Roof monitors d. Scuttle hatches e. Dropout panels K. Roof characteristics 1. Flat roofs a. Common on mercantile, industrial, and apartment buildings b. Construction (1) Rafters - wooden or metal

NOTES	STUDENT GUIDE
	(2) Parallel cord trusses (3) Covered with sheathing (4) May be poured concrete, precast gypsum, or concrete slabs c. Ventilating a flat roof (1) Precautions (a) (b) Sagging or spongy roofs (2) Confirm the order to ventilate the roof (3) Select the location for ventilation (4) Outline the opening with an axe pick (5) Cut a three-sided (triangular) inspection opening to determine fire conditions (6) Cut the roof deck parallel to a roof truss or support on the side further from the ladder (escape route) (cut #1) (7) Cut the roof deck on one side of the opening perpendicular to the first cut (cut #2) (8) Cut the roof deck of the opposite side of cut #1 (9) Complete the ventilation hole by cutting between cut #2 and cut #3 (10) Remove the decking from the opening

NOTES	STUDENT GUIDE
	(11) Working from upwind of the hole, open the ceiling under the opening by pushing the ceiling with the blunt end of a pike pole 2. Pitched roofs a. Elevated in the center along a ridge with a downward pitch to the eaves along the roof's edges b. Rafters or trusses run from ridge to walls for support c. Sheathing or decking material is attached to the rafters at right angles (1) May be placed solidly over the roof (2) May also consist of boards or planks with a small space between them (skip sheathing) d. Ventilating a pitched roof (1) Watch for signs of heat (2) (3) Confirm the order to ventilate the roof (4) Select the location for ventilation (5) Outline the opening with an axe pick (6) Cut the roof deck across the rafters on the high side parallel to the ridge

NOTES	STUDENT GUIDE
	(7) Cut the deck on the further side of the ventilation opening perpendicular to the first cut (8) Cut the deck on the opposite of the cut above (9) Complete the opening by cutting the bottom between the two parallel cuts (10) Remove the decking with an axe or pike pole (11) Working from upwind of the hole, open the ceiling under the opening by pushing the ceiling with the blunt end of a pike pole 3. Arched roofs a. Span large, open areas unsupported by pillars or posts b. Bowstring trusses (1) The lower chords may be covered by a ceiling, forming an enclosed cockloft or attic (2) (3) If one member of a bowstring truss fails, the entire truss will probably fail and can push out other trusses and walls

NOTES	STUDENT GUIDE
	c. Trussless or "Lamella" construction enables all parts of the roof to be visible (1) Made up of relatively short boards of uniform length (2) Boards are beveled and bored at the ends and bolted together at an angle (3) Forms an interdependent structural member network (4) Supported by buttresses or tie rods or both (5) These roofs can fail when one part of the network of boards burns through d. Some trussless arched roofs use massive arches of steel, concrete, or laminated wood buttressed to the ground at both ends (1) Arches are connected to each other by horizontal members called "purlins" (2) e. Ventilation procedures for arched roofs are similar to those for flat or pitched roofs (1) The biggest problem in venting arched roofs is that the roof curvature prevents ladders from laying flat or being hooked onto the roof (2) Fire fighters must sound an arched roof and walk only on trusses or strong points

NOTES	STUDENT GUIDE
	(3) An inspection hole should be cut in the roof to locate trusses and determine fire involvement under the roof 4. Concrete roofs a. Precast concrete roofs are becoming more common b. "Lightweight concrete" roof decks may be poured in place over form boards and steel roof decking (1) Lightweight concrete is made of gypsum plaster and portland cement mixed with other aggregates (2) Usually finished with roofing felt and mopped with hot tar c. (1) Some lightweight concrete roof may be penetrated with a hammerhead pick or power saw with a concrete blade (2) Heavier roofs may require a jackhammer or diamond-tipped chain saw (3) Existing roof openings should be utilized before trying to open a concrete roof 5. Metal roofs a. May be constructed of: (1) Light-gauge steel decks

NOTES	STUDENT GUIDE
	(2) Cold-formed steel (3) Galvanized sheet metal (4) Aluminum b. Metal cutting tools or power saws with metal cutting blades are needed to open metal roofs c. Metal roofs on industrial buildings usually have roof openings, such as skylights or hatches L. Trench or strip ventilation 1. Used to stop spread of fire in long, narrow structures 2. 3. Hole is cut ahead of advancing fire to set up a defensive line 4. Advantage is to stop horizontal spread of fire 5. Disadvantages: a. Danger to personnel if roof is weakened b. c. Requires several fire fighters M. Basement fire ventilation 1. Without built-in vents, ventilation of basement fires is essential to avoid vertical extension

NOTES	STUDENT GUIDE
	2. Direct ventilation of basements a. If windows are available, these can be used for horizontal ventilation b. Natural paths, such as stairways, can be used if the smoke and gases can be ventilated to the outside without endangering other areas of the building c. As a last resort, a hole can be cut in the floor near a door or window and a smoke ejector used to force the heat and smoke to the exterior N. Disrupting vertical ventilation 1. a. Heat and gases can be forced down into the building on fire fighters and contribute to fire spread b. If streams are to be used to cool the thermal column from a ventilation opening, they should be operated above the hole and aimed slightly upward 2. Other factors that can disrupt effective ventilation: a. Improper forced ventilation b. c. Breaking skylights d.

NOTES	STUDENT GUIDE
	IV. Horizontal Ventilation *(Essentials p. 570)* A. B. Used in situations where the building: 1. Is not heavily charged with fire and the attic is not involved 2. Has high windows 3. Is a multistory structure 4. Has large unsupported open spaces under the roof 5. Is so weakened by fire that vertical ventilation is unsafe 6. Has a daylight (walkout) basement C. Advantages 1. 2. May be more effective 3. D. Disadvantages 1. 2. If not properly done, can draw fire into uninvolved areas 3. Always consider interior and exterior exposures

NOTES	STUDENT GUIDE
	4. Opening extra doors and windows can disrupt ventilation E. Wind must always be a consideration when using horizontal ventilation 1. Cannot be used if wind will push fire toward an exposure or through structure a. b. May ignite higher portions of the fire building c. May ignite adjacent structures 2. When there is a lack of wind, horizontal ventilation will be less effective 3. F. Charged hose lines must be ready to attack the fire whenever horizontal ventilation is used G. Opening a door or window on the windward side of a building without an opening on the leeward side may upset normal thermal layering H. Daylight basement ventilation 1. Found in homes built on a slope with exterior windows and exterior doors 2. Usually easier to ventilate than conventional basements

NOTES	STUDENT GUIDE
	3. Opening exterior doors and windows can provide adequate ventilation **V. Forced Ventilation** *(Essentials p. 572)* A. Accomplished mechanically with fans or hydraulically with fog streams when natural ventilation is ineffective B. Situations where forced ventilation can be effective: 1. 2. When the fire is below ground level 3. When there is no fire but an undesirable atmosphere a. Oxygen deficiency b. Toxic gases c. Explosive or flammable atmospheres C. Advantages 1. 2. Supplements natural ventilation 3. 4. Reduces smoke damage D. Disadvantages 1. Improperly used it can spread fire and smoke to uninvolved areas 2.

NOTES	STUDENT GUIDE
	3. May require special equipment E. Negative pressure ventilation 1. 2. Fan should be placed to pull smoke out in same direction as wind 3. a. Recirculation is referred to as "churning" b. Opening around fan should be covered to prevent churning 4. Attempt to keep air flow in as straight a line as possible to avoid turbulence 5. Avoid opening windows or doors near the fan 6. Remove obstacles to air flow a. Window screens b. Curtains c. Debris 7. 8. Exhaust fans should be shut off when moved

NOTES	STUDENT GUIDE
	F. Positive pressure ventilation (PPV) 1. High-volume fans blow fresh air into building to create higher pressure in building which forces smoke out to lower pressure areas 2. 3. Smoke is ejected from another opening about the same size as the point of entry 4. Doors inside structure may be closed to clear one area at a time to speed smoke removal 5. With multiple floors, fans should be placed at the lowest level 6. 7. Keys to effective positive pressure ventilation: a. Take advantage of wind conditions b. c. Reduce the size of the area pressurized to speed up the process d. Keep the exit opening about the same size as the entry opening e. Avoid creating horizontal openings by breaking glass or opening doors

NOTES	STUDENT GUIDE
	8. Advantages of positive pressure ventilation a. Can be set up without personnel entering smoke-filled area b. c. Removes smoke faster than negative pressure ventilation d. Heat and smoke may be directed away from unburned areas e. Fans do not block means of egress f. g. The velocity of air currents within a building is minimal with little effect on the contents or smoldering fires h. The cleaning and maintenance of PPV fans is less than required for smoke ejectors i. j. Exposed buildings can be pressurized to reduce fire spread into them 9. Disadvantages of positive pressure ventilation a. Structure must be intact b. Fan exhaust can create higher carbon monoxide levels c.

NOTES	STUDENT GUIDE
	G. Hydraulic ventilation 1. May be used when other types of forced ventilation are not being used 2. Performed by crews making an interior attack after a fire has been controlled 3. 4. 5. Air drawn into fog pattern will pull smoke out along with water 6. Advantages a. Removes more than mechanical smoke ejector b. c. Water fog also protects personnel 7. Disadvantages a. b. Increased drain on the available water supply c. In freezing temperatures, the amount of ice is increased d. Fire fighters must be in heated atmosphere during hydraulic ventilation operations in order to operate hoselines

NOTES	STUDENT GUIDE
	e. The operation may have to be interrupted when personnel exhaust their air supplies **VI. Building Ventilation Systems Effects** *(Essentials p. 579)* A. Heating, ventilation, and air-conditioning (HVAC) systems may draw in smoke and heat and spread fire B. System may automatically shut down when smoke or heat is detected in the air ducts or fire fighters may have to shut down the system to control smoke and heat spread C. During overhaul, area around system should be checked for fire extension D. Personnel should rid system of smoke before reactivating it E. System may be equipped with dampers or smoke detectors which shut system down if smoke is present F. G. Building engineers should be called to operate smoke control systems at the direction of fire personnel **VII. Ventilation Summary** A. Properly done ventilation decreases fire spread and increases visibility for fire attack 1. Aids in life safety 2. Speeds fire attack and extinguishment

NOTES	STUDENT GUIDE
	3. Aids in fire spread control 4. Reduces the potential for flashover and backdraft 5. Helps with property conservation B. Inadequate or improper ventilation can cause death or injury to fire victims and fire fighters and cause destruction of the building C. Before ventilation can be started, officers must make numerous decisions based not only on fire conditions but also their experience and knowledge