Continuing Education for the Fire Fighter

Copyright: IFSTA, Essentials of Fire Fighting and Fire Department Operations, 6th Edition

Tactical Ventilation

Module 2

Chapter 13

Copyright: IFSTA, Essentials of Fire Fighting and Fire Department Operations, 6th Edition

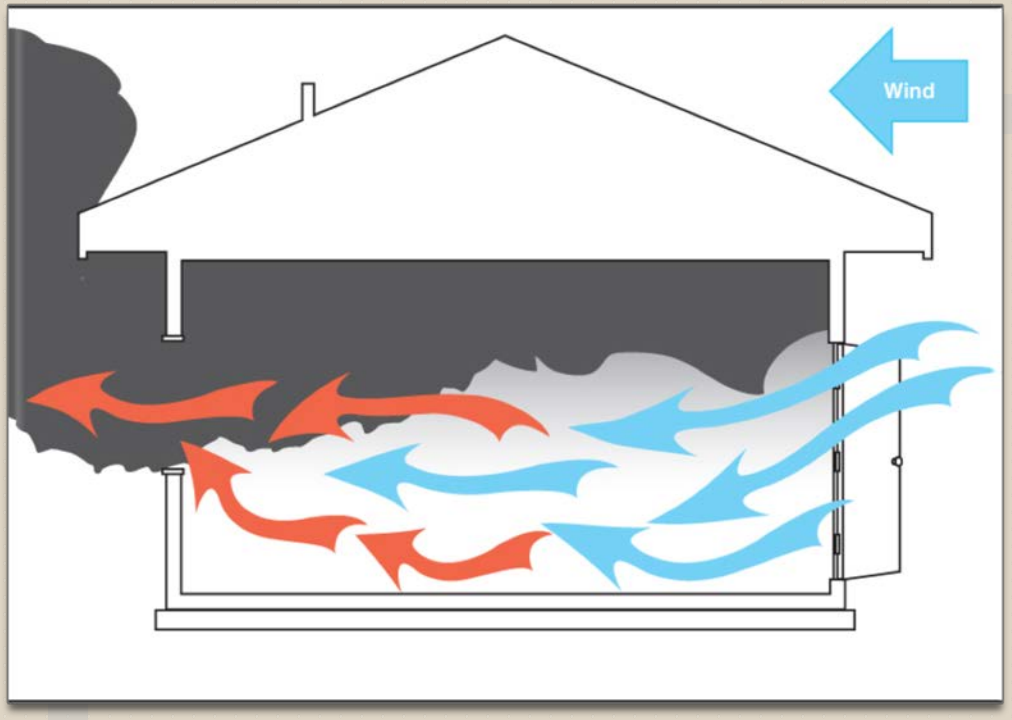
LEARNING OBJECTIVES

- Describe the types of horizontal ventilation.
- Describe the types of vertical ventilation.
- Recognize other types of ventilation situations.
- Explain the effects of building systems on tactical ventilation.
- Ventilate using mechanical negative pressure in a window.
- Ventilate using mechanical negative pressure in a doorway.

LEARNING OBJECTIVES

- Ventilate using mechanical positive pressure.
- Perform horizontal hydraulic ventilation.
- Demonstrate the procedure for sounding a roof.
- Ventilate using a rotary saw to cut an opening.
- Ventilate using an axe to cut an opening.
- Demonstrate the procedure for opening a flat roof.
- Perform the steps for opening pitched roofs.
- Demonstrate the procedure for making a trench cut using a rotary saw.

THERE ARE TWO MAIN TYPES OF TACTICAL VENTILATION THAT CAN BE PERFORMED.



Horizontal Ventilation

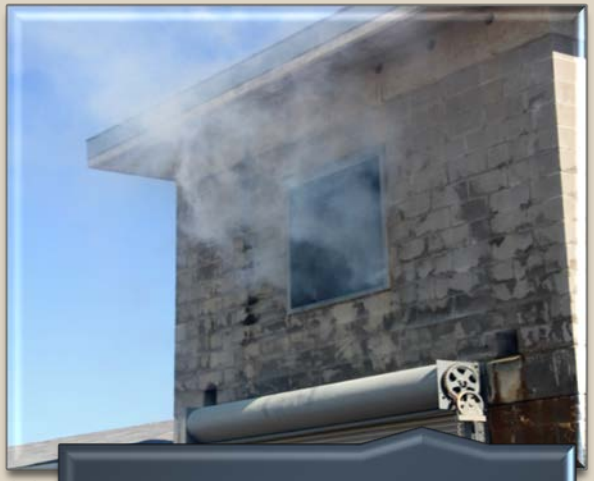
Heat, smoke, other parts of combustion channeled out through existing or created horizontal openings

THERE ARE TWO MAIN TYPES OF TACTICAL VENTILATION THAT CAN BE PERFORMED.

Vertical Ventilation

Ventilating at point above the fire; channeling contaminated atmosphere out the top

THERE ARE THREE MEANS TO ACCOMPLISH VENTILATION USED IN THE FIRE SERVICE.



Natural

Mechanical

Hydraulic

THERE ARE SEVERAL INDICATORS OF THE NEED FOR MECHANICAL OR HYDRAULIC VENTILATION.

HORIZONTAL VENTILATION CAN BE APPLIED TO SEVERAL TYPES OF STRUCTURES.

- Building where fire has not involved attic, cockloft
- Multistory building with fire below top floor, or top floor if attic uninvolved
- Building so weakened unsafe for vertical ventilation
- Building with daylight basement
- Building where vertical ventilation ineffective

NATURAL HORIZONTAL VENTILATION WORKS WITH EXISTING CONDITIONS TO TAKE ADVANTAGE OF NATURAL AIR FLOW.

THERE ARE TWO TYPES OF MECHANICAL HORIZONTAL VENTILATION.

Negative-pressure ventilation (NPV)

Positive-pressure ventilation (PPV)

NPV USES SMOKE EJECTORS TO EXPEL AND PULL SMOKE FROM A STRUCTURE.

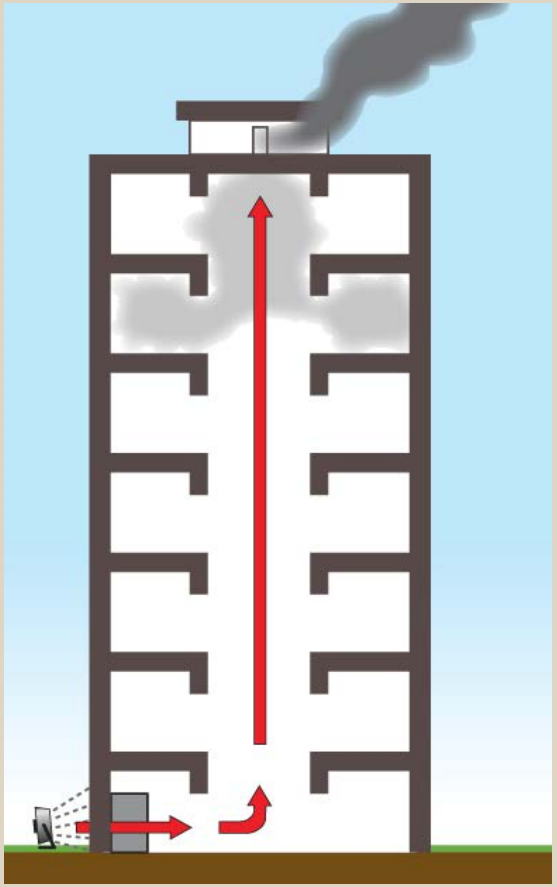
Know placement process

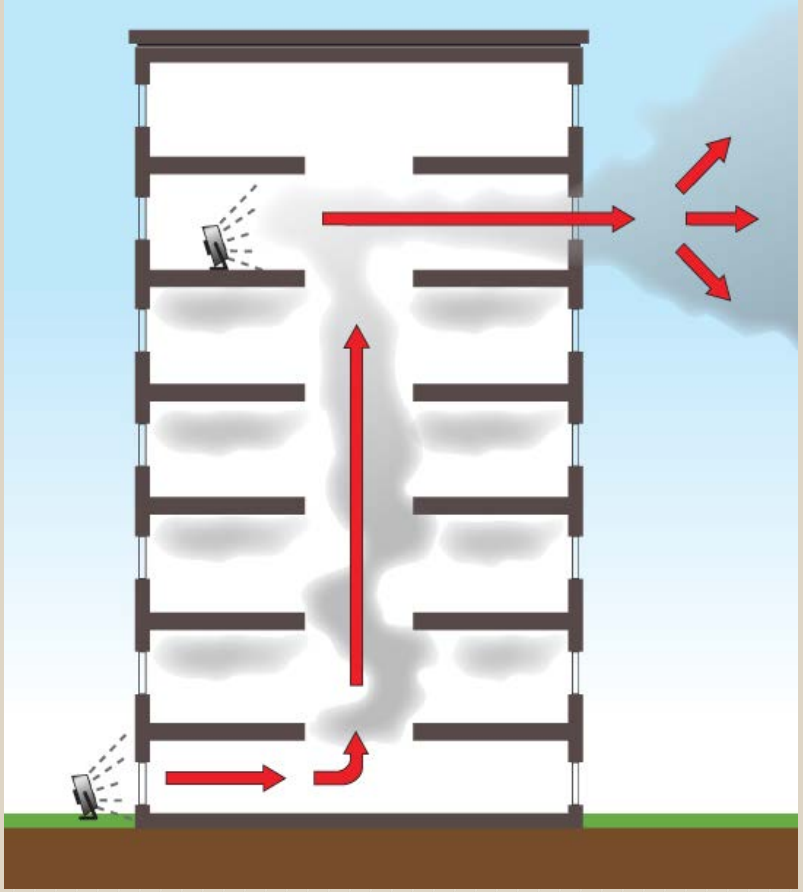
- In windows openings
- On leeward side
- Properly seal
- Flow of smoke, gases
- Avoid opening windows, doors near ejector
- Remove obstacles
- Do not allow ejector to be obstructed

Understand selection and use

- Use intrinsically safe if needed
- Turn off when carrying
- Cautions before starting
- Avoid air discharge from an

PPV USES A FAN TO CREATE SLIGHTLY HIGHER PRESSURE INSIDE A STRUCTURE THAN IS OUTSIDE.





WARNING

Improperly applied, PPV can change the interior conditions and injure personnel working inside the structure.

PPV HAS BOTH ADVANTAGES AND DISADVANTAGES.

Advantages

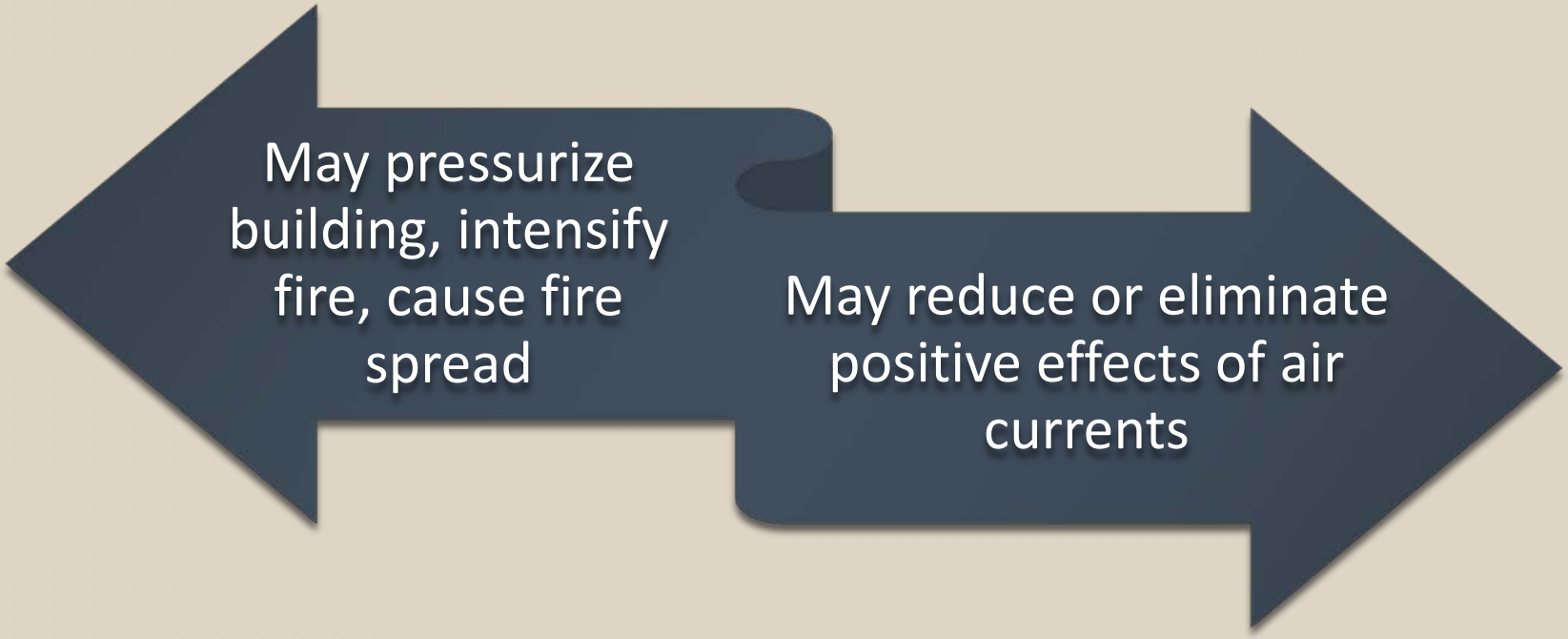
- Set up
- Effectiveness
- Efficiency
- Limits currents
- Operate efficiently
- Cleaning, maintenance less
- Effective in all structure types
- Able to direct
- Can be pressurized

Disadvantages

- Structure must be intact
- May increase interior carbon monoxide levels if fan exhaust enters
- May accelerate, spread hidden fires

HYDRAULIC VENTILATION IS USED WHEN OTHER TYPES OF FORCED VENTILATION ARE UNAVAILABLE.

YOU SHOULD KNOW THE PRECAUTIONS AGAINST UPSETTING HORIZONTAL VENTILATION.



MECHANICAL VENTILATION HAS BOTH ADVANTAGES AND DISADVANTAGES.

Advantages

- Enhances natural ventilation
- Ensures more air flow control
- Speeds removal of contaminants
- Reduces smoke damage
- Promotes good public relations
- Benefits spaces with low oxygen levels

Disadvantages

- Can cause fire to intensify, spread
- Depends on power source
- Requires special equipment, additional resources and personnel

VERTICAL VENTILATION OCCURS AFTER THE INCIDENT COMMANDER CONSIDERS SEVERAL FACTORS.

VERTICAL VENTILATION PRESENTS SEVERAL RISKS THE IC MUST ASSESS.

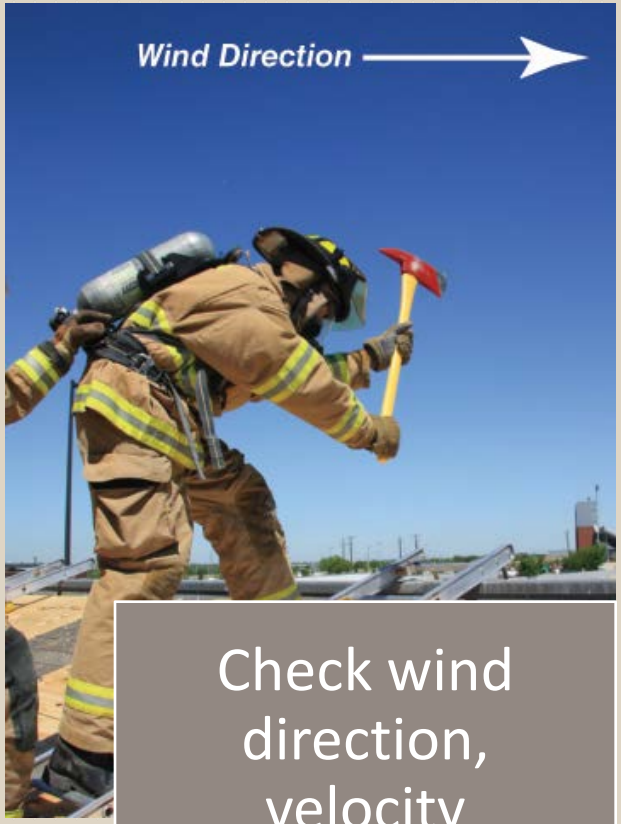
Risks

- Personnel working above ground level on peaked, flat surfaces
- Working above fire, on weakened roofs

Determine if offensive or defensive

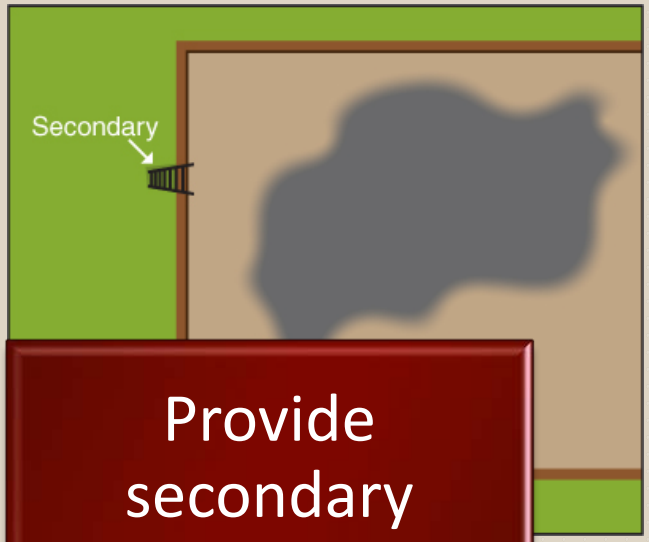
- Offensive – Aids in reaching, extinguishing fire
- Defensive – Stop spread of fire, contains in one area

SAFETY PRECAUTIONS SHOULD BE USED DURING VERTICAL VENTILATION.



Check wind direction, velocity

Note obstructions, excessive weight



Provide secondary means of escape

SAFETY PRECAUTIONS SHOULD BE USED DURING VERTICAL VENTILATION.

- Ensure main structural supports not cut
- Guard opening
- Evacuate promptly
- Prevent personnel from sliding, falling off roof
- Secure ladder firmly

CAUTION

Roof ladders are only meant to prevent slipping and are not intended to be used on fire-weakened roofs.

SAFETY PRECAUTIONS SHOULD BE USED DURING VERTICAL VENTILATION.

- Caution when around electric wires, solar panels, guy wires
- Wear full PPE
- Keep out of range of swinging axes, power saws
- Remain aware of overhead obstructions
- Power tool cautions
- Extend ground ladders above edge of roof or top of wall

SAFETY PRECAUTIONS SHOULD BE USED DURING VERTICAL VENTILATION.

- Ensure aerial platform even or slightly above roof
- Check roof structural integrity
- Walk on load-bearing walls, strongest parts
- Penetrate ceiling to enhance ventilation

WARNING

Never direct a fire stream into a vertical exhaust opening when interior attack crews are inside the structure because it will force smoke, heat, and steam down on them.

KNOWING WHAT TO EXPECT WHEN SOUNDING A ROOF IS IMPORTANT.

CAUTION

Work in groups of at least two, but with no more personnel than absolutely necessary to perform the assigned task.

ROOF-CUTTING OPERATIONS REQUIRE SPECIFIC RESOURCES AND SKILLS.

Courtesy of Matt Daly

ROOF VENTILATION LEADERS HAVE SPECIFIC RESPONSIBILITIES TO PERFORM.

Ensure

- Roof safe
- Only require openings made

Minimize secondary damage

Coordinate with firefighters inside

Ensure

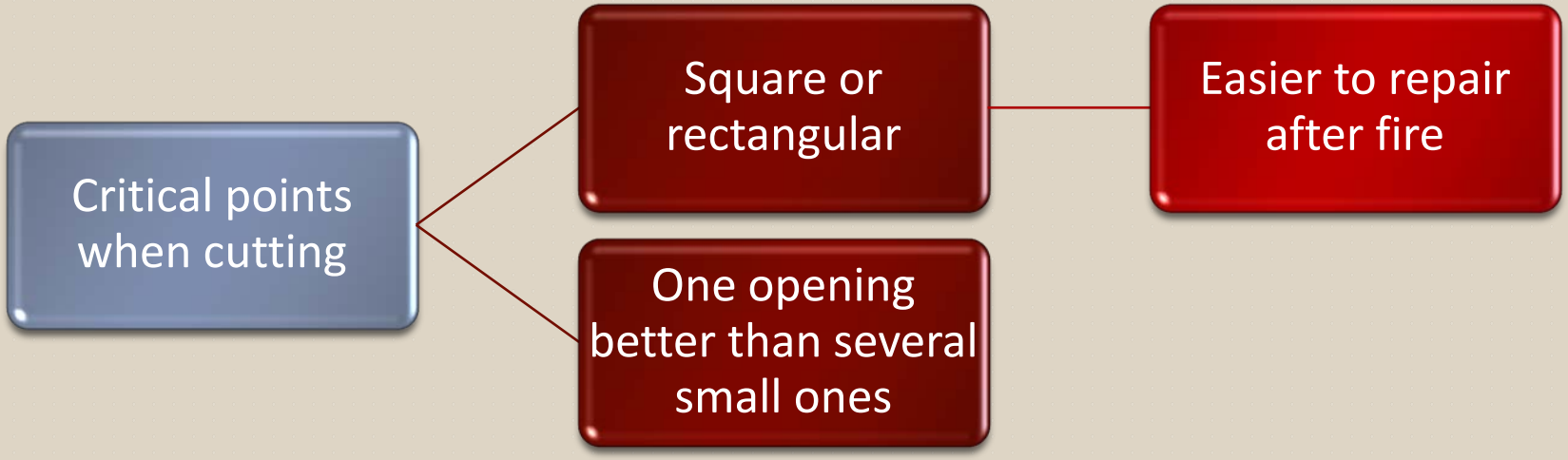
- Safety of personnel
- Two means of egress
- Adequate exhaust opening size
- Team leaves when assignment completed

VARIOUS TYPES OF INSPECTION HOLES CAN BE USED DURING VENTILATION.

Kerf cut

Triangle cut

OFFENSIVE VENTILATION METHODS DEPEND ON THE OPENING AND ROOF TYPE.



A SQUARE OR RECTANGLE IS THE MOST COMMON OPENING MADE IN A FLAT ROOF.

DIFFERENT TYPES OF ROOFS REQUIRE DIFFERENT VENTILATION TACTICS.

- Pitched roof, shingle-covered
- Pitched roof, slate or tile-covered
- Arched roofs
- Metal roofs

THE TRENCH CUT IS STRICTLY A DEFENSIVE VENTILATION METHOD.

THE PROCESS FOR MAKING A TRENCH CUT FOLLOWS SPECIFIC PROCEDURES.

Opening created ahead of fire

- Only after vertical ventilation opening made

Created by

- Two parallel cuts
- Remove roof material
- Push ceiling material down

Improper cut

- Places firefighters in dangerous position
- May cause fire spread more rapidly

ALL VENTILATION TEAM MEMBERS SHOULD FOLLOW SAFETY PRACTICES.

- Plan ahead
- Establish and maintain communication
- Be aware
- Have clear understanding of objectives
- Have charged hoseline present
- Wear full PPE and SCBA
- Have two means of escape
- Assign roof safety officer
- Cut small inspection holes on both fire, safe working side

YOU SHOULD KNOW THE PRECAUTIONS AGAINST UPSETTING VERTICAL VENTILATION.

Factors that can reduce effectiveness

Not a solution to all ventilation problems

WARNING

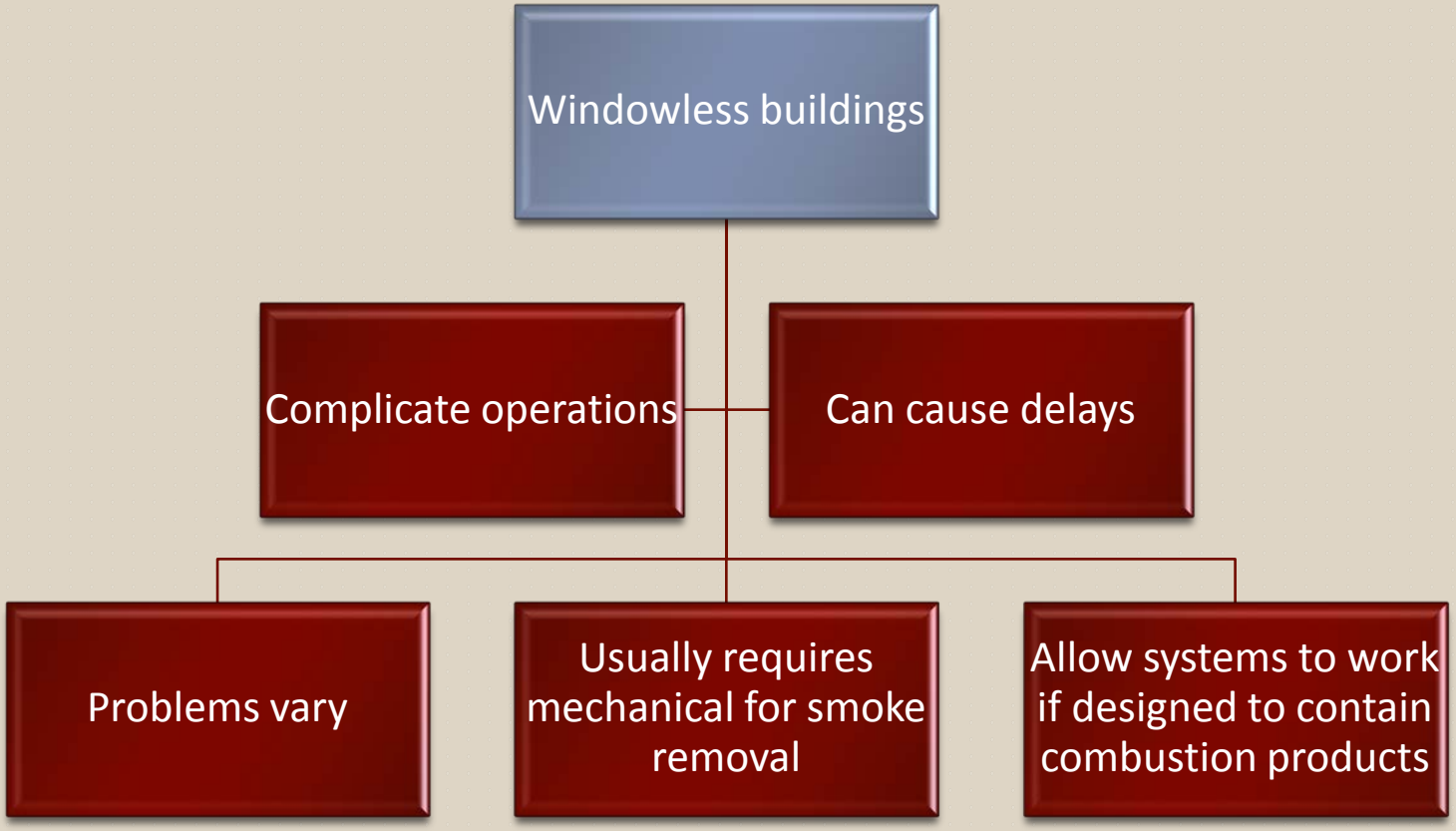
Do not direct a fire stream into a ventilation opening during offensive interior operations.

OTHER TYPES OF VENTILATION SITUATIONS, SUCH AS BASEMENT FIRES, MAY ARISE.

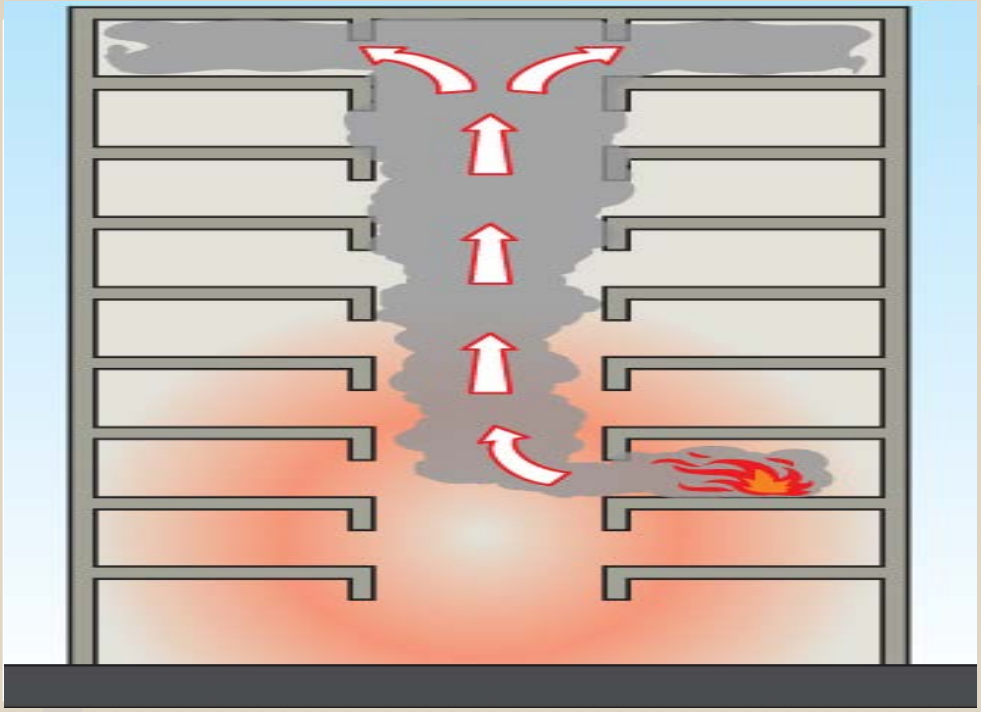
Basement fire

- Heat, smoke spread upward
- Access can be difficult without ventilation
- Several ventilation methods

OTHER TYPES OF VENTILATION SITUATIONS EXIST, SUCH AS WINDOWLESS BUILDINGS.



HIGH-RISE FIRES ARE ALSO ANOTHER TYPE OF VENTILATION SITUATION THAT MAY ARISE.



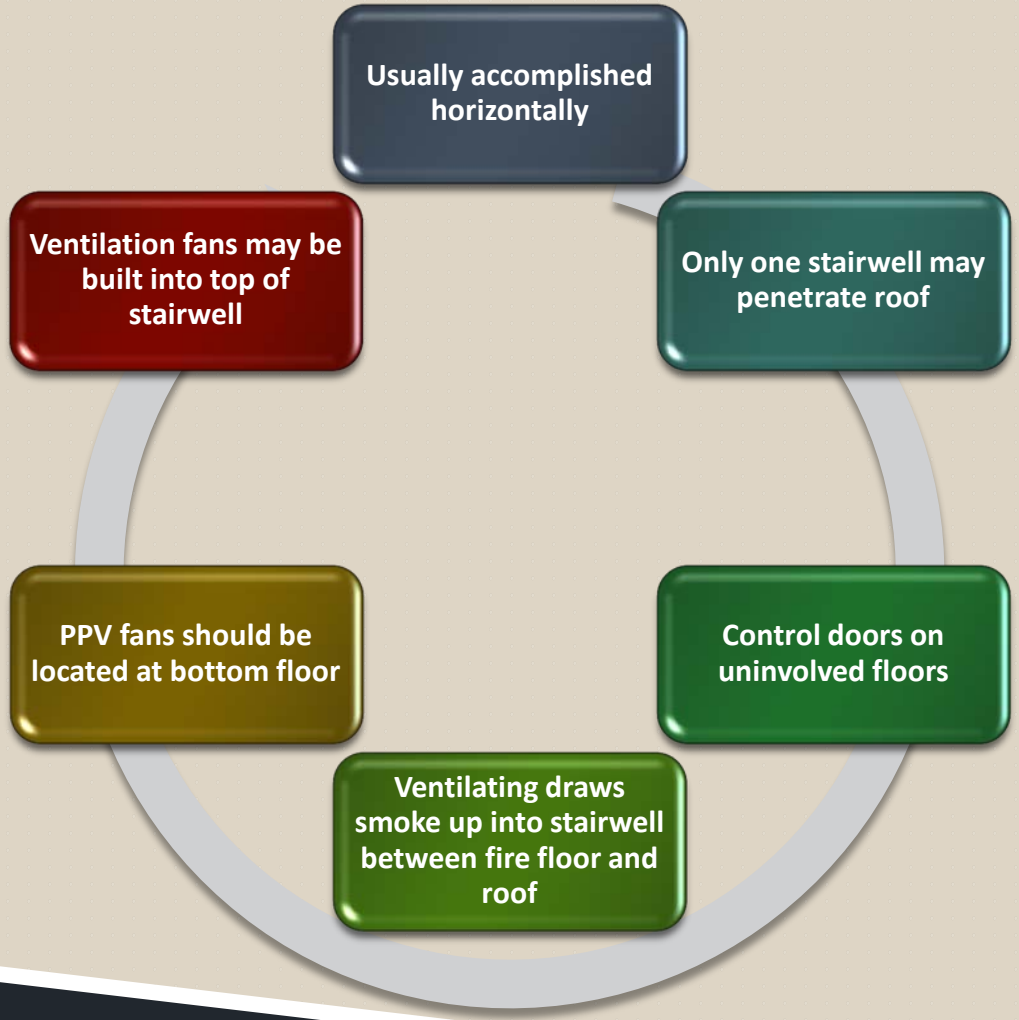
High-rise fires

Higher life safety considerations present

More personnel required

Consider smoke spread, hot gas layer development

TACTICAL VENTILATION MUST BE CONSIDERED DURING PREINCIDENT PLANNING.



WARNING

Do not use stairwells or elevator shafts simultaneously for both evacuation and ventilation.

VENTILATION WILL HAVE SEVERAL EFFECTS ON BUILDING SYSTEMS.

- Modern HVAC may contribute to fire spread
- Systems usually controlled from panel in basement, ground level
- Restoring system responsibility of building staff
- Ductwork may create additional fire damage

BUILT-IN SMOKE CONTROL SYSTEMS ARE DESIGNED TO CONFINE FIRE.

WARNING

Do not attempt to operate building systems that assist in ventilation.

SUMMARY

Tactical ventilation limits fire spread and channels heat and smoke away from trapped victims; but must be correctly coordinated.

Firefighters must understand fire behavior, know various ventilation methods and have knowledge of roof construction and know how to create exhaust openings in all types of roofs that have a variety of openings in order to perform ventilation correctly.