TOPIC: Ventilation - Positive Pressure

TIME FRAME: 1 Hour

LEVEL OF INSTRUCTION:

BEHAVIORAL OBJECTIVE:

Condition: A written quiz

Behavior: The student will list and describe positive pressure ventilation operations and procedures.

Standard: With a minimum of 70% accuracy

MATERIALS NEEDED:

- Appropriate visual aids
- Audio visual equipment

REFERENCES:

- IFSTA, Essentials of Fire Fighting, 2nd Edition, Chapter 11
- Tempest Technology Corporation, Positive Pressure Ventilation Training Manual

PREPARATION: There are basically two concepts of forced or mechanical ventilation, positive and negative pressure. Both concepts are effective, but have some major differences in application. In this lesson, we will specifically discuss positive pressure ventilation.

PRESENTATION	APPLICATION

I. POSITIVE PRESSURE VENTILATION

A. A Process Whereby Pressure Within an Involved Structure Is Increased to the Point that it is Greater than the Outside Pressure. Once an Exhaust Opening is Created the Pressure Inside and Outside the Involved Structure Will Tend to Equalize. As Air in the Involved Structure (High Pressure or Positive Pressure) Rushes to the Exterior (Low Pressure or Negative Pressure) the Byproducts of Combustion are Cleared from the Structure.

Information sheet #1

B. The Positive Pressure Is Created by Using

1. Blowers

   a. Specifically designed to pressurize buildings

   b. Powered by internal combustion engine, electricity or water

   c. Vary in size from 16" to 48"

2. Smoke ejectors

   a. Must be turned backwards i.e. with the exhaust side of the ejector pointed toward the ventilation opening

   b. Powered by internal combustion engine or by electricity

C. The Objective Is to Pressurize the Building and Then by Controlling Exhaust Openings Channel Byproducts of Combustion to the Exterior of the Building

D. Advantages of Positive Pressure Versus Negative Pressure (Smoke Ejection) Operations

PRESENTATION	APPLICATION

1. Personnel need not enter structure to place equipment in operation
2. Ingress, egress, halls, doors and windows remain unobstructed
3. Equipment requires less maintenance since by products of combustion are not drawn across and through
4. Internal combustion engines are more efficient in oxygen rich exterior environment
5. Equipment is not polluting the air within the building with exhaust fumes
6. Noise level within the structure is reduced
7. Less time and staff to set up
8. Additional equipment not needed to support or suspend blower or ejector
9. Can be set up prior to interior operations commencing

E. Procedures for Establishing Positive Pressure Ventilation

1. Conduct ventilation assessment
   a. Determine need for ventilation
      (1) Fire location
      (2) Fire spread
      (3) Fire intensity/size
      (4) Fire direction of travel
   b. Determine where exhaust or vent opening should be (downwind)

PRESENTATION	APPLICATION
c. Determine where pressurization opening will be (upwind)	
2. Placement of blowers/ejectors	
	Information sheet #2
a. Position far enough from opening so cone of air completely covers opening, (10' - 15' from opening)	
(1) May have to tilt blower or ejector 20 to 300	
(2) Do not place so far away that air directed against exterior of structure.	
b. If more than one ejector or blower is to be used	
(1) Stack blowers for better coverage of opening and move closer to door to increase pressurization	
(2) May set one behind another to supercharge air and increase pressurization inside building	
	Information sheet #3
(3) Set side by side to cover wide openings	
	Information sheet #3
(4) May pressurize from more than one opening.	
3. Open exhaust or vent hole	
a. Just prior to pressurizing the building	

PRESENTATION	APPLICATION

b. As near seat of fire as possible

c. To maintain positive pressure control size of exhaust opening

(1) For single 18" blower exhaust opening should be 3/4 the size of pressurization opening

(2) If more than one blower/ejector used exhaust opening may be 1 1/2 times the size of pressurization opening

d. Use existing openings if possible. Sliding glass doors of particular value since adjustable.

4. Attack fire

a. After exhaust vent opening made

b. 5-15 seconds after positive pressure established in structure

c. Speed of attack will more than compensate for damage incurred due to increase in fire spread or intensity because:

(1) Heat reduced

(2) Vapor and gasses reduced

(3) Visibility increased dramatically

(4) Seat of fire found more quickly

(5) Less water and smoke damage

5. Continue ventilation through salvage and overhaul

PRESENTATION	APPLICATION
a. Positive pressure is not a substitute for S.C.B.A.	
b. Smoke removal is expedited if one room or floor at a time is cleared	
	Information sheet #4
c. Smoke removal is expedited by increasing number or size of blowers and ejectors	
F. Special Applications	
1. Basements can be cleared by setting blower at basement door. Smoke will churn and exit above blower onto first floor where another blower should be set up to push smoke outside.	
2. Multi story buildings can be cleared by setting blowers/ejectors at ground level opening to pressurize building	
a. Open windows and doors to clear smoke floor by floor	
b. To maximize efficiency must have strict control of which doors and windows are opened and when	
c. During firefighting operations work from upper floors downward	
	Information sheet #5
d. During overhaul work from bottom floors up to assist convective action	
	Information sheet #5

PRESENTATION	APPLICATION

e. From ground floor opening positive pressure to 20th floor can be accomplished in 30 seconds

G. Safety Precautions

1. Coordinate ventilation with interior teams
2. Do not ventilate in this manner in backdraft conditions
3. Place blower or ejector on debris free surface
   a. Will throw gravel and debris if placed directly on ground
4. Do not move blower while running
5. Lift with legs not back
6. Heavy blowers require two persons to place and/or move
7. Blowers can be awkward to move
   a. Use handles
8. Carry fuel in safe and approved containers
9. Keep fingers away from blades during operation

SUMMARY:

Positive pressure ventilation can be utilized in many different applications. It is important to have a good working knowledge of the different concepts and how to implement them.

EVALUATION:

A written quiz.

ASSIGNMENT:

To be determined by instructor(s).