




# High-Rise Fire Sample Scenario with Stairwell Pressurization

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Fire Engineering Simulation

This sample simulation utilizes multiple points of view to accomplish fire knockdown and stairwell pressurization to limit smoke spread in the building. PPV fans utilized correctly can increase the effectiveness of fire fighters and survivability of occupants in high-rise buildings. In a high-rise building it is possible to increase the pressure of a stairwell to prevent the infiltration of smoke if fire crews configure the fans properly. Use your own experience and the teaching points at the end of this example to teach your firefighters.

Key	Description	Picture
Arrival	Smoke is visible from side A coming from the 7 <sup>th</sup> Floor	
2	This starts heavier smoke pushing from the 7 <sup>th</sup> Floor	
Arrows	Chief completes 360 size-up of the structure  Note: Report from other sides can be obtained from incoming units	
3	The smoke increases and fire is now visible from the 7 <sup>th</sup> Floor	



Arrows  
Crew moves to "Side A Steps" and then into the "Building Lobby"

Click  
Crew chooses to bypass the elevator and moves into and up the stairs











Arrows  
As crew gets to the 4<sup>th</sup> floor they see that it has been chocked open by an occupant

Click  
Click on the chock to remove it and close the door. Note: This will increase the effectiveness of the stairwell pressurization.

Arrows  
Once closed the crew continues up the steps.



Arrows	Crew stops on the 6 <sup>th</sup> floor to connect to standpipe riser and check floor layout			
b	While the crew is making their way up to the fire floor another crew places a blower at the base of the stairwell for pressurization			
Arrows	The crew reaches the fire floor with their hose line  Smoke has filled the stairwell and is continuing to descend			
v	Crew asks for the stairwell to be ventilated to lift the smoke			
b	The blower is turned on to speed up the ventilation of the stairwell			

v	<p>Once the smoke has been mostly cleared the roof door is closed to pressurize the stairwell and stop smoke infiltration</p> <p>Note: If you don't remove the chock from the open door on the way up the stairs the fan has little impact on ventilation.</p>	
Arrows	<p>While the ventilation is being controlled the crew moves down the hallway to extinguish the fire</p>	
		

Teaching points for the use of PPV to pressurize the stairwell:

- Smoke can only flow from a higher pressure to a lower pressure. The fire creates its own pressure and PPV fans, when configured correctly create a slightly higher pressure to control or stop the flow of smoke.
- This tactic is meant to keep smoke out of the stairwell to provide a safe egress path for occupants and provide a safer environment for crews operating in the structure.
- When dealing with high-rise buildings fans at least 24" are recommended because of the large volumes being pressurized.
- Fans should be placed at the base of the stairwell to maximize impact.
- The control of open doors is important, doors opening and closing is not a major concern but doors should not be left open in the stairwell. An open door below the fire floor could limit the impact of the fan.
- CO generation by the fans is minimal compared to the CO created by the fire.
- The taller the building the more fans that may be needed. One fan at the base of a stairwell can create enough pressure to stop smoke spread from a well developed fire in a 10-story building. Taller buildings require fan placed in the building. Placing the fan 2 floors below the fire floor in larger structures is a good rule of thumb.

- Fans used inside the building should be configured just as if they are positioned at an outside doorway.
- There are many considerations that exist for high-rise ventilation, visit the simulation forum and discuss them.

For more detailed information on the use of PPV fans in large structures visit

<http://www.fire.gov/PPV/index.htm>

Read:

Evaluating Positive Pressure Ventilation In Large Structures: High-Rise Pressure Experiments

(<http://fire.nist.gov/bfrlpubs/fire07/PDF/f07011.pdf>)

and

Evaluating Positive Pressure Ventilation In Large Structures: High-rise Fire Experiments

(<http://fire.nist.gov/bfrlpubs/fire07/PDF/f07011.pdf>)