# Insight: High Volume Low Speed (HVLS) Fans

## Recognizing the Risk

What started in 1998 as a way to cool cattle in hot summers has continued to grow in use as a way to cool occupants and control humidity in various industrial buildings from stadiums to warehouses. High-volume low-speed (HVLS) mechanical fans continue to grow in popularity as an alternative to conventional air conditioning systems due to effectiveness, economic value with low per unit and operational costs, ease of installation, and, the aesthetic look in some venues. HVLS fans typically have a much lower rotational speed than residential units but, due to blade design and length, create a much higher air movement volume and velocity that can spread over a wider floor area. HVLS fans can have blade diameters up to 24 ft (7.3 m).

But the significant air velocity the HVLS fans produce can also negatively impact the control and suppression dynamics of a developing fire below and adjacent to these units in several ways.

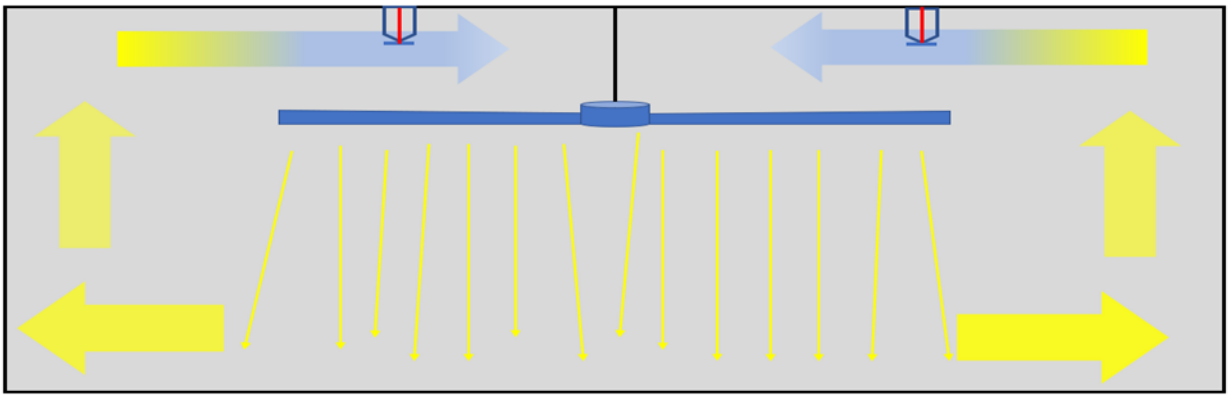
The downward fan air draft can push a fire horizontally away from activating sprinklers quicker than sprinklers would typically activate - to pre-wet ahead of a growing fire area.

The high velocity of downward moving air can also dissipate rising fire heat which would normally activate sprinklers-resulting in a sprinkler activation delay. The same delays could also occur with some ceiling-mounted smoke and heat detectors.

The added air velocity can accelerate both fire general growth and horizontal spread by pushing the fire along the floor area.

The large size of the fan blades can obstruct ceiling sprinkler system discharge patterns both when rotating and if stopped directly below sprinklers (and too close).

Since discharge air velocity generated by below HVLS fans draws in return air across the ceiling above, this airflow across ceiling sprinklers could also dissipate or disrupt heat flow around the sprinklers creating delayed activation times.



HVLS Typical Air Flow

## Controlling the Hazard

Based on these concerns, the NFPA Fire Protection Research Foundation (FPRF) sponsored by the Property Insurance Research Group (PIRG) which AIG supports, conducted numerous large-scale tests using various sprinkler types. And their concerns on potential negative fire control impact were confirmed. From this research, FPRF developed installation recommendations to limit negative impact which are not part of the current edition of NFPA 13. These recommendations include proper fan placement (centered between four (4) sprinklers), minimum fan blade vertical clearance from sprinklers

(36 in. (900mm)), and the fan motor interlocks to fire detection devices (to quickly stop blade spin). Interlocks can be via connection to sprinkler system water flow devices, flame detectors, or other acceptable devices.

But in the testing that FPRF completed, results were successful when the operating HVLS fan was shut down within 90 seconds of the first sprinkler activation. When fans are interlocked for shutdown via fire alarm system devices, requirements of NFPA 72 are also recommended. Fans with diameters larger than 24 ft. (7.3 m) are not currently allowed by NFPA 13, as no formal testing of such fans has been conducted.

A final part of HVLS fan risk management, as with all fire protection and detection systems, is testing. Regular and comprehensive testing of automatic fan-motor interlock devices and shutdowns must be conducted to help ensure operational readiness. Such testing is typically driven by NFPA 72 and alarm device testing frequencies for the interlock detection devices and should be included each time this testing is done. HVLS interlocks should also be tested as part of integrated systems testing per NFPA 72 with added guidance per NFPA 4.

## References & Resources

The Fire Protection Research Foundation, High Volume/Low-Speed Fan and Sprinkler Operation Phase II

Research Program Report, revised January 27, 2011

National Fire Protection Association (NFPA) NFPA 4: Standard for Integrated Fire Protection and Life Safety System Testing

National Fire Protection Association (NFPA) NFPA 13: Standard for Installation of Sprinkler Systems

National Fire Protection Association (NFPA) NFPA 72: National Fire Alarm and Signaling Code

*While NFPA documents are the global standard used by AIG, international equivalents may be acceptable.

For more information, contact your local AIG Risk Engineer.