

EBTRON Insight

Wildfires have Increased Advocacy for Better Indoor Air Quality and Building Codes

In recent years, a record number of wildfires in Canada and the Western United States has sparked a renewed discussion about indoor air quality (IAQ). Building codes and ASHRAE's Ventilation and IAQ Standards (62.1, 62.2) basis for achieving IAQ is through dilution (ventilation) and air cleaning (filtration) as well as ensuring air that enters or leaves a building in a controlled and intended manner (pressurization control). These things are essential to maintaining indoor contaminant levels generated by people, building materials, and components below thresholds. In some instances, the contaminants outdoors may be higher than indoors, universally measured by the air quality index (AQI)¹, and sometimes differs by country.² Wildfires generate gases and particulate matter that the AQI measures; it is a good indicator to determine when the outdoor air is at risk. These contaminants can be filtered out. The amount of removal depends on the mass removal efficiency of the filters used and the loading of the filter (how long the filter is effective) is dependent on particle size.³

Recent events have put the AQI within the unhealthy to hazardous levels. With the increase in wildfires and other events that release contaminants into the air, it is good practice to have a Smoke Readiness Plan^{3,4} that can be implemented to protect people indoors from bad outdoor air while also protecting them from contaminants generated indoors.

That is why it is essential to:

1. Ensure adequate filtration to defend against harmful particles.
 - Maintain an inventory of additional MERV 11 filters at a minimum for use on all outdoor air inlets.
 - Verify that existing filtration systems have correct MERV ratings and fit well without air gaps.
 - Add in-room filtration systems as needed.



2. Make sure ventilation is compliant with building codes.
 - Directly measure with installed flow measurement or validate by an Accredited TAB professional.⁵ Note that a TAB measurement is only good for a moment in time; systems are impacted by the environment and degrade over time.
 - Inspect, maintain, and monitor the system often.⁶
3. Maintain positive building pressurization.
 - Ensure windows and doors are properly closed.
 - Control the pressurization flow by ensuring the ventilation rates exceed exhaust and relief rates during all operation and dynamic reset modes.
 - Disable Demand Control Ventilation (DCV) and Economizer Operation to limit dynamic modes of operation during wildfire events.

ASHRAE Journal stated one of the points on the Smoke Readiness Plan. "Optimize System Airflows- Assess and maintain adequate airflows that are protective of human health and equipment health during smoke events. Prior to wildfire season, determine an outdoor air intake level that controls odor, temperature, indoor contaminant levels and maintains a positive building pressure consistent with the building and HVAC system design."⁷



Filtering, ventilation, and pressure control are the foundation of maintaining a healthy building during normal operation and essential during an outdoor event such as a wildfire. Integrating airflow measuring devices into a building automation system allows ventilation rates to be automatically adjusted or manually adjusted as conditions change. In addition, it prepares the building for any future need to increase and confirm ventilation rates.

Proper outdoor air ventilation and building pressurization are necessary for controlling indoor pollution concentration. Uncontrolled or imbalanced airflow can cause unwanted air to enter a space through walls, windows, and doors; janitor closets or mechanical rooms; toilet or locker rooms; basements or underground. Installed airflow measuring solutions can also indicate when filters are becoming loaded and need replacement.

Maintenance is critical for effective operation in any mode. Testing and inspection protocols maintain IAQ during normal operation and keep systems ready for future events.⁶ It is important to inspect the HVAC system after a smoke event. Smoke may have affected the operation of components and caused the system to function improperly or inefficiently, impacting normal mode IAQ.

If you don't measure it, you can't control it.

When designing or upgrading a mechanical system or setting up an HVAC system, it's essential to prioritize measurement, control, and fault alerts as the foundation for these systems. New HVAC system designs should consider adding filtration efficiency and control strategies to initiate smoke mode. This will allow the system to operate energy efficiently during normal mode and allow for additional fan capacity and the control logic needed during wildfire events. Airflow measurement and control costs in an HVAC system are minimal compared to the future impact and cost due to over ventilation, inadequate ventilation, and infiltration.

REFERENCES

1. [Air Quality Index](#)
2. [Wikipedia Air Quality Index](#)
3. [Guideline 44P, Protecting Building Occupants from Smoke During Wildfire and Prescribed Burn Events](#)
4. [Planning Framework for Protecting Commercial Building Occupants from Smoke During Wildfire Events](#)
5. [ASHRAE 62.1-2022 Appendix L7 Ventilation for Existing Buildings](#)
6. [ASHRAE 62.1-2022 Table 8-1 Minimum Maintenance Activity and Frequency for Ventilation System Equipment and Associated Components](#)
7. [ASHRAE Journal 2021 Protecting Building Occupants From Smoke During Wildfire and Prescribed Burn Events](#)

ABOUT THE AUTHOR

Darryl DeAngelis holds a B.S. degree in Marine Engineering from the Massachusetts Maritime Academy. He is a LEED AP certified professional and has garnered more than 30 years of experience in the HVAC industry. His extensive work history includes roles as a contractor, system designer, consultant engineer, product development engineer, sales manager, product manager, and market intelligence manager. The Director of Business Development for EBTRON has 20 years of experience with ASHRAE and has contributed to the development of standards and guidelines. He is also a member of ASTM, ISIAQ, and I2SL, and has four HVAC-related patents.

