

How Wildfires Can Affect Buildings Miles From the Fire Line

Wildfires can affect properties far beyond the immediate burn area. Smoke may travel hundreds of miles, reduce outdoor air quality, enter buildings, and disrupt normal operations. Properties closer to wildfire-prone areas may also face windblown embers, radiant heat, and direct flame exposure.

A site-specific review can help determine how these hazards may affect the building enclosure, mechanical systems, surrounding property, and continued operations. The findings can guide response planning, targeted repairs, and longer-term improvements.

Smoke Can Travel Far From an Active Fire

Wildfire smoke contains gases and fine particulate matter that can move across large regions and enter buildings through outdoor-air intakes, open doors and windows, enclosure leakage, and pressure-driven air movement.

Remaining indoors may reduce exposure during a smoke event, but it does not necessarily mean the indoor air is clean. Conditions depend on filtration efficiency, uncontrolled air leakage, ventilation strategy, building pressure, and operating procedures.

"Wildfire risk does not stop at the fire line. Smoke, embers, air leakage, and operational disruptions can affect buildings well beyond the immediate burn area."

Schools, offices, health care facilities, multifamily buildings, and other occupied properties may need to remain open while outdoor air quality is poor. Understanding how smoke moves through a building before an event can help facility personnel make informed decisions about ventilation, filtration, monitoring, and operations when outdoor conditions deteriorate.

HVAC Systems Require a Building-Specific Plan

During wildfire smoke events, HVAC systems play an important role in maintaining indoor conditions. However,

the right approach depends on the building, its systems, and how it is used.

Reducing outdoor-air intake may help limit smoke entry, but the building still needs enough ventilation for occupants and normal operations. Higher-efficiency filters may capture more fine particles, but they can also increase pressure drop and reduce airflow if the system was not designed for them.

A smoke-readiness plan may address:

- Outdoor-air intake and recirculation settings
- Filter efficiency, fit, and replacement schedules
- Building pressure and uncontrolled air leakage
- Portable air-cleaning equipment
- Indoor and outdoor air quality monitoring
- Doors, windows, and loading areas
- Procedures for communicating with occupants

These decisions should be considered together. Changes to outdoor air, filtration, or building pressure can affect ventilation, occupant comfort, and system performance.

The Building Enclosure Influences Smoke Entry

Wildfire smoke can enter a building through leaks in the enclosure, bypassing the HVAC system's filters.

Common entry points include gaps around windows and doors, wall penetrations, roof transitions, loading docks, vestibules, and poorly sealed connections between materials. Frequent door use can also bring in more smoke, especially in retail, hospitality, health care, and distribution facilities.

An enclosure assessment can help locate these air leakage pathways and show how the enclosure interacts with mechanical ventilation and building pressure. Depending on the property, the evaluation may include visual observations, air leakage testing, pressure measurements, infrared thermography, or other diagnostic methods.

The findings can guide targeted repairs and operating strategies instead of sealing areas without first confirming where air is entering.

Embers Create a Different Type of Risk

Smoke can affect buildings far from a wildfire, while windblown embers pose a greater threat to properties in or near wildfire-prone areas.

Embers can land on roofs, collect in gutters, or enter through vents and other openings. They may ignite combustible materials before the main fire front reaches the property. Exterior walls, roof edges, soffits, decks, other projections, and beautification/vegetation may also be exposed to radiant heat and direct flame.

A building's vulnerability often depends on several conditions working together. A roof covering may resist ignition, for example, while debris in a gutter, an unprotected vent, or combustible material near an exterior wall creates another way for fire to spread.

Product selection and assembly design can affect how these areas perform during a wildfire. Intertek tests exterior wall assemblies, eaves, roof coverings, decks, and other building components to applicable wildfire and fire-exposure standards.

The appropriate test method depends on the product, assembly, intended use, and project requirements as well as the referenced building code.

Wildfires Can Disrupt Operations Without Damaging the Building

Wildfires can disrupt a property even when they cause no physical damage. Smoke, road closures, evacuation orders, power outages, and employee access issues may affect operations before flames reach the site.

A building may remain structurally intact but still be unable to operate because outdoor air is unhealthy, indoor particle levels are high, employees cannot reach the property, or utilities are unavailable.

Some facilities face added risks. Data centers and manufacturing facilities may need to protect sensitive equipment from particulate matter. Health care and senior living facilities serve people who may be more susceptible to smoke exposure. Schools may need to determine whether indoor conditions are safer than the outdoor air when activities are restricted.

Planning should consider utility service, employee access, indoor air quality thresholds, equipment sensitivity, and how operations could continue or move elsewhere during an extended disruption.

Property Assessments Can Help Prioritize Improvements

Wildfire risk varies by location, construction, surrounding vegetation, occupancy, and building systems. Using the same checklist for every property can miss the conditions that create the greatest risk at a specific site.

A Property Resilience Assessment can start with hazard screening to identify the wildfire-related concerns that apply to the property. The review may consider smoke infiltration, windblown embers, exterior materials and openings, mechanical systems, emergency power, site access, and plans for keeping the property operating.

The findings can help separate maintenance items that need attention now from larger improvements that may require capital planning. Recommendations may include sealing air leakage, reviewing filtration capacity, managing vegetation and combustible storage, improving emergency power, or updating response procedures.

Preparing Before the Next Smoke Event

Wildfires are often associated with properties near forests, grasslands, or other areas with combustible vegetation. Smoke events show that the effects can reach much farther.

Evaluating the enclosure, HVAC system, filtration, monitoring capabilities, and operating procedures before an event can support faster, better-informed decisions when outdoor air quality declines.

Properties with direct wildfire exposure may also benefit from testing, assessment, and site-specific planning for windblown embers, radiant heat, and flame.

Intertek provides Property Resilience Assessments, building enclosure evaluations, indoor air quality services, and testing for building products and assemblies.

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