

Cleaning the air in commercial spaces

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Most of us spend at least part of our day in climate-controlled commercial buildings for work, school, exercise, entertainment, or shopping. When it's hot outside, it can be a huge relief to go inside to robust air conditioning. Unfortunately, when it's smoky outside, that air conditioning is not a guarantee of clean indoor air.

Here's why:

1. **Filters:** Commercial HVAC systems bring outside air inside. It's what they are designed to do. They filter the air, but the current commercial standard for HVAC filters in Montana (and most of the country) is MERV 8. ASHRAE, the organization that sets HVAC standards, recommends MERV 13 filters for wildfire smoke. However, the less efficient MERV 8 filters are cheaper, so that's what you'll typically find in commercial HVAC systems.
2. **Deferred maintenance:** You may assume that if your air is cooled or heated adequately, everything is hunky dory with the HVAC system. Turns out, that's not always the case, and simple HVAC malfunctions such as broken dampers or blocked air return vents can impact your indoor air quality.
3. **Building pressure:** If a building has negative air pressure, smoky air can rush inside every time someone uses a door. It can also enter via cracks around doors and windows. Positive pressure is maintained by bringing in outside air via the HVAC system and (hopefully) filtering it before ushering it into occupied spaces.
4. **Door use:** Commercial buildings, especially those open to the public, can see a lot of door use. Uncontrolled door opening combined with negative pressure can mean a lot more smoke coming inside.
5. **Filters (again):** If your HVAC filter is used up and super dirty, air will go around the filter and you just have dirty air going straight into the building. If you have gaps around the filter because it's a.) too large and you jam it in anyway creating buckles and folds, or b.) too small and rattles around, dirty air will go through those gaps and into the building.

As a note, the air inside a commercial building will usually be better than unfiltered outdoor air. However, "better" is not always "good." When we measured indoor air in commercial buildings, smoke reduction inside versus outside ranged from 22-70%, and most had less than a 40% smoke reduction. That's not great. Fortunately, in 2021, ASHRAE, the authoritative voice on all things HVAC, developed a framework for commercial building operators to help them navigate wildfire smoke season. The full document is available here: <https://www.montanawildfiresmoke.org/commercial-spaces.html>

Here are some basic tips from the framework to get you started:

1. Purchase smoke preparation supplies such as portable air cleaners and extra filters.
2. Evaluate the ability of the HVAC System to handle a higher efficiency filter, like MERV 13 or higher.
3. Conduct a full maintenance check on the HVAC system and make repairs if needed.
4. Assess and maintain adequate air flows to protect occupant health and equipment during smoke events.
5. Prepare to add supplemental filtration at the intake air vent where possible.

6. Assess filter conditions by adding a port or pressure gauge to measure the filter pressure drop on at least one air- handling unit.
7. Weatherize the building to limit smoke intrusion. Consider measures such as limiting allowable entrances to reduce smoke entry.
8. Prepare to monitor indoor fine particulate matter (PM2.5) by purchasing one or more low-cost air sensors designed to measure the pollutant. These low-cost sensors can show trends in PM2.5 levels.
9. Determine how to create temporary cleaner air spaces within the building.
10. Reduce sources of indoor PM2.5 such as cooking, vacuum cleaning, use of printers or copiers and smoking.

With a little preparation, commercial spaces can offer their occupants cleaner indoor air!