# Schools as Cleaner Air and Cooling Centers

## Tips for Facilities Managers

Communities are facing the impacts of climate change, including severe health consequences from heat waves and wildfires. EPA launched a pilot project in 2021 called Schools as Community Cleaner Air and Cooling Centers to address the combined hazards of extreme heat and wildfire smoke with a focus on spaces that serve children. The goals of this project are to support practical strategies for safeguarding children in schools during heat and smoke events.

Well-operated buildings play a critical role in protecting students from the harmful impacts of heat and smoke. Facilities managers can be champions for practical smoke and heat mitigation strategies, including upgrades to filtration and cooling systems, that can keep kids and staff safe during the school day. Facilities managers can also conduct building-wide vulnerability assessments and highlight deficiencies and vulnerabilities to appropriate decisionmakers. Facilities managers are encouraged to connect with district leadership, staff, and teachers to understand any changes in practice and to get feedback on conditions in different spaces during different times of the day. This fact sheet can help you take the first steps toward upgrading school facilities for extreme heat and wildfire smoke mitigation.

### HEALTHY LEARNING ENVIRONMENTS BENEFIT SCHOOL SYSTEMS

Facilities managers play a crucial role in addressing environmental challenges for the school community. Creating a safe, clean-air environment in schools is vital for children, especially for children with additional health vulnerabilities or in places with more persistent or extreme climate risks. Extreme heat events, wildfire smoke, and viruses like COVID-19 are all hazards to the students, faculty, and staff of the school system. Facilities managers can help reduce the impact of these hazards by ensuring that the facilities' HVAC system(s) are properly maintained and able to maintain thermal comfort and indoor air quality during heat waves, wildfires, and periods of increased cases of infectious disease. Plus, improvements to a building and its HVAC systems can not only ensure the health and safety of building occupants during these events but can also provide a number of health and energy benefits throughout the year.

Generally, facilities managers should prioritize efficient ventilation, air filtration systems, and preventive measures such as reducing light levels, checking building envelope integrity, maintaining air conditioning units, and using window coverings to minimize heat gain.

During smoke events, efforts should focus on preventing outside smoke from entering the building, including sealing cracks and openings, and maintaining a positively pressurized environment. Efforts should also include enhanced filtration to reduce levels of smoke and particles indoors, including by upgrading furnace filters. Portable air cleaners can also be used, such as in areas not served by the building's HVAC system and in areas with a higher density of occupants. Transportation logistics and ensuring parental support during such events pose significant challenges for school systems and emergency management teams. Include these details in the facility's emergency management plan to be prepared.

Outside of the school community, low-income residents and seniors can be particularly vulnerable to heat and smoke events, especially if they live in homes with inadequate air filtration, cooling equipment, or insulation from smoke intrusion. In some communities, schools serve as a cleaner air and cooling center for members of the public, especially in vulnerable communities. Understanding the capacity of the filtration and cooling systems will help the facility managers prepare the building, or portions of the building, to serve this extended community during a heat or smoke event.

Portable air cleaners can be employed within classrooms or other critical spaces. Please see EPA's page on air cleaners and air filters for more information.

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## OPERATIONS AND MAINTENANCE CONSIDERATIONS

For facilities that do not have HVAC systems, passive strategies can help mitigate the effects of heat and smoke. During a heat wave, take steps to reduce the solar heat gain of the building: provide shading or cover windows, make sure that windows and doors are well-sealed, and reduce the buildings' power output. For smoke events, ensure that the building is well-sealed to prevent smoke from seeping into the building. Provide a portable filtration unit if no building HVAC systems exists.

For facilities that have HVAC systems, facilities managers should do proactive maintenance before a heat wave to ensure the system is well maintained and do continual diagnostic/maintenance during the event. Conduct regular maintenance including inspection and cleaning of HVAC coils, replacing or cleaning air filters, and maintaining fan motors.

Higher-efficiency filters are recommended (MERV-13 minimum, or as high as the system allows), not only during smoke events, but year-round to provide public health and indoor air quality benefits. In addition, determine if the outside air inlet at the HVAC system can be retrofitted to install carbon filters. A positively pressurized building is effective in keeping smoke out of the building. As such, ensuring that the building's exhaust airflows are balanced with the ventilation airflows is crucial to ensure smoke does not seep into the building from cracks in the exterior.

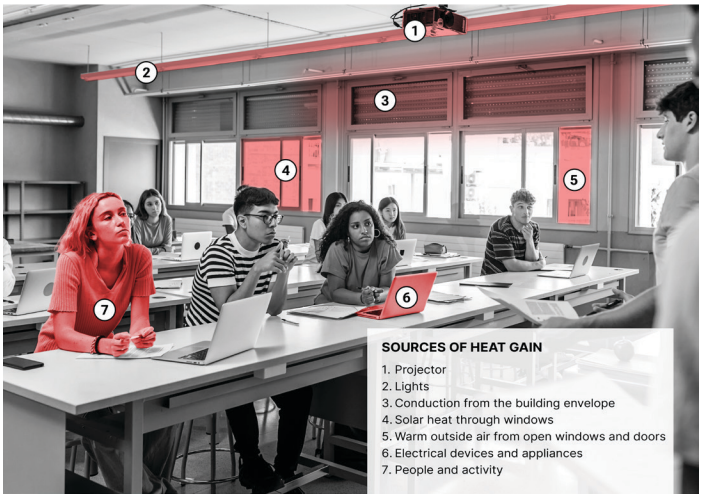


*Figure 1: Sources of heat within a typical classroom*

## DESIGN CONDITIONS OVERVIEW

Figure 4 provides summarized recommendations for preparing classroom environments for various events, including SARS-CoV-2 and some other viral airborne illnesses (e.g., influenza), smoke, heat waves, and combined heat and smoke events. For SARS-COV-2, using higher efficiency filters minimum MERV-13 and increasing ventilation rates are recommended. When setting a ventilation rate, follow CDC recommendations as everyday post pandemic best practices. For more specific information on setting a ventilation rate during pandemic conditions, please see ASHRAE 241. Additionally, enhanced air cleaning systems such as UV irradiation systems can be considered. However, note that enhanced air cleaning technologies may be new/emerging and are therefore understudied and not recommended at this time (such as bipolar ionization).

During smoke events, employing higher efficiency filters (minimum MERV-13), while maintaining proper ventilation rates (avoid closing outside air dampers completely), and using carbon filters to remove smoke odors are recommended. In heat waves, it is important to check and maintain HVAC systems, employ passive strategies to reduce cooling demand, and ensure rooftop surfaces where equipment is located are white to mitigate heat islanding.

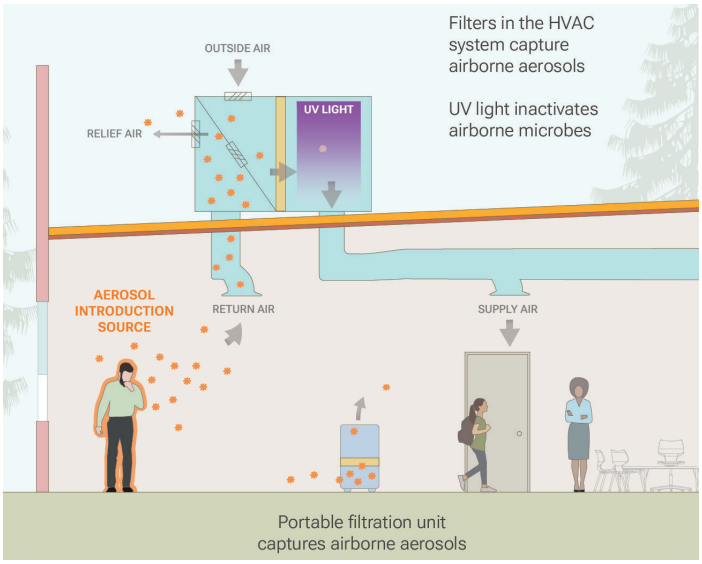


*Figure 2: Sources of airborne aerosols and their infiltration*

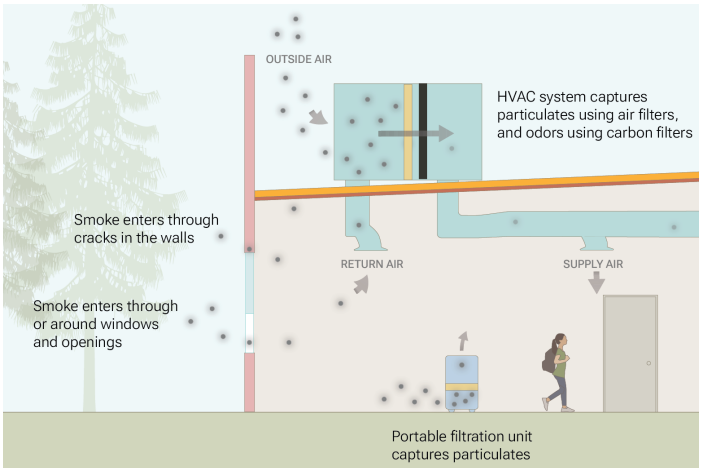


*Figure 3: Sources of smoke inflitration during a smoke event*

**CONTACT:** EPAchildren@epa.gov

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## DESIGN CONDITION MATRIX

| | SARS-COV-2[1] | SMOKE (WILDFIRES)[1] | HEAT WAVES[1] | HEAT AND SMOKE[1] |
|---|---|---|---|---|
| **PM 2.5/PM 10 Filtration[2]** | MERV 13 filters or as high as your HVAC can handle. Consult with a professional as needed. | MERV 13 filters or as high as your HVAC can handle. Consult with a professional as needed. | Code minimum MERV 13 filters recommended for increased air quality. | MERV 13 filters or as high as your HVAC can handle. Consult with a professional as needed. |
| **Enhanced Air Scrubbing[2]** | Ultraviolet light (optional) | Carbon filters to address smoke odors. | N/A | Carbon filters to address smoke odors. |
| **Ventilation** | Follow CDC recommendations as everyday post pandemic best practices.<br><br>For more specific information on setting a ventilation rate during pandemic conditions please see ASHRAE 241. | Ventilation with unfiltered outdoor air is not recommended during a smoke event. Close doors and windows. Building envelope should be monitored to limit smoke from seeping in through doors, windows, and vents. Prepare to add supplemental filtration at the intake air vent, where possible. See EPA guidance for more info. | Use either conditional outdoor air, if possible, otherwise attempt to supply equivalent ventilation in the form of enhanced filtration (MERV 13 or greater) and/or supplemental air cleaner. | Follow guidance in previous two boxes. |
| **Cooling Capacity** | Increased capacity to address increased ventilation. | N/A | Meet increased cooling requirements via mechanical and passive cooling solutions. | Meet increased cooling requirements via mechanical and passive cooling solutions. |
| **Heating Capacity** | Increased capacity to address increased ventilation. | N/A | N/A | N/A |
| **Fan Performance** | Improve fan performance to overcome increased filtration pressure drop. | Improve fan performance to overcome increased filtration pressure drop. | Improve fan performance to achieve max supply design airflow. | Improve fan performance to overcome increased filtration pressure drop & achieve max supply design airflow. |
| **Max Temperature Equipment Concerns** | N/A | N/A | Confirm with equipment manufacturers for max operating temperature limitations. 125F is a common limit, however, it is not a universal limitation and manufacturers should be consulted. | Confirm with equipment manufacturers for max operating temperature limitations. 125F is a common limit, however, it is not a universal limitation and manufacturers should be consulted. |
| **Building Pressurization** | N/A | Positive | N/A | Positive |
| **Portable Filtration Units** | Portable filtration units provide benefit. | In addition to HVAC filter improvements (see above), provide supplemental air cleaning with portable filtration units, including in areas not served by an HVAC system or with a higher density of building occupants. | N/A | In addition to HVAC filter improvements (see above), provide supplemental air cleaning with portable filtration units, including in areas not served by an HVAC system or with a higher density of building occupants. |
| **Additional Notes** | Health protocols such as social distancing, mask use, cleaning surfaces, etc. that extend beyond HVAC should be deployed. Refer to your local health agency and the Center for Disease Control for additional guidance. | Monitor indoor air quality in a representative space. Consider mask use should poor air quality persist after exhausting applicable HVAC modifications. Repairs to the building envelope and keeping doors and windows shut will also reduce smoke entrainment. | Repairs to the building envelope and keeping doors and windows shut will also reduce heat entrainment.<br><br>Cover windows with shades or drapes to limit solar heat gain. If the air outside is hotter than the air inside, close windows. If outside air is cooler, open windows. | Follow guidance in previous two boxes. |
| **NOTES** | 1: Strategies for SARS-CoV2 should be considered for all design conditions as a post pandemic best practice.<br>2: Refer to Pages 15-17 of the *ASHRAE Planning Framework for Protecting Commercial Building Occupants from Smoke During Wildfire Events* (https://www.ashrae.org/File%20Library/Technical%20Resources/COVID-19/Planning-Framework-for-Protecting-Commercial-Building-Occupants-from-Smoke-During-Wildfire-Events.pdf) for adding additional filters and pressure drop to existing fan systems.<br>3: For latest guidance on equivalent air changes, refer to *ASHRAE Standard 241 – Control of Infectious Aerosols* (https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards)<br>CDC and ASHRAE guidance may not always align. It is up to the facility manager to decide what is best for their facility. | | | |

*Figure 4: Design Condition Matrix Overview by System.*

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