

STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC HEALTH

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Guidance for School Systems for the Operation of Central and non-Central Ventilation Systems during the COVID-19 Pandemic

Improving ventilation in school buildings is just one part of system of procedures that will safeguard the health and safety of students, teachers, and school staff during the COVID-19 pandemic. Other parts of this system of procedures include physical distancing, face coverings, and efficient identification and isolation of sick students and staff. While improving ventilation is not necessarily the most effective tool for reducing transmission of the virus that causes COVID-19 (maintaining social distancing and wearing face coverings are far more effective), some studies suggest that adjustments and attention to proper ventilation can reduce the viable virus load in indoor spaces. In addition, we know that providing good ventilation in schools is important even outside of the COVID-19 pandemic, because it has been shown to improve student and staff performance in educational settings.

This guidance provides actions schools should take to ensure that their ventilation systems are performing optimally. The goal is not for schools to invest in costly upgrades and add-ons to existing mechanical systems. Rather, schools should understand what their current mechanical systems are capable of and how they can adjust the function of those systems to optimize their capabilities.

Before School Opens:

1. Commission building mechanical systems for full occupancy (see details below for tips about how and why to commission mechanical systems for fall start-up).
2. Operate all ventilation systems at full capacity for one (1) week prior to the reopening of school buildings.
3. Discuss with the entire facilities team and school administrators the general principles about what changes are planned to the usual ventilation system operation for the coming year. It will be important to communicate with school staff the importance of not making any adjustments to the mechanical systems inside school buildings (thermostats, fan speeds, etc.) without input from the facilities team.

After School Opens:

1. Flush the air inside the building for a minimum of two (2) hours prior to occupancy and one (1) hour after occupancy (after the night-shift custodians leave), with the dampers open as fully as possible (i.e. to maximize fresh air intake) during this flushing period.
2. Program and lock fan schedules to align with the building occupancy schedule (i.e. provide flushing ventilation starting two (2) hours before building occupancy and one (1) hour post occupancy).
3. Develop a system for building users to notify the facilities department if the building needs to be open longer than usual so that the fan schedule can be altered for that day.
4. Keep the ventilation system running during all hours that the building is occupied.
5. Do not allow teachers or other staff to make changes to ventilation system controls in their respective rooms. Explain to them the importance of keeping fans running all day. If temperature, noise, or other issues exist in certain areas, encourage staff to discuss the problem with the facilities department to try to identify a suitable fix that does not negatively impact ventilation.
6. Keep bathroom exhaust systems running all day, every day (24 hours a day/7 days a week).
7. For isolation rooms to be used for holding sick students prior to dismissal, consider adding supplemental filtration, such as a portable air cleaner. This is particularly important if the ventilation serving those rooms cannot be run at 100% exhaust at all times. If a portable air cleaner is used, it should:
 - Contain HEPA filters only without ionizers, ozone generators, UV light, or other add-ons.
 - Be correctly sized for the space, with an appropriate CADR (clean air delivery rate).
 - Be located for greatest efficiency within the space.
 - Be turned on at all times that the space is occupied.
8. Develop a specific plan for performing routine inspections and maintenance of mechanical systems, as specified in the commissioning process.
9. For buildings without central ventilation systems or with certain areas not served by the central ventilation system, there are other important design considerations facility managers should be aware of, and in control of, in order to maximize available dilution ventilation and minimize the spread of virus particles inside their facilities.

- At a minimum, where temperature allows and no other means of ventilation is available, windows should be opened to allow for some minimum level of fresh air exchange into occupied spaces.
- Window air conditioning units should be adjusted to maximize fresh air intake into the system. Air conditioner blower fans should be set on low speed and pointed away from room occupants to the extent possible.
- Ceiling fans should be adjusted so that fins are rotating in a direction that draws air up toward the ceiling rather than down onto occupants.
- Window fans should be turned to exhaust air out of the window in the direction of the outdoors. Ensure that fans are not blowing out of windows directly into walking paths or areas where individuals may congregate.
- Window fans that blow air into a room or free-standing fans that only serve to circulate existing air around a room should not be used.
- In addition, we do not recommend separate, free-standing air cleaner or HEPA filter units for individual classrooms. These units are highly variable in their effectiveness in larger open spaces such as classrooms and in general, any effect on indoor air quality is likely insignificant and greatly outweighed by the additional costs to school systems.

How to Commission Building Mechanical Systems for fall school reopening

1. If your school system does not already have one that it routinely works with, hire a mechanical engineering firm with a proven track record in evaluating, adjusting, and balancing ventilation systems, particularly ventilation systems in school buildings, to commission all of the buildings' mechanical systems for full occupancy. The school facilities manager should be part of the discussion team talking with the engineering firm and the commissioning agent.

Consider asking your Commissioning Agent the following questions:

- How many and what types of systems serve your buildings, and which area of the building does each separate system serve?
- What are the capabilities of the systems present in your school buildings?
- Are the systems currently working to their full capabilities?
- Are the current systems' capabilities enough to satisfy full capacity for how the buildings need to operate now?
- Can demand-based systems be converted to constant volume until cooling season is over (if systems provide central cooling)? During heating season? Longer-term?

- Can recirculation of air be suspended (economizers disabled)?
 - Can they provide a summary of performance expectations for mechanical systems in the building?
2. Include the following items in the commissioning process:
- A complete set of measurements to understand total air distribution throughout the building.
 - Inspection and evaluation of all building ventilation systems, both automated and manual.
 - Air balancing and appropriate retesting to ensure parameters that satisfy the conditions of full occupancy of the buildings.
 - Inspections:
 - Filter frames - Decide what kind of filter thickness and type you will be using if you decide to upgrade to a higher-rated filter. Discuss this with your ventilation engineering firm. Either way, all filter frames will need to be inspected. Replace or fix all bent, broken, misshapen frames to prevent air from by-passing the filter.
 - Dampers and all associated controllers and actuators need to be visually inspected. Do not rely only on looking at a computer screen if you have an automated building system.
 - Inspect, verify, and modify automated set points, if needed. Discuss both temperature and CO₂ set points in newer buildings that utilize these variables for automated decision-making.
 - Locations of supply and return diffusers. Look at ventilation effectiveness and whether short-circuiting is occurring. This happens frequently when supply and return diffusers are too close to each other. Discuss the possibility of moving them farther apart if this is occurring. If supplies and returns are ducted using flex duct and the room has a suspended ceiling, relocating can be performed more easily.
 - Air balancing, inspections, and other work should be performed in accordance with one of these certification bodies: [NEBB \(https://www.nebb.org/\)](https://www.nebb.org/); [TABB \(https://www.tabbcertified.org/\)](https://www.tabbcertified.org/); [AABC \(https://www.aabc.com/\)](https://www.aabc.com/)
3. Strive toward the following ventilation goals.
- Increase outdoor air ventilation as much as possible by disabling demand-controlled ventilation systems and opening outdoor air dampers to 100%, as indoor and outdoor conditions permit. Disabling demand-based systems will allow fans to run continuously.
 - Tune ventilation systems to enable them to perform to the maximum capacity consistent with full occupancy conditions for the building.

- Bypass energy recovery ventilation systems that leak or recirculate potentially contaminated exhaust air back into the outdoor air supply.
- Once fans are running continuously, provide increased particle capture by increasing air filtering capacity through repair/upgrades to current system, where needed. This includes filter frames, filter configuration, and filter rating (ASHRAE recommends striving for filters with a MERV-13 rating where possible).

Why it is Important to Commission Building Mechanical Systems

1. Commissioning verifies that existing equipment is working properly. Adjustments can then be made to allow current systems to operate to the best of their ability.
2. Adjusting mechanical systems to satisfy full building occupancy, even if buildings will have reduced occupancy in the fall, will result in increased ventilation per person without over-taxing the equipment and potentially causing premature equipment failure.
3. Commissioning reduces the likelihood of unintended consequences of making changes to how systems operate.
4. If one or more of the systems are deemed to be inadequate, commissioning will provide the basis for making informed and intelligent decisions about next steps to improve those systems.
5. The cost for commissioning is money well spent because it will prevent building operators from spending money on things that add little value and instead, help them focus attention on things that will make a real difference.

Additional resources:

- AICARR- Decision Tree: [Protocol for risk reduction of SARS-CoV2-19 Diffusion With the Aid of Existing Air Conditioning and Ventilation Systems](#)
- [Air filtration and COVID-19: Indoor air quality expert explains how to keep you and your building safe: Interview with Professor Jeffrey Seigel, University of Toronto](#)
- [The Path to COVID-19 Recovery: How To Improve Indoor Air Quality When Re- Opening K-12 Schools.](#) Univ Calif Davis.



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