



SAFER SCHOOLS AND CAMPUSES
**BEST PRACTICES
CLEARINGHOUSE**

- Lessons from the Field -

***Indoor Air Quality and Ventilation in America's K-12
Schools: Guidance and Strategies for Improved
Results***

JUNE 30, 2021



NCSSLE Website

[HTTPS://SAFESUPPORTIVELEARNING.ED.GOV](https://safesupportivelearning.ed.gov)

The screenshot shows the homepage of the National Center on Safe Supportive Learning Environments (NCSSLE). At the top, there is a navigation bar with a search function and social media links. Below the navigation bar, the main header includes the organization's name and a list of topics: School Climate Improvement, Engagement Topics, Safety Topics, Environment Topics, Events, Products, and TA, and States and Grantees. A featured event banner is prominently displayed, titled "Strategies for Supporting College and University Students Holistically and Safely: CDC Guidance and Best Practices", scheduled for June 09, 2021, at 03:00pm EDT. Below the event banner, there is a video player with the caption "Get Strategies for Safe Operation and Addressing the Impact of COVID-19 on Higher Education Students, Faculty and Staff". A "Welcome!" message follows, stating that NCSSLE offers information and technical assistance to various educational entities. A "More About Us" button is located at the bottom of the welcome message.

A horizontal grid of five resource icons with corresponding text labels below them:

- School Climate Improvement Resource Package**: Icon showing four colorful arrows pointing towards the center.
- ED School Climate Surveys**: Icon showing a clipboard with a checklist and a red pencil.
- Trauma-Sensitive Schools Training Package**: Icon showing a stylized tree with green and orange leaves.
- Building Student Resilience Toolkit**: Icon showing two stylized figures, one larger than the other, with a cloud above them.
- Human Trafficking in America's Schools**: Icon showing three stylized human figures in silhouette.

A horizontal grid of four resource icons with corresponding text labels below them:

- Improving Higher Education Learning Environment**: Icon showing a purple classical building with columns.
- Supporting Trauma Recovery**: Icon showing two stylized human figures, one green and one orange, with a hand holding the other.
- Promoting Mental Health**: Icon showing a green profile of a human head with a brain and a heart inside.
- Responding to Covid-19**: Icon showing a green circular virus-like structure with orange dots.

To access information and archived materials from previous Lessons from the Field webinars, go to: <https://safesupportivelearning.ed.gov/lessons-field-webinar-series>



Logistics

Zoom Control Panel

Audio Settings ^



Chat



Raise Hand



Q&A

Leave Meeting

Technical Issues

For assistance during the webinar, please contact Shoshana Rabinovsky at srabinovsky@air.org.

This webinar is being recorded and will be archived at the following location:

<https://safesupportivelearning.ed.gov/events/webinar/lessons-field-indoor-air-quality-and-ventilation-america%E2%80%99s-k-12-schools-guidance-and>



The content of this presentation does not necessarily represent the policy or views of the U.S. Department of Education, nor does it imply endorsement by the U.S. Department of Education.



Initial Polling Questions

1. Do you work in:

- Administration
- Building & Grounds
- Capital Projects
- Facilities & Maintenance
- Safety/Security
- Other (Please specify in the chat.)

2. Do you represent:

- School
- Local education agency
- State education agency
- Community
- Contractor
- Other (Please specify in the chat.)

3. How well do you feel your indoor air quality program is functioning?

- Excellent
- Good
- Average
- Fair
- Poor
- Not applicable



Agenda

- 1 Introduction and Logistics
- 2 Elementary and Secondary School Emergency Relief (ESSER) Program: Use of Funds FAQs
Improving Ventilation (ED)
- 3 Ventilation in Buildings During the COVID-19 Pandemic (CDC)
- 4 Indoor Air Quality and Ventilation in America's K-12 Schools: Guidance and Strategies for Improved
Results (EPA)
- 5 Panel Discussion
- 6 Wrap Up & Closing



Speakers



Ruth Ryder

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Education Program
Specialist, Office of State
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Department of Education



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Assistant Director of
Facility Services, Salt
Lake City School
District, UT

Bios for the speakers are archived at the following location:

<https://safesupportivelearning.ed.gov/events/webinar/lessons-field-indoor-air-quality-and-ventilation-america%E2%80%99s-k-12-schools-guidance-and>

Elementary and Secondary School Emergency Relief (ESSER) Program

Use of Funds FAQs Improving Ventilation

June 30, 2021



Background

- References to “ESSER” in this presentation includes ESSER I under the CARES Act, ESSER II under the CRRSA Act, and ARP ESSER.
- As noted in the *ESSER and GEER Use of Funds FAQs* issued on May 26, 2021, GEER funds can be used for the same activities as ESSER.

The Use of Funds FAQs can be accessed here:

https://oese.ed.gov/files/2021/05/ESSER.GEER_FAQs_5.26.21_745AM_FINALbocd6833f6f46e03ba2d97d30aff953260028045f9ef3b18ea602db4b32b1d99.pdf



ESSER Authorized Use of Funds

With regard to ventilation systems, the authorizing statutes allow ESSER funds to be used for:

- School facility repairs and improvements to enable schools to reduce the risk of virus transmission and exposure to environmental health hazards, and to support student health needs
- Inspection, testing, maintenance, repair, replacement, and upgrade projects to improve the indoor air quality in school facilities, including mechanical and non-mechanical heating, ventilation, and air conditioning systems, filtering, purification and other air cleaning, fans, control systems, and window and door repair and replacement



Considerations

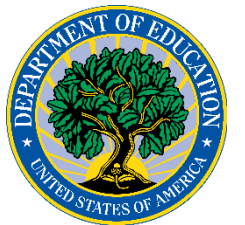
- **Before using ESSER or GEER funds for construction activities, including new construction, remodeling, alterations, or renovations, LEAs should consult questions B-6 and B-7 in the ESSER and GEER Use of Funds FAQs.**
- **FAQs B-6 and B-7 highlight the Federal requirements that apply when undertaking such projects with Federal education funds, including :**
 - Cost principles in 2 CFR Part 200, subpart E
 - Prior approval requirements
 - Davis Bacon prevailing wage requirements and
 - Department's applicable regulations regarding construction at 34 CFR §§ 76.600 and 75.600-75.618.



Process for Prior Approval

Does the Department determine the process that States must use for granting prior approval to their LEAs for capital expenditures?

- No. The process an SEA uses for granting prior approval to an LEA to use ESSER funds for capital expenditures (including HVAC projects) such as minor remodeling, renovation, or construction is left to the discretion of the SEA. Neither the Department nor the Uniform Guidance specifies the process that must be used.
- An SEA has the flexibility to establish its own reasonable process that ensures that the expenditures meet the applicable statutory and regulatory requirements, including those in Subpart E of the Uniform Guidance (2 CFR Part 200).



Process for Prior Approval

Does the Department determine the process that States must use for granting prior approval to their LEAs for capital expenditures? *(continued)*

- For example, an SEA could:
 - Use or modify the current procedures that it already uses for prior approval categories for other Federal programs under the Uniform Guidance.
 - Consider getting a building expert (engineer, inspector, architect) who knows applicable State, local, and Federal requirements to assist with its review of prior approval requests. The expert could be acquired on a limited basis through procurement or perhaps an interagency agreement with another State agency, such as a Public Works office or another agency with authority over facilities.
 - Consult with other States that have facilities programs for suggestions on how to implement an efficient process for prior approvals for facilities expenditures.



(continued on next page)

Process for Prior Approval

Does the Department determine the process that States must use for granting prior approval to their LEAs for capital expenditures? *(continued)*

For example, an SEA could:

- Develop a checklist of items that an LEA seeking prior approval should provide. This could include:
 - The name of the school facility the LEA is proposing to repair, construct, or modernize.
 - The identification of the LEA's interest in, or authority over, the school facility involved, such as an ownership interest or a lease arrangement.
 - Sources and amounts of funds available for the proposed project.
 - A statement signed by an appropriate independent local official that: (1) the renovation or construction project meets the applicable Federal, State, or local requirements with respect to health and safety, environmental standards, Historic Preservation, and other requirements (see FAQ B-6 and 34 CFR Part 75) and (2) any deficiency that requires renovation or construction is necessary (e.g., because it threatens the health and safety of occupants of the facility or prevents the use of the facility). An appropriate local official may include a local building inspector, a licensed architect, or a licensed structural engineer.
 - A description of the need for funds as related to COVID-19 including a cost estimate and other details needed to support the reasonableness and allowability of the expenditure under the applicable statute ARP Act and cost principles in the Uniform Guidance (e.g., the original construction date and the dates and descriptions of any other major renovations of the school facility).
 - Applicable assurances and certifications (see FAQ B-6 for applicable requirements that must be met for any renovation or construction project).



Process for Prior Approval

Does the Department determine the process that States must use for granting prior approval to their LEAs for capital expenditures? *(continued)*

- Please note that some HVAC upgrades may constitute “minor remodeling” and the Department’s applicable regulations regarding construction at 34 CFR §§ 76.600 and 75.600-75.618 would not apply.
- Minor remodeling means minor alterations in a previously completed building, for purposes associated with the coronavirus. The term also includes the extension of utility lines, such as water and electricity, from points beyond the confines of the space in which the minor remodeling is undertaken but within the confines of the previously completed building.
- The term does not include permanent building construction, structural alterations to buildings, building maintenance, or repairs. However, minor remodeling projects that constitute capital assets under the Uniform Guidance still require prior approval consistent with 2 CFR 200.439.



Prior Approval and Bidding

Is SEA prior approval required before LEA bidding is advertised?

- No. SEA prior approval is not required before LEA bidding is advertised under applicable Department requirements.
- The provisions in 34 CFR §§ 75.600-617 are “as applicable” and every provision does not apply to every project. Some have cited 34 CFR § 75.605, which states in relevant part that: “Before construction is advertised or placed on the market for bidding, the grantee shall get approval by the Secretary of the final working drawings and specifications.”
- This provision applies to direct construction projects that require approval from the Department, not those that require approval under the Uniform Guidance from an SEA. Therefore, an LEA ESSER project that an SEA is approving and has been initiated or is already underway should not have to be rebid.



Prior Approval Timeline

When must SEA prior approval occur?

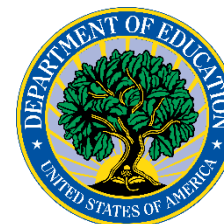
- SEA approval can come at any point in the project timeline until the point that reimbursement using ESSER funds occurs.
- As described in the response to the first question, States have the flexibility to develop or refine their own prior approval processes to ensure that an allowable expenditure is reasonable and necessary and is otherwise in line with program, Uniform Guidance, and other applicable requirements. Ideally the SEA review process is complete as soon as possible on a project's timeline, but a State may utilize this flexibility at any point in the project process.
- This continuum includes up until the point when the Federal funds are actually approved for reimbursement.



Applicability of NEPA

Is NEPA applicable to LEA construction projects funded with ESSER funds?

- No. NEPA is not applicable to LEA construction projects that are funded with ESSER funds.
- 34 CFR § 75.601 requires an applicant to submit an environmental assessment of the impact on the proposed construction that is consistent with relevant provisions of the National Environmental Policy Act (NEPA). This provision only applies to construction projects that are operated and managed by the Department and require direct approval from the Department. Due to the nature of the ESSER funds, the Department does not: have a decision-making role in planning the specific projects, or directly manage the implementation or procurement for LEA projects such as the HVAC projects or have the power to act on any environmental effects revealed by an environmental assessment.



Applicability of NEPA

Is NEPA applicable to LEA construction projects funded with ESSER funds? (continued)

- In addition, the Department does not exercise control over the use of the funds for any individual project, as long as the project continues to meet all statutory and other applicable requirements (such as the Uniform Guidance and the Department’s administrative regulations). As a result, these types of LEA ESSER projects are not considered as a “major Federal action” under the NEPA provisions and are not subject to 34 CFR§ 75.601.
- While NEPA is not applicable, the Department highly encourages States to require some type of environmental assessment for LEA projects that involve breaking new ground such as for expanding the size of an existing facility or replacing an outdated facility. This may already be required by some State laws and is a prudent step that would help to assess any potential environmental ramifications of expanding or replacing school facilities and ensure compliance with any applicable State, local or Federal environmental requirements.



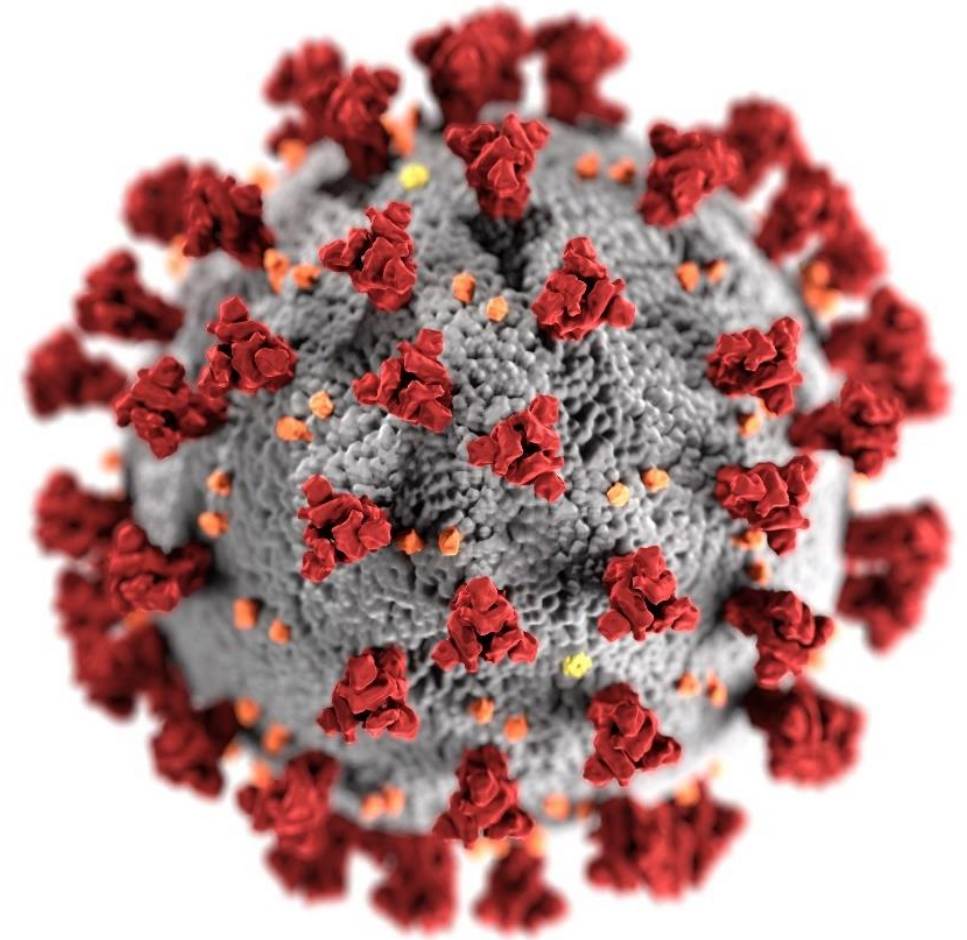
If you have questions that are not addressed in this FAQ document, please send them to your State email box, [STATE].oese@ed.gov



CDC/NIOSH Worker Safety and Health Team (WSH)
Healthcare Systems and Worker Safety (HSWS) Task Force

Ventilation in Buildings During the COVID-19 Pandemic

Kenneth R. Mead, PhD, PE
kmead@cdc.gov



cdc.gov/coronavirus

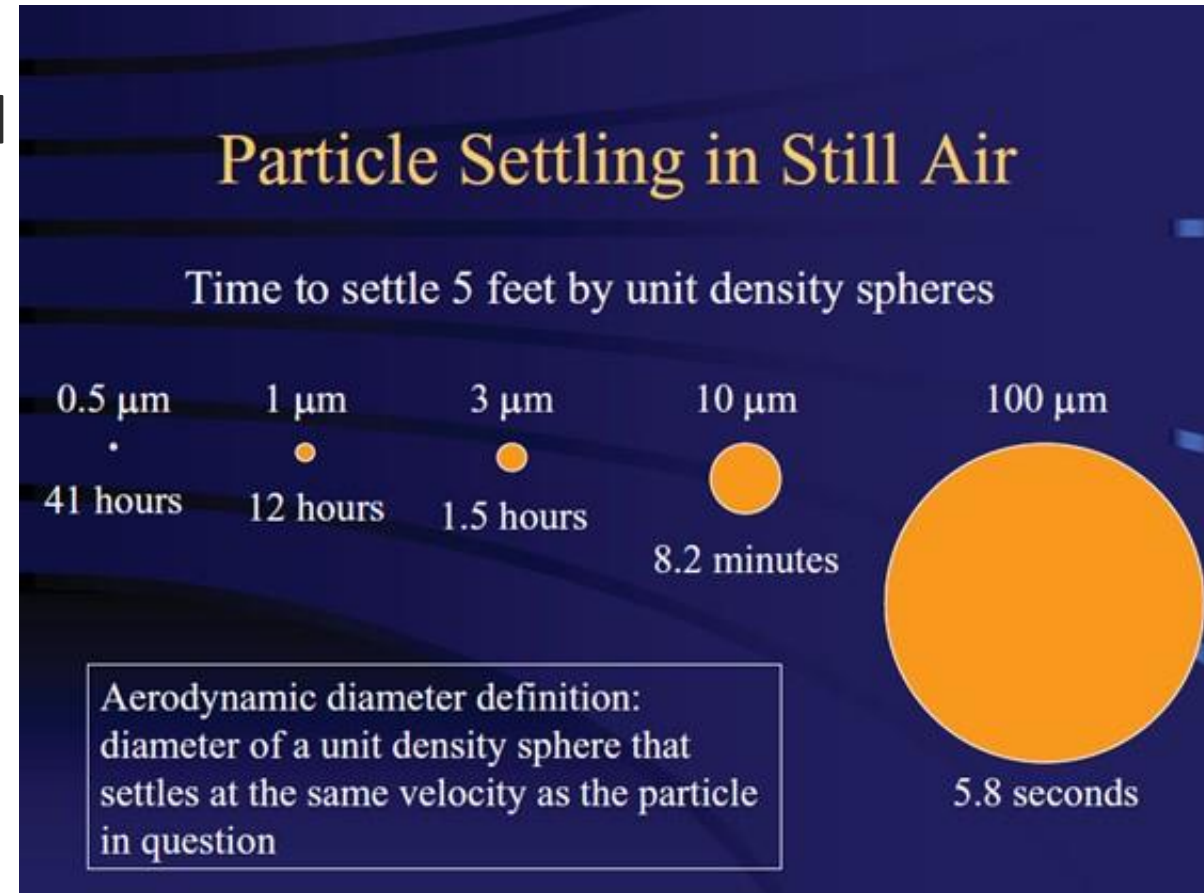
CDC Science Brief on transmission modes (05/07/2021)

- *The principal mode by which people are infected with SARS-CoV-2 (the virus that causes COVID-19) is through exposure to respiratory fluids carrying infectious virus. Exposure occurs in three principal ways:*
 1. *Inhalation of very fine respiratory droplets and aerosol particles.*
 2. *Deposition of respiratory droplets and particles on exposed mucous membranes in the mouth, nose, or eye by direct splashes and sprays.*
 3. *Touching mucous membranes with hands that have been soiled either directly by virus-containing respiratory fluids or indirectly by touching surfaces with virus on them.*
- *The risk of SARS-CoV-2 infection varies according to the amount of virus to which a person is exposed.*
- *Transmission of SARS-CoV-2 from inhalation of virus in the air farther than six feet from an infectious source can occur.*



Do not get distracted by terminology

- Different professions (clinicians, aerosol scientists, engineers, industrial hygienists, microbiologists) do not always use consistent terminology.
- Regardless of the name, if it is small enough to float in air, then ventilation interventions can help prevent its distribution and reduce individual exposure.



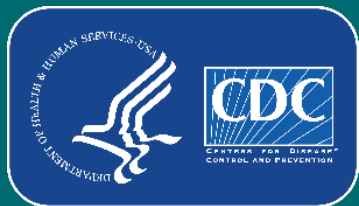
Graphic: https://www.cdc.gov/niosh/topics/aerosols/pdfs/Aerosol_101.pdf

Ventilation in Buildings

Reference: <https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>

Ventilation in Schools and Childcare Programs

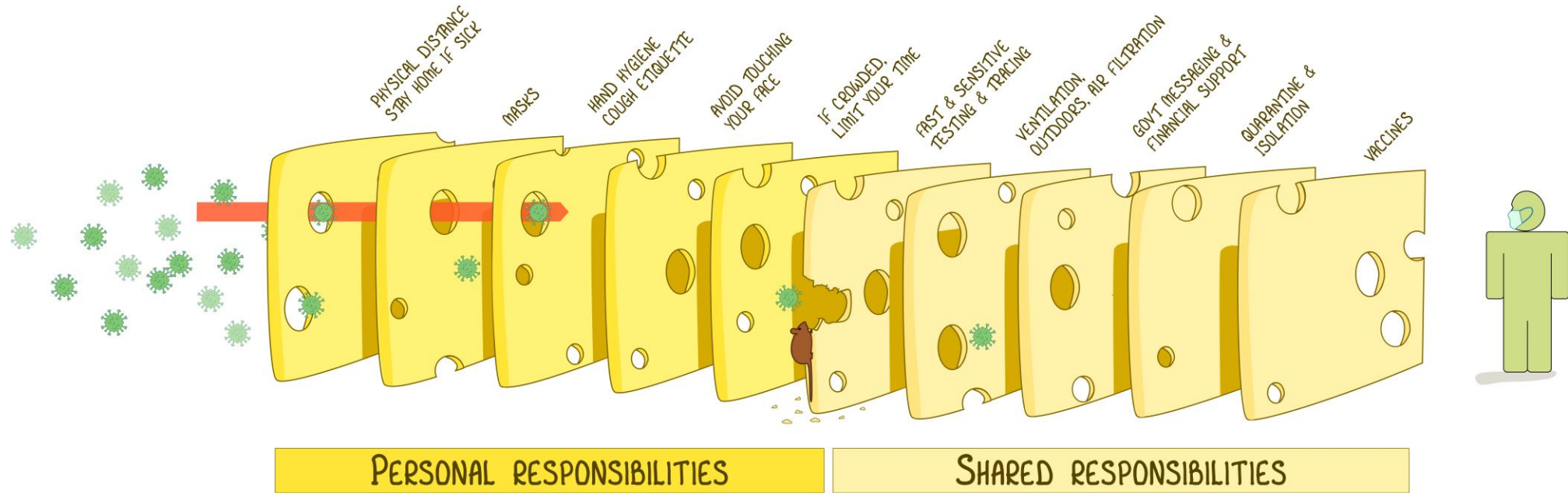
Reference: <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html>



CDC recommends a layered approach to reduce exposures to SARS-CoV-2

THE SWISS CHEESE RESPIRATORY VIRUS PANDEMIC DEFENCE

RECOGNISING THAT NO SINGLE INTERVENTION IS PERFECT AT PREVENTING SPREAD



EACH INTERVENTION (LAYER) HAS IMPERFECTIONS (HOLES).
MULTIPLE LAYERS IMPROVE SUCCESS.

Graphic Credit: Ian W. McKay, virologydownunder.com

Note: The interventions shown are not all-inclusive and are not depicted in any meaningful order.



SARS-CoV-2 viral particles are more readily spread between people indoors than outdoors

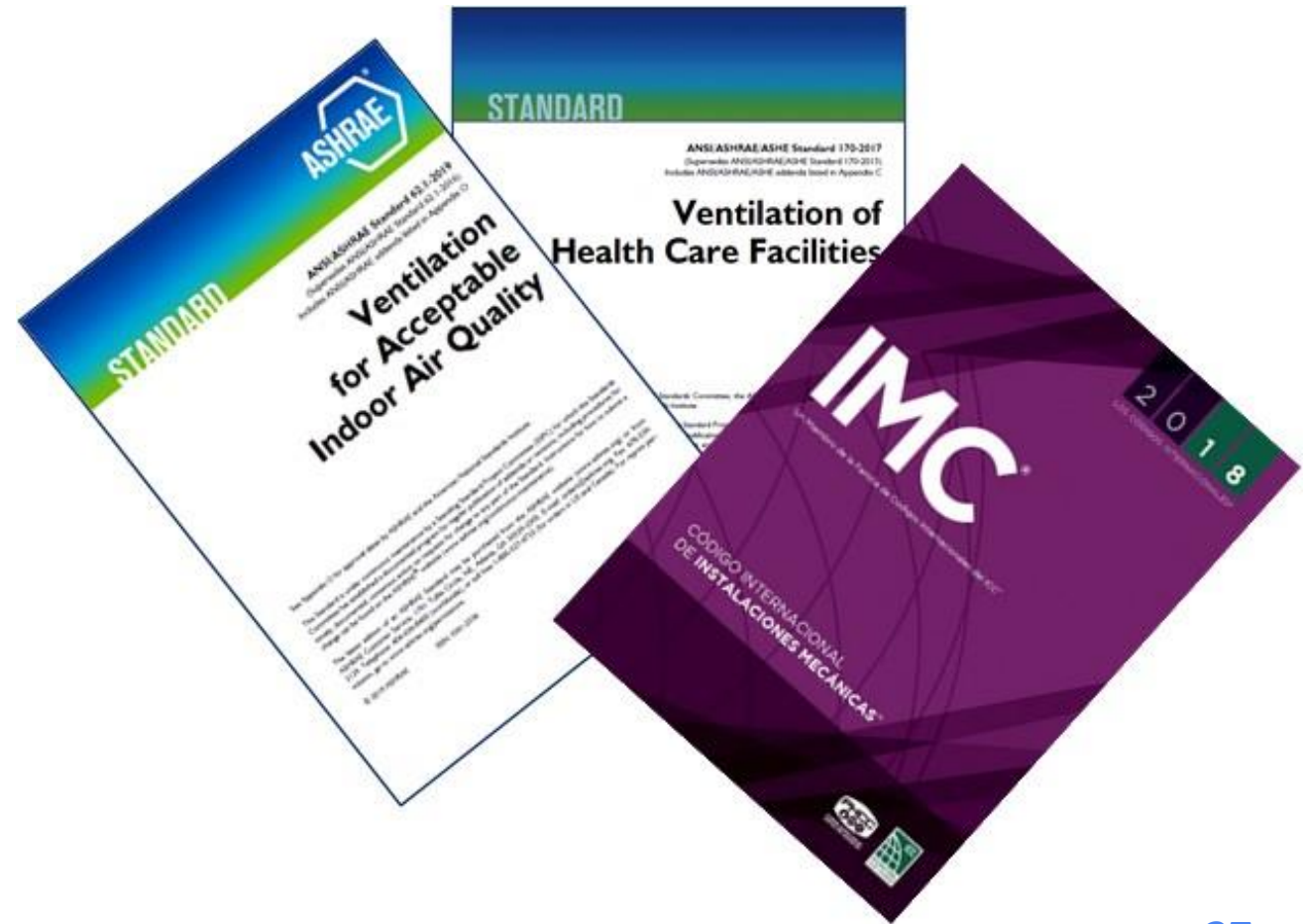
- Outdoors: Even a light 1 mph [88 feet per minute (fpm)] wind can rapidly reduce airborne contaminant concentration.
- Indoors: Protective ventilation practices and interventions can reduce the airborne concentration of the virus and reduce the overall viral dose to occupants.



Graphic: Getty Images

Reoccupying a building during the pandemic

- In most cases, re-occupancy should not require new building ventilation systems.
- Buildings that provided healthy, code-compliant indoor air quality prior to the pandemic can be improved for pandemic occupancy using less costly interventions.



Steps beyond code-compliant minimums

- Ventilation system upgrades or improvements can increase the delivery of clean air and dilute potential contaminants.
 - Consult experienced heating, ventilation, and air conditioning (HVAC) professionals.
 - CDC guidance presents a list of ventilation interventions, “tools in the mitigation toolbox,” that can help reduce the concentration of viral particles in the air.
 - Each tool can contribute towards a reduction in risk.
 - Implementing multiple tools at the same time is consistent with CDC’s layered approach and will increase overall effectiveness.



Steps beyond code-compliant minimums (continued)

- Using these tools can reduce the risk of exposure to the virus and the spread of disease but will not eliminate risk completely.
 - Tools can be universally applied across indoor environments but choosing which tools to apply can be challenging.
 - The specific combination of tools used at any point in time can change.
 - The building owner or operator (with expert consultation as needed) should identify which exposure reduction tools are appropriate for each building throughout the year.
- In addition to buildings, ventilation improvements can be applied to vehicles, including public transportation.



Ventilation FAQs

<https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>

Can COVID-19 be transmitted through HVAC (ventilation) systems? ∨

How long will it take to dilute the concentration of infectious particles in a room once they are generated? ∨

Can ventilation filters effectively capture SARS-CoV-2 viral particles? ∨

What is meant by “directional airflow?” How and where should it be used? ∨

What is a HEPA filter and why use a portable HEPA air cleaner? ∨

Does ultraviolet germicidal irradiation (UVGI) kill SARS-CoV-2? ∨

What types of ultraviolet germicidal irradiation (UVGI) devices are available for cleaning and disinfection in the workplace? ∨

Many new air disinfection devices are marketed for their ability to inactivate SARS-CoV-2. How can I tell if they work as advertised? ∨

Can carbon dioxide (CO₂) monitors be used to indicate when there is good ventilation? ∨

Should indoor temperature and humidity be used to help reduce the risk of COVID-19 transmission? ∨

Can fans be used to decrease the risk of COVID-19 transmission indoors? ∨



Ventilation FAQs

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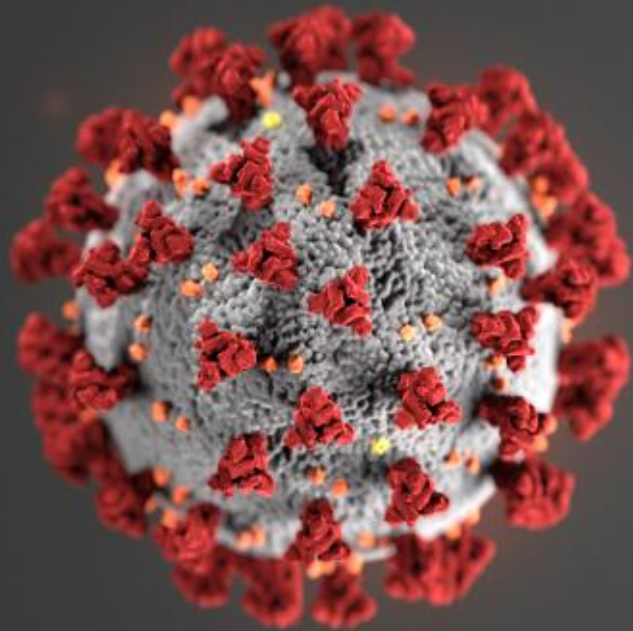


Many new air disinfection devices are marketed for their ability to inactivate SARS-CoV-2. How can I tell if they work as advertised?

As with all emerging technologies, consumers are encouraged to exercise caution and to do their homework. Registration alone, with national or local authorities, does not always imply product efficacy or safety. Consumers should research the technology, attempting to match any specific claims against the intended use of the product. Consumers should request testing data that quantitatively demonstrates a clear protective benefit and occupant safety under conditions consistent with the intended use. When considering air cleaning technologies that potentially or intentionally expose building occupants, the safety data should be applicable to all occupants, including those with health conditions that could be aggravated by the air treatment. In transient spaces, where average exposures to the public may be temporary, it is important to also consider occupational exposures for workers that must spend prolonged periods in the space.

Preferably, the documented performance data under as-used conditions should be available from multiple sources, some of which should be independent, third-party sources. Unsubstantiated claims of performance or limited case studies with only one device in one room and no reference controls should be questioned. At a minimum, when considering the acquisition and use of products with technology that may generate ozone, verify that the equipment meets UL 867 standard certification (Standard for Electrostatic Air Cleaners) for production of acceptable levels of ozone, or preferably UL 2998 standard certification (Environmental Claim Validation Procedure (ECVP) for Zero Ozone Emissions from Air Cleaners) which is intended to validate that no ozone is produced.





For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.





Indoor Air Quality and Ventilation in America's K-12 Schools: Guidance and Strategies for Improved Results

Wednesday, June 30, 2021





Eligible IAQ Activities under the American Rescue Plan

American Rescue Plan Act, Title II U.S.C. § 2001(e)(2) (2021)

(H) Training and professional development for staff of the local educational agency on sanitation and minimizing the spread of infectious diseases.

(I) Purchasing supplies to sanitize and clean the facilities of a local educational agency...

(O) School facility repairs and improvements to enable operation of schools to reduce risk of virus transmission and exposure to environmental health hazards...

(P) Inspection, testing, maintenance, repair, replacement, and upgrade projects to improve the indoor air quality in school facilities, including mechanical and non-mechanical heating, ventilation, and air conditioning systems, filtering, purification and other air cleaning, fans, control systems, and window and door repair and replacement.

(Q) Developing strategies and implementing public health protocols including . . . policies in line with guidance from the Centers for Disease Control and Prevention for the reopening and operation of school facilities to effectively maintain the health and safety of students, educators, and other staff.



Frequently Asked Questions

Elementary and Secondary School Emergency Relief Programs Governor's Emergency Education Relief Programs



Please note that the Environmental Protection Agency (EPA) has a variety of publications that can assist education leaders in improving the indoor air quality in schools. EPA resources on indoor air quality in schools can be accessed at: <https://www.epa.gov/iaq-schools>. The EPA has information available at: <https://www.epa.gov/coronavirus/air-cleaners-hvac-filters-and-coronavirus-covid-19> on some indoor air filtration devices that use bipolar ionization technology, which has the potential to create ozone. EPA states that ozone generators should not be used in occupied spaces. If choosing to use a device that incorporates bipolar ionization technology, EPA recommends using a device that meets UL 2998 standard certification (Environmental Claim Validation Procedure (ECVP) for Zero Ozone Emissions from Air Cleaners) and notes that there are many air cleaning devices that do not use bipolar ionization. In addition, the CDC provides information on improving ventilation in schools at: <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/ventilation.html> and in buildings at: <https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html>.



Newly Released CDC Guidance

COVID-19

ACT NOW!



Your Health

Vaccines

Cases & Data

Work & School

Healthcare Workers

Health Depts

More

Community, Work & School

Vaccination

Health Equity +

Community Mitigation Framework

Cleaning, Disinfecting, & Ventilation -

Cleaning, Disinfecting, and Ventilation

Plan, Prepare, and Respond

Updated Dec. 21, 2020 Languages  Print



Guidance for Cleaning and D

Heating, Ventilation, and Air Conditioning (HVAC)

Items for Assessment	Completed	In-Progress	Not Started	Not Feasible
Has the heating, ventilation, and air conditioning (HVAC) system(s) and/or ventilation equipment in all buildings (both permanent and temporary) been assessed and controls calibrated per manufacturer specification? <i>Note: For detailed checklists for Janitors and Maintenance Staff and HVAC and School Facilities Staff see Appendix A.</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has an HVAC maintenance technician or HVAC professional changed building air ventilation according to CDC and ASHRAE guidance?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has local exhaust ventilation in restrooms and other high occupancy areas been assessed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was ventilation through other means considered when HVAC adjustments were not possible? Portable high-efficiency particulate air (HEPA) fan/filtration systems to help enhance air cleaning can be considered in areas of higher risk such as the nurse's office and isolation rooms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Has ultraviolet germicidal radiation (UVGI) been considered as a supplement to help kill SARS-CoV-2, especially when increasing room ventilation options are limited?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is there a plan to leave windows and doors open to increase air flow from outside? <i>Note: Ensure opening windows and doors does not create safety or health hazards (e.g., exacerbating asthma symptoms or other symptoms of respiratory illness).</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have bus operators been instructed to leave windows open, when doing so does not create a safety or health hazard?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Employ Proven Technologies



COVID-19



WEAR A MASK



STAY 6 FEET APART



AVOID CROWDS



GET A VACCINE



Your Health

Vaccines

Cases & Data

Work & School

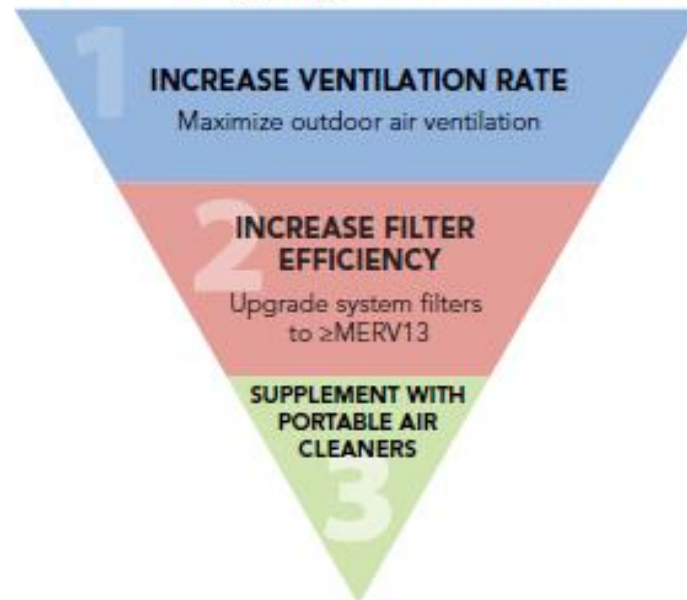
Healthcare Workers

Health Depts

Science

More

Prioritization of Engineering Controls to Reduce Long-Range Airborne Transmission



Ventilation in Schools and Childcare Programs

How to use CDC building recommendations in your setting



Opening windows, using portable air cleaners, and improving building-wide filtration are ways you can increase ventilation in your school or childcare program.

Figure 2. Source: Jones et al., 2020. *Schools for Health: Risk Reduction Strategies for Reopening Schools*. Harvard Healthy Buildings Program.

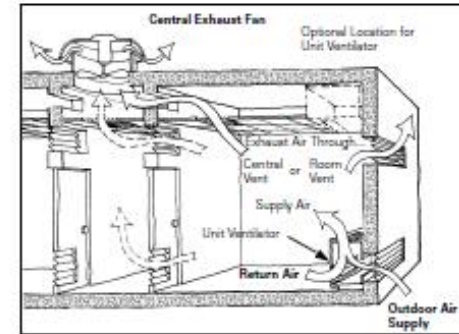


HVAC and Reducing Airborne Transmission

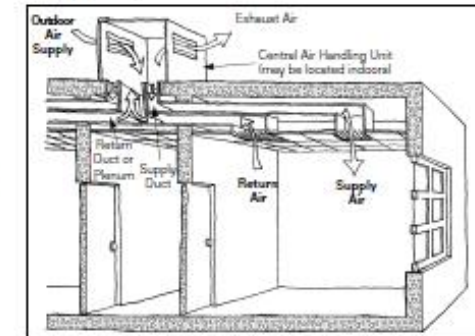


COVID-19 can sometimes be spread by airborne transmission.

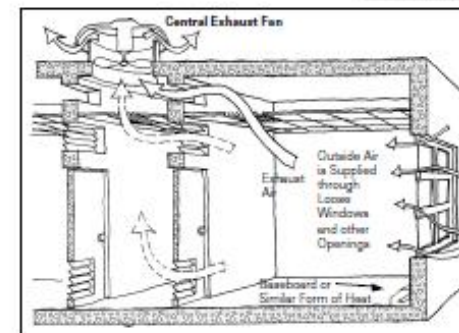
- Some infections can be spread by exposure to virus in small droplets and particles that can linger in the air for minutes to hours. These viruses may be able to infect people who are further than 6 feet away from the person who is infected or after that person has left the space. This kind of spread is referred to as **airborne transmission**.
- There is evidence that under certain conditions, people with COVID-19 seem to have infected others who were more than 6 feet away. These transmissions occurred within enclosed spaces that had **inadequate ventilation**.



Air Supply through a Unit Ventilator



Air Supply in a Central Air Handling System



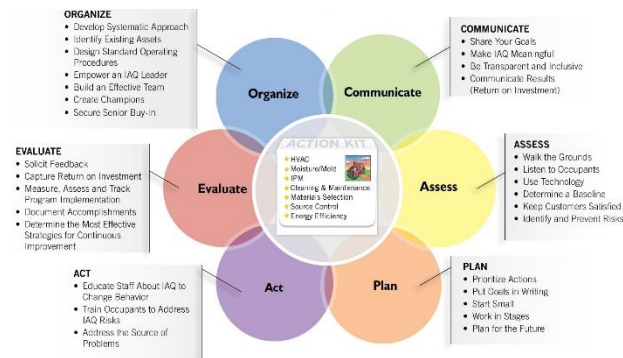
Air Supply in an Exhaust-only System



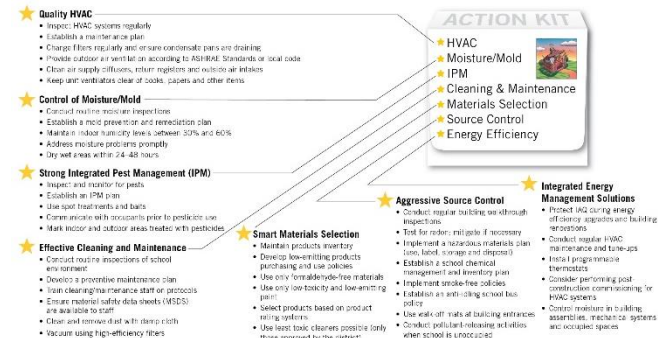
IAQ Tools for Schools Resources



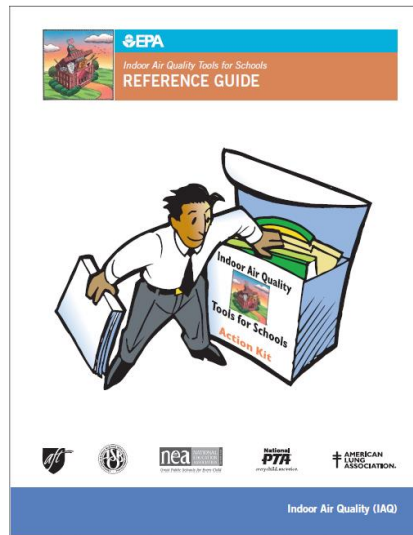
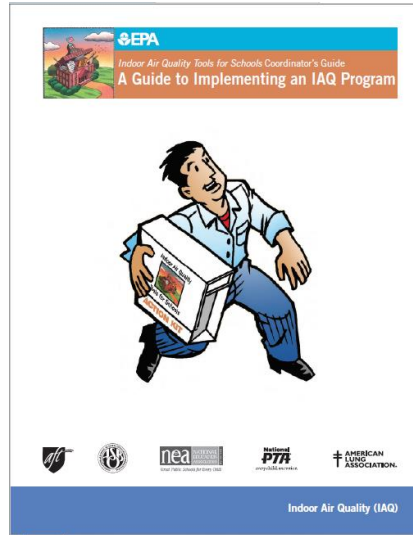
IAQ Tools for Schools: Preventive Maintenance Guidance



The Framework for Effective School IAQ Management: Seven Technical Solutions



IAQ Tools for Schools



Indoor Air Quality Backgrounder: The Basics

Indoor air quality (IAQ) is an increasingly important issue in schools across the nation. IAQ can directly affect the health and comfort of students and staff. There are many ways that school occupants can help to improve air quality. EPA developed the Indoor Air Quality Tools for Schools (IAQ TFS) Program to help schools address many IAQ issues using practical and often low-cost measures (such as unblocking ventilation supply vents to improve airflow).

By simply reviewing this *Indoor Air Quality Backgrounder* and completing the IAQ checklists, occupants can learn how to make a significant impact on IAQ and provide a healthier learning and working environment.

This guidance is based on the following principles:

- Most IAQ problems are resolved by a simple, inexpensive measure.
- The cost and effort to resolve most IAQ problems is less than the cost to resolve problems that develop.

WHY IAQ IS IMPORTANT IN YOUR SCHOOL

Most people are aware that air pollution can impact the environment, but indoor air pollution is a significant, harmful source of human exposure to pollutants. Indoor air pollutants may be more concentrated and occur more frequently than outdoor pollutants. The Science Advisory Board on Indoor Air Quality in Schools (SAB) ranked indoor air pollution as one of the top five environmental health threats to children.

This is especially true for children who may be more susceptible to air pollutants.

Failure to prevent or respond promptly to IAQ problems can:

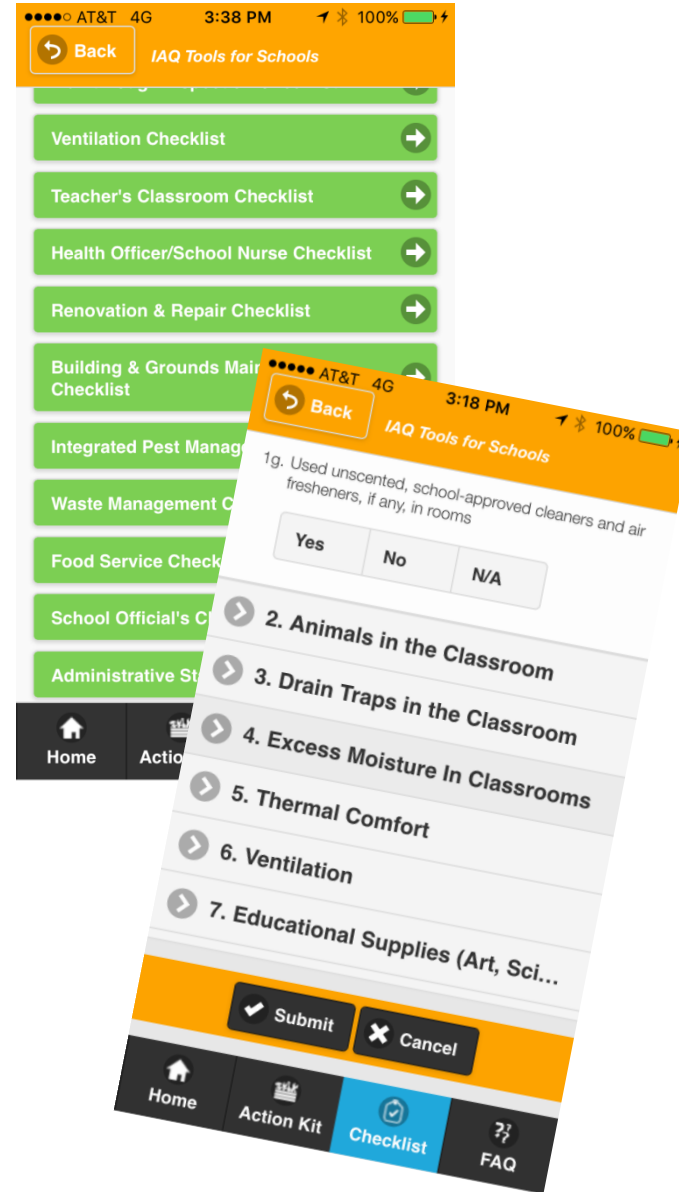
- Increase potential for long- and short-term health problems for students and staff.
- Negatively impact student attendance, comfort, and performance.
- Reduce teacher and staff comfort and performance.
- Accelerate deterioration and reduce efficiency of school facilities and equipment.
- Increase potential for school closings or relocation of occupants.
- Strain relationships among school staff.

Good IAQ helps to provide a healthy and productive environment for students, teachers, and staff!

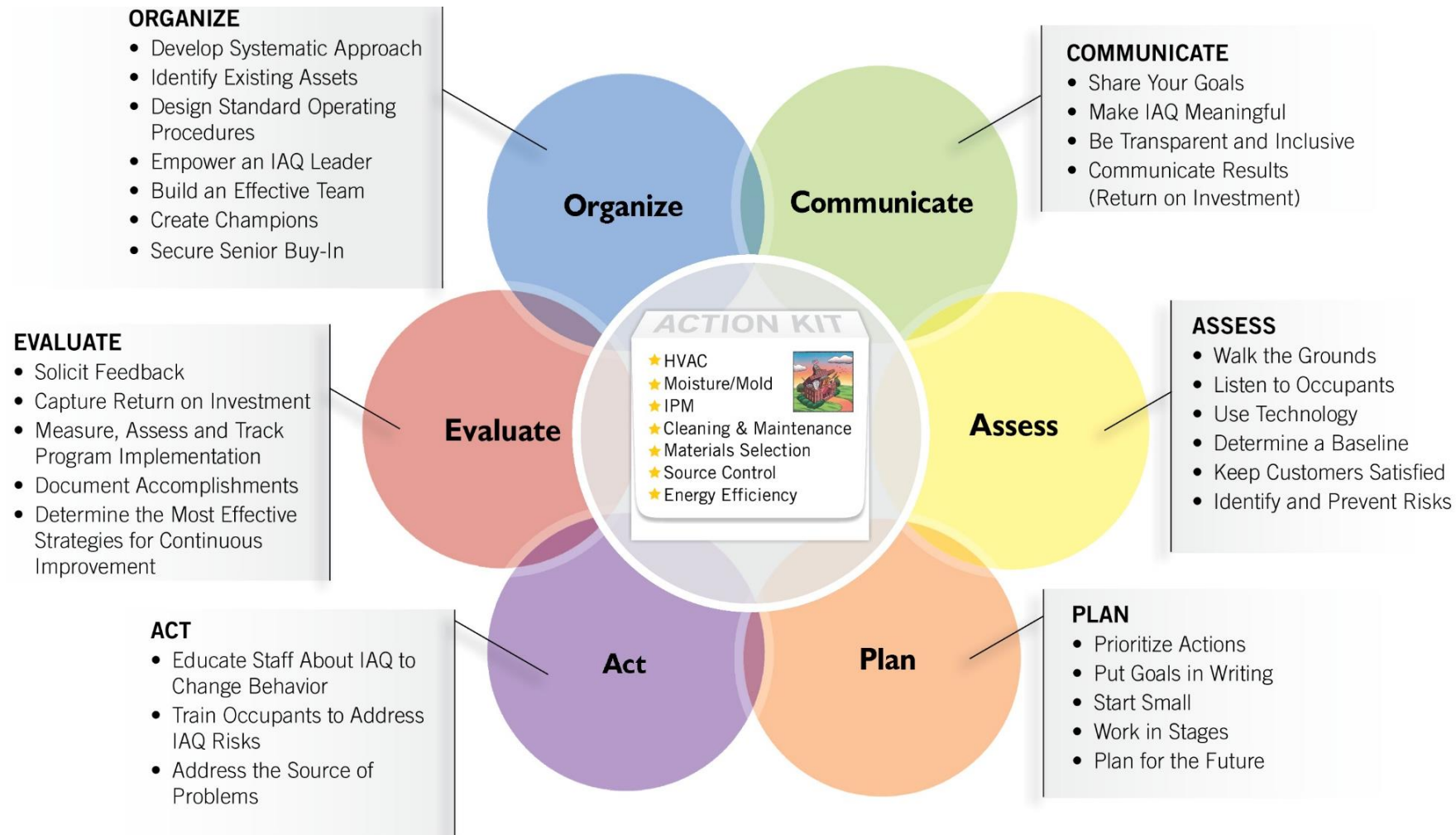
The diagram shows a cross-section of a room with a unit ventilator. Outdoor air supply enters through the unit ventilator, passes through a filter, and is distributed into the room. Return air is shown circulating back into the unit ventilator. Labels include: Central Exhaust Fan, Optional Location for Unit Ventilator, Outdoor Air Supply, Return Air, Unit Ventilator, Central Air Through Vents, and Air Supply through a Unit Ventilator.

The diagram shows a cross-section of a room with a central air handling unit. Outdoor air supply enters through the unit, passes through a filter, and is distributed into the room. Return air is shown circulating back into the unit. Labels include: Outdoor Air Supply, Central Air Handling Unit (may be located outdoors), Return Air, Supply Air, and Air Supply in a Central Air Handling System.

The diagram shows a cross-section of a room with an exhaust-only system. Outdoor air is supplied through windows and other openings. Return air is shown circulating back into the room. Labels include: Central Exhaust Fan, Outdoor Air Supply, Exhaust, Outside Air is Supplied through Windows and other Openings, and Air Supply in an Exhaust-only System.



The Framework for Effective School IAQ Management: Six Key Drivers



The Framework for Effective School IAQ Management: Seven Technical Solutions

★ Quality HVAC

- Inspect HVAC systems regularly
- Establish a maintenance plan
- Change filters regularly and ensure condensate pans are draining
- Provide outdoor air ventilation according to ASHRAE Standards or local code
- Clean air supply diffusers, return registers and outside air intakes
- Keep unit ventilators clear of books, papers and other items

★ Control of Moisture/Mold

- Conduct routine moisture inspections
- Establish a mold prevention and remediation plan
- Maintain indoor humidity levels between 30% and 60%
- Address moisture problems promptly
- Dry wet areas within 24–48 hours

★ Strong Integrated Pest Management (IPM)

- Inspect and monitor for pests
- Establish an IPM plan
- Use spot treatments and baits
- Communicate with occupants prior to pesticide use
- Mark indoor and outdoor areas treated with pesticides

★ Effective Cleaning and Maintenance

- Conduct routine inspections of school environment
- Develop a preventive maintenance plan
- Train cleaning/maintenance staff on protocols
- Ensure material safety data sheets (MSDS) are available to staff
- Clean and remove dust with damp cloth
- Vacuum using high-efficiency filters

★ Smart Materials Selection

- Maintain products inventory
- Develop low-emitting products purchasing and use policies
- Use only formaldehyde-free materials
- Use only low-toxicity and low-emitting paint
- Select products based on product rating systems
- Use least toxic cleaners possible (only those approved by the district)

★ Aggressive Source Control

- Conduct regular building walkthrough inspections
- Test for radon; mitigate if necessary
- Implement a hazardous materials plan (use, label, storage and disposal)
- Establish a school chemical management and inventory plan
- Implement smoke-free policies
- Establish an anti-idling school bus policy
- Use walk-off mats at building entrances
- Conduct pollutant-releasing activities when school is unoccupied

★ Integrated Energy Management Solutions

- Protect IAQ during energy efficiency upgrades and building renovations
- Conduct regular HVAC maintenance and tune-ups
- Install programmable thermostats
- Consider performing post-construction commissioning for HVAC systems
- Control moisture in building assemblies, mechanical systems and occupied spaces



Make a Copy of Checklist

Select and Customize a Checklist

Use Filters Below to Customize Checklist

School Name:

Date:

This tool is designed to allow you to add your own checks or modify the existing checks to match your needs. You may want to add additional activities related to IAQ preventive maintenance, such as those in *IAQ Tools for Schools Action Kit*. Enable macros to use this checklist customizer. Refer to Help files to learn how to enable macros for your version of MS Excel.

Category	Category Data	Action	Priority	Y	N	Notes
HVAC	Outdoor Air Ventilation	Implemented pre-occupancy ventilation control for ventilation systems that serve spaces that are not continuously occupied, to provide the design minimum outdoor air ventilation rate for a period of one hour prior to expected occupancy whenever the spaces have been unventilated for a period longer than 24 hours.	EA	<input type="checkbox"/>	<input type="checkbox"/>	
HVAC	Outdoor Air Ventilation	Adjusted existing HVAC systems to meet all requirements of ASHRAE Standard 62.1, where possible, using the Ventilation Rate Procedure.	MA	<input type="checkbox"/>	<input type="checkbox"/>	
HVAC	Outdoor Air Ventilation	Considered the impacts of building envelope air sealing on ventilation. Avoided tightening the building shell and reducing air exchange rates if increasing ventilation or installing additional ventilation is not possible. Ensured school buildings that rely on natural ventilation have adequate ventilation after weatherization.	MA	<input type="checkbox"/>	<input type="checkbox"/>	



Category	Category Data	Action	Priority	Y	N	Notes
Source Control	Exhaust Ventilation	Verified that exhaust from rooms with localized contaminant sources discharge outdoors and do not discharge or leak into other indoor spaces or the building structure.	AP	<input type="checkbox"/>	<input type="checkbox"/>	
Source Control	Exhaust Ventilation	Ensured exhaust is provided for rooms or areas with localized indoor contaminant sources and ensured that exhaust rates required by ASHRAE Standard 62.1 are met.	MA	<input type="checkbox"/>	<input type="checkbox"/>	
Source Control	Exhaust Ventilation	Confirmed proper functionality of the exhaust systems to reduce causes of complaints.	MA	<input type="checkbox"/>	<input type="checkbox"/>	
Source Control	Exhaust Ventilation	Implemented additional efforts to prevent the recirculation of exhausted air into outdoor air intakes.	EA	<input type="checkbox"/>	<input type="checkbox"/>	
Source Control	Exhaust Ventilation	Measured exhaust airflows on a room-by-room basis and determined whether the school complies with the exhaust requirements of ASHRAE Standard 62.1 for each space.	EA	<input type="checkbox"/>	<input type="checkbox"/>	

Category	Category Data	Action	Priority	Y	N	Notes
Cleaning – Green Methods & Maintenance	Cleaning – Green Methods & Maintenance	If using disinfectant for controlling the spread of viruses and bacteria, (1) verified the product is EPA approved and (2) considered using a product that is Design for the Environment labeled. For SARS-CoV-2, the virus that causes COVID-19, verified the product is on EPA's list of disinfectants for use against SARS-CoV-2 (www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2-covid-19).	MA	<input type="checkbox"/>	<input type="checkbox"/>	
Cleaning – Green Methods & Maintenance	Cleaning – Green Methods & Maintenance	Determined which surfaces require disinfection following routine cleaning.	MA	<input type="checkbox"/>	<input type="checkbox"/>	
Cleaning – Green Methods & Maintenance	Cleaning – Green Methods & Maintenance	Developed a cleaning/sanitizing plan for high-touch surfaces as recommended in CDC's guidance for cleaning and disinfection of community facilities (www.cdc.gov/coronavirus/2019-	MA	<input type="checkbox"/>	<input type="checkbox"/>	



EPA Resources for Responding to COVID-19

Environmental Topics | **Laws & Regulations** | **About EPA** | Search EPA.gov

Related Topics: Coronavirus | CONTACT US | SHARE

Frequent Questions Related to Coronavirus (COVID-19)

View frequently asked questions related to Coronavirus (COVID-19) and find key EPA resources.

Disinfectants

I can't tell if the product I'm interested in is on the list or not. Can you help me?

I want to use a product to kill SARS-CoV-2 but it isn't on List N. Is it effective against SARS-CoV-2?

[View all frequent questions about disinfectants and Coronavirus \(COVID-19\).](#)

Drinking Water

Do I need to boil my drinking water?

Is tap water safe to use for hand washing?

Is drinking tap water safe?

[View all frequent questions about drinking water and Coronavirus \(COVID-19\).](#)

Grants

May EPA waive prior approval requirements specified at 2 CFR 200.407 if a waiver is necessary to address COVID-19 related concerns?

What documentation does EPA require for resumption of non-competitive awards?

[View all frequent questions about grants and Coronavirus \(COVID-19\).](#)

Indoor Air

Is there HVAC guidance that building and maintenance professionals can follow to help protect from COVID-19?

Will an Ozone Generator protect me and my family from COVID-19?

Will an air purifier protect me and my family from COVID-19 in my home?

Questions from State, Local and Tribal Leaders

Can states expect any regulatory relief or flexibility if they temporarily suspend certain inspections, monitoring, and reporting requirements such as vehicle emissions testing programs or certain air quality monitoring reports under the Clean Air Act?

[View all frequent questions from State, Local and Tribal Leaders about Coronavirus \(COVID-19\).](#)

Wastewater and Septic Systems

Can I get COVID-19 from wastewater or sewage?

Will my septic system treat COVID-19?

Do wastewater treatment plants treat COVID-19?

[View all frequent questions about wastewater and septic systems and Coronavirus \(COVID-19\).](#)

Waste

Does RCRA regulate wastes that may contain the virus that causes COVID-19, such as used medical equipment or personal protective equipment?

Where can I find information regarding the handling of wastes associated with Coronavirus and COVID-19?

What information has EPA shared to provide the public, the regulated community and other government agencies with the most complete and up to date information on actions related to COVID-19?

[View all frequent questions about waste and Coronavirus \(COVID-19\).](#)

Environmental Topics | **Laws & Regulations** | **About EPA** | Search EPA.gov

Related Topics: Coronavirus | CONTACT US | SHARE

Indoor Air and Coronavirus (COVID-19)

COVID-19 is thought to spread mainly through close contact from person-to-person. However, some uncertainty remains about the relative importance of different routes of transmission of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19). There is growing evidence that this virus can remain airborne for longer times and further distances than originally thought. In addition to close contact with infected people and contaminated surfaces, there is a possibility that spread of COVID-19 may also occur via airborne particles in indoor environments, in some circumstances beyond the 2 m (about 6 ft) range encouraged by social distancing recommendations. See [Science and Technical Resources related to Indoor Air and Coronavirus \(COVID-19\)](#) or [Indoor Air and COVID-19 Key References and Publications](#) for technical information.

However, there are straightforward steps that can be taken to reduce potential airborne transmission of COVID-19 and the focus of this material is on those measures. The layout and design of a building, as well as occupancy and type of heating, ventilation, and air conditioning (HVAC) system, can all impact potential airborne spread of the virus. Although improvements to ventilation and air cleaning cannot on their own eliminate the risk of airborne transmission of the SARS-CoV-2 virus, EPA recommends precautions to reduce the potential for airborne transmission of the virus. These precautions include increasing ventilation with outdoor air and air filtration as part of a larger strategy that includes social distancing, wearing cloth face coverings or masks, [surface cleaning and disinfecting](#), handwashing, and other precautions. By themselves, measures to reduce airborne exposure to the virus that causes COVID-19 are not enough since airborne transmission is not the only way exposure to SARS-CoV-2 could potentially occur.

Frequent Questions

- [Read Frequent Questions about Indoor Air and Coronavirus \(COVID-19\).](#)
- [Explore all EPA Frequent Questions related to Coronavirus \(COVID-19\).](#)

All best practices recommended by the Centers for Disease Control and Prevention (CDC) should be followed.

- [How to Protect Yourself and Others](#)
- [Cleaning and Disinfecting Your Home](#)
- [Community, Work and School: Cleaning and Disinfecting](#)
- [Use of Cloth Face Coverings to Help Slow the Spread of COVID-19](#)



List N: Disinfectants for Use Against SARS-CoV-2

All products on this list meet EPA's criteria for use against SARS-CoV-2, the virus that causes COVID-19.

Finding a Product

To find a product, enter the **first two sets** of its **EPA registration number** into the search bar below. You can find this number by looking for the EPA Reg. No. on the product label.

For example, if EPA Reg. No. 12345-12 is on List N, you can buy EPA Reg. No. 12345-12-2567 and know you're getting an equivalent product.

[Search by EPA registration number](#)

Other COVID-19 Resources

- [EPA's Coronavirus Site](#)
- [CDC's Coronavirus Disease 2019 Site](#)
- [CDC's Cleaning and Disinfection Recommendations for COVID-19](#)
- [NPIIC's COVID-19 Virus Factsheet](#)





Professional Training Webinar Series

★ Free Online Training, Earn CEUs!

IAQ Master Class Series

10 technical trainings to build your knowledge base to start, improve or sustain an IAQ management program. Complete all 10 to join the IAQ Master Class.

IAQ Knowledge-to-Action Series

Technical trainings to deepen your IAQ knowledge and build capacity to take immediate action.

Technical Knowledge

- Asthma Triggers
- HVAC Systems
- Moisture and Mold
- Energy Efficiency
- Integrated Pest Management
- Cleaning and Maintenance
- Materials Selection and Source Control

Capacity Building

- Funding and Gaining Buy-In
- Assessment and the IAQ Mobile App
- Staff Training
- Evaluation and Data

★ Virus Mitigation

www.epa.gov/iaq-schools/ondemand-training-webinars



EPA Resources to Get You Started!



**IAQ Tools for Schools
Action Kit**



**IAQ Tools for Schools
Mobile App**



**Framework for Effective
IAQ Management**



**IAQ Master Class
Professional Training
Webinar Series**



**Energy Savings Plus Health Guide
and Interactive Air Quality Planner**



**IAQ Tools for Schools:
Preventive Maintenance
Guidance**



www.epa.gov/iaq-schools

Thank You!



**Tracy Washington Enger
Indoor Environments Division
US Environmental Protection Agency
enger.tracy@epa.gov**



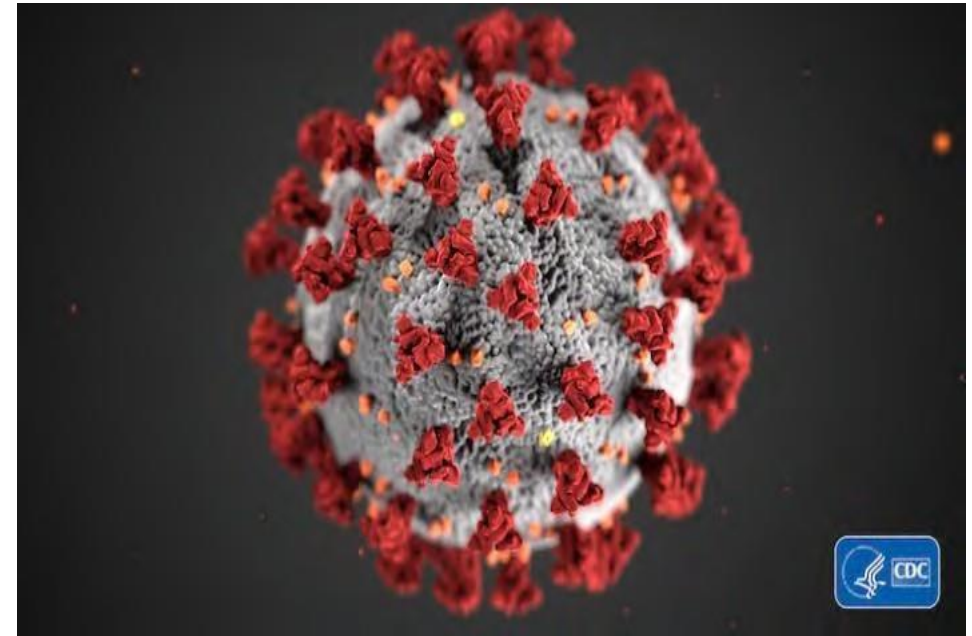


**SAFER SCHOOLS AND CAMPUSES
BEST PRACTICES
CLEARINGHOUSE**

Panel Discussion

LESSONS FROM THE FIELD

Frederick P. Remelius, Director of Operations
Upper Merion Area School District
4,000 K-12 students in King of Prussia, PA



WE SURVIVED THE GREAT COVID PANDEMIC THANKS TO

CDC & US EPA

AND WE ARE READY TO MOVE FORWARD!

COVID isn't gone yet, the flu will be back and ASTHMA will be here forever.

Asthma affects more than 1 in 10 students & staff



Return On Investment from PREVENTIVE MAINTENANCE
can be as much as **545 percent.**

Preventive Maintenance yields an estimated 12% to 18% cost / energy savings!



MARK A. COCCO, FIRE INSPECTOR I, CIAQP, CPSI, CSCSI SAFETY MANAGER

Martin County School District, Florida

K-12 | 17,500 Students | 34 Facilities | 3,689,914 sq ft

IAQ SUPPORT

Indoor air quality is not a job for one person. Support from School Boards, Principals, Staff and all Departments is necessary.

- Funding
- Policies, Procedures & Rules
- Technical





COMMUNICATION

Keep all stakeholders informed of the preventative measures and corrective actions through each step or phase of the IAQ program.

Remember, it is about the children.



**Ricky Martinez Assistant Director Of Facility Services
Salt Lake City School District
K-12 24,020 Students, 38 Facilities, 4,600,000 sq ft**



Front Line Workers are Heroes!

We Did It Together!





Pandemic & Indoor Air Quality



-
- Cleaning & Disinfecting – Safer Chemicals, Equipment, Processes, IPM
 - Ventilation- Filters, Airflow, Set Points, Runtime & Damper Adjustments
 - Training – Communication and Educating Staff & Stakeholders



**SAFER SCHOOLS AND CAMPUSES
BEST PRACTICES
CLEARINGHOUSE**

Panel Discussion

LESSONS FROM THE FIELD



Closing Polling Question

4. Select the topic(s) for which you feel additional information is needed. (Select all that apply.)

- Allowable Uses of ARP Funds
- COVID-19 Prevention and Safe Operations Strategies
- Mental Health for Students, Faculty and Staff
- Vaccinating Students, Faculty and Staff
- Re-engaging students
- Early childhood
- Higher education
- Nutrition and wellness
- Other (Please specify in the chat box.)



Lessons from the Field Webinar Series

SCHEDULE AND TOPICS FOR BACK-TO-SCHOOL SUMMER SESSIONS

July

July 14:
Preparing to return
to school

July 28:
Supporting staff and
educators

August

August 11:
Re-engaging
students as return to
school (1)

August 25:
Re-engaging
students as they
return to school (2)

September

September 8:
Early childhood

September 22:
Nutrition and
wellness



Feedback Form



SAFER SCHOOLS AND CAMPUSES
BEST PRACTICES
CLEARINGHOUSE

Lessons from the Field - Indoor Air Quality and Ventilation in America's K-12 Schools: Guidance and Strategies for Improved Results

Thank you for attending the webinar, *Lessons from the Field - Indoor Air Quality and Ventilation in America's K-12 Schools: Guidance and Strategies for Improved Results*, on June 30, 2021. To best serve you, we would greatly appreciate receiving your feedback on the webinar.

1. Prior to the webinar, how knowledgeable were you about the webinar's topic?

- Not At All Knowledgeable
- Somewhat Knowledgeable
- Very Knowledgeable

2. Overall this webinar was a good use of my time.

- Strongly Disagree
- Somewhat Disagree
- Somewhat Agree
- Strongly Agree

3. This webinar improved my understanding of the covered topic.

- Strongly Disagree
- Somewhat Disagree
- Somewhat Agree
- Strongly Agree

[HTTPS://WWW.SURVEY
MONKEY.COM/R/LFTF
SESSION7](https://www.surveymonkey.com/r/LFTF_SESSION7)



Thank You!

Should you have any questions, please contact us at NCSSELE@air.org or 800-258-8413. We are happy to help!

NCSSLE Website

<https://safesupportivelearning.ed.gov>

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