

## Designing and Implementing a COVID-19 Indoor Air Quality Plan in Schools

October 28, 2020

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## I. Introduction to promoting better indoor air quality through ventilation in schools

Schools face complicated challenges to ensure the safe and equitable return to in-person instruction—and to avoid the resurgence of conditions that require students and educators to return to remote learning. The air quality in school buildings is central to these goals. The reason is simple. According to the U.S. Centers for Disease Control and Prevention (CDC), “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.”<sup>1</sup>

ASHRAE, which used to be called by its full name, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, frames the problem this way: “Transmission of SARS-CoV-2 [the novel coronavirus] through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.”<sup>2</sup>

Whatever the space, ventilation and other approaches to addressing indoor air quality are essential to prevent or reduce the spread of airborne hazards like the novel coronavirus, the virus that causes the disease COVID-19. Broadly, heating, ventilation, and air conditioning (HVAC) systems move air in and out of buildings. Within this framework, HVAC systems can do a combination of things to the indoor air that students and educators breathe to counter airborne disease transmission: exhaust (remove) potentially contaminated air, dilute it with clean outside air, change the way it flows in and out of indoor spaces, filter or otherwise clean it, and adjust environmental conditions like temperature and humidity. Windows, doors, fans, and other methods of addressing indoor air quality (IAQ) must also be considered.

A broad and robust IAQ management plan is crucial, and we recommend user-friendly sources for preparing one. Our planning focus here, however, is on how to develop and implement COVID-19-related ventilation initiatives. We rely on authoritative sources, including CDC, ASHRAE, the U.S. Environmental Protection Agency (EPA), and the National Institute for Occupational Safety and Health (NIOSH).<sup>3</sup> None of these entities creates directly enforceable air quality standards, but many states or local jurisdictions incorporate them in laws or requirements, and collective bargaining agreements often include them. Even when they are not legally mandated, they may be relied upon as persuasive authority.

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<sup>1</sup> Centers for Disease Control and Prevention, “How COVID-19 Spreads,” updated October 5, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>. Accessed: October 5, 2020.

<sup>2</sup> ASHRAE, “ASHRAE Position Document on Infectious Aerosols,” April 14, 2020, p. 2. [https://www.ashrae.org/file%20library/about/position%20documents/pd\\_infectiousaerosols\\_2020.pdf](https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf). Accessed: September 24, 2020.

<sup>3</sup> CDC, which is located within the U.S. Department of Health and Human Services, focuses on protecting health by fighting disease and helping others do the same; it conducts scientific research and produces analyses and recommendations, among other work. Among other work, ASHRAE develops standards and guidelines that address topics such as indoor air quality; how comfortable people feel with a building’s temperature, humidity, and air movement (thermal comfort); energy conservation in buildings; reduction of refrigerant emissions; and the designation and safety classification of refrigerants. The EPA’s work focuses on protecting human health and the environment. NIOSH, which is part of CDC, conducts research and promotes and enhances the health and safety of workers.

In preparing this document, we chose to focus on ventilation in the context of the pandemic. As a result, it identifies common-sense steps that can be taken to mitigate the airborne transmission of the novel coronavirus. Many of the recommendations included here require action but no additional funding, while others require funding far short of what an HVAC system installation or upgrade is likely to cost. While major HVAC work may certainly be necessary, students and educators cannot wait for such changes and budgets may not easily permit them. In addition, schools may rely at least in part on methods of addressing IAQ that do not involve HVAC systems.

The information that follows is broken into five categories: creating and implementing an indoor air-quality management plan; integrating awareness of racial and social justice into ventilation solutions; ensuring that indoor air is appropriately replaced with clean outside air, recirculated, or exhausted; improving air filtration; and ensuring that environmental conditions like temperature and humidity minimize risk. Throughout the document, we suggest language that can be used in collective bargaining and other labor-management settings. The language is also helpful for the development of school board policies and other guidance. At the end, we provide a compilation of the suggested language and a list of additional IAQ resources. We have also produced a condensed version of this publication—the NEA Quick Guide to Indoor Air Quality Strategies to Mitigate COVID-19—that summarizes key issues, sources, language, and resources.

## **II. Create and implement an indoor air quality management plan**

Schools should develop and implement an IAQ management plan to identify and resolve existing IAQ issues and prevent future problems from occurring. Broadly, effective IAQ management means controlling airborne contaminants from inside or outside the building, ensuring that an adequate supply of fresh outdoor air is introduced and distributed, and creating comfortable environmental conditions. A good IAQ management plan involves the ongoing assessment of IAQ, including the inspection of ventilation systems.

This guidance focuses on practical steps to take to address the novel coronavirus and COVID-19, but it is important to note that improving IAQ is a crucial goal in and of itself. As the EPA notes, “Ventilation rates in most schools are below recommended levels. Growing evidence of the positive impact of outdoor air ventilation suggests a clear opportunity for improving health and academic performance.”<sup>4</sup> The EPA has an extensive set of informational, practical, and training materials for promoting IAQ in schools. They can be found on the [Creating Healthy Indoor Air Quality in Schools](https://www.epa.gov/iaq-schools) website.<sup>5</sup> Note that site’s [Indoor Air Quality Tools for Schools Action Kit](https://www.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit),<sup>6</sup> which includes checklists, fact sheets, and an IAQ assessment app for mobile devices.

You do not need to be an HVAC expert to develop and implement a plan to promote optimal IAQ. What you need to do is ask the right questions, be able to identify IAQ problems, understand and push for the right solutions, and make sure necessary changes are made.

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<sup>4</sup> U.S. Environmental Protection Agency, “Evidence from Scientific Literature about Improved Academic Performance.” <https://www.epa.gov/iaq-schools/evidence-scientific-literature-about-improved-academic-performance>. Accessed: October 8, 2020.

<sup>5</sup> U.S. Environmental Protection Agency, “Creating Healthy Indoor Air Quality in Schools.” <https://www.epa.gov/iaq-schools>. Accessed: October 17, 2020.

<sup>6</sup> U.S. Environmental Protection Agency, “Indoor Air Quality Tools for Schools Action Kit.” <https://www.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit>. Accessed: October 17, 2020.

## A. Ventilation as part of an overall COVID-19 mitigation strategy

Incorporating ventilation into an overall COVID-19 mitigation strategy is crucial. People are more at risk of infection the longer and closer they are to people with the disease,<sup>7</sup> and no single mitigation strategy can effectively address all possible modes of transmission in public spaces, like schools. Social distancing is very important, but, on its own, the “six-foot rule” does not fully address airborne viruses in spaces like classrooms and halls. The EPA clearly makes this point about incorporating ventilation into a broader plan:

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.<sup>8</sup>

The proceedings of a National Academies of Sciences, Engineering, and Medicine (NASEM) workshop on airborne transmission of the novel coronavirus noted, “The panelists were consistent on the need for layering protective measures to reduce the spread of the virus, including masking, hand hygiene, face shields where appropriate, physical distancing, and maximizing ventilation. Panelists pointed out the value of such layered approaches in indoor spaces, such as schools, public transportation, health care settings, air travel, dental offices, and office buildings.”<sup>9</sup>

As you read this document, keep in mind that the interaction of mitigation strategies can play a role in your response. For example, if you are unable to improve ventilation sufficiently in an indoor location, you may be able to respond appropriately by limiting the number of people who can simultaneously be in that location.

CDC notes, “There is growing evidence that droplets and airborne particles can remain suspended in the air and be breathed in by others, and travel distances beyond 6 feet (for example, during choir practice, in restaurants, or in fitness classes). At the same time, face coverings do not stop the wearer from inhaling small particles/aerosols. Unlike respirators (PPE/personal protective equipment), they are a source-control or reduction tool that may help reduce droplet spread when

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<sup>7</sup> U.S. Centers for Disease Control and Prevention, “CDC Updates ‘How COVID is Spread’ Webpage,” October 5. <https://www.cdc.gov/media/releases/2020/s1005-how-spread-covid.html>. Accessed: October 21, 2020.

<sup>8</sup> U.S. Environmental Protection Agency, “Ventilation and Coronavirus (COVID-19).” <https://www.epa.gov/coronavirus/ventilation-and-coronavirus-covid-19>. Accessed: October 21, 2020.

<sup>9</sup> National Academies of Sciences, Engineering, and Medicine 2020. Airborne Transmission of SARS-CoV-2: Proceedings of a Workshop in Brief. Washington, D.C.: The National Academies Press, p. 60. <https://doi.org/10.17226/25958>. Accessed: October 23, 2020. These findings are consistent with NASEM’s earlier analysis of the steps necessary for schools to return to in-person instruction: “In a small space with poor ventilation, the droplets and aerosols in the air may accumulate enough to create a risk of infection. For this reason, it is important to ensure that classrooms and other spaces in the school building are well ventilated. Ventilation systems should be operating properly and, when possible, circulation of outside air should be increased, for example by opening windows and doors. Also, use of face masks will limit the number of droplets and aerosols that are released into the air.” National Academies of Sciences, Engineering, and Medicine 2020. Reopening K-12 Schools During the COVID-19 Pandemic: Prioritizing Health, Equity, and Communities. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25858>. Accessed: October 26, 2020.

a person wearing a face covering coughs, sneezes, talks, or raises their voice.”<sup>10</sup> It summarizes how the novel coronavirus spreads this way:<sup>11</sup>

- The virus that causes COVID-19 most commonly spreads between people who are in close contact with one another (within about 6 feet, or 2 arm lengths).
- It spreads through respiratory droplets or small particles, such as those in aerosols, produced when an infected person coughs, sneezes, sings, talks, or breathes.
  - These particles can be inhaled into the nose, mouth, airways, and lungs and cause infection. This is thought to be the main way the virus spreads.
  - Droplets can also land on surfaces and objects and be transferred by touch. A person may get COVID-19 by touching the surface or object that has the virus on it and then touching their own mouth, nose, or eyes. Spread from touching surfaces is not thought to be the main way the virus spreads.

## **B. Labor-management engagement**

Where education employees have the right to bargain collectively over the range of employment issues impacted by COVID-19, use it to address ventilation issues. If you have a collective bargaining agreement, review its content for health and safety language that addresses IAQ, ventilation, or other related issues. Throughout this document, we provide sample language that can be included in contracts or memorandums of understanding. The language can also be used as the basis for school board resolutions or other policy guidance, if your affiliate does not have bargaining rights.

Do not overlook opportunities that can be used in addition to bargaining or if bargaining over IAQ is not possible. Existing labor-management health care committees, health and safety committees, or COVID-19 task forces can provide such opportunities. Where education employees lack collective bargaining rights or where the scope of bargaining is too limited to address COVID-19 issues, use, create, or repurpose committees or other mechanisms to engage with management. If there is no health and safety committee, consider creating one—focusing on ventilation is an excellent opportunity to do so.

Language for bargaining and other labor-management engagement:

*A joint labor-management indoor air quality committee will be created at the district level and in every building. The committee will facilitate, monitor, research, and recommend solutions to indoor air quality issues and concerns. Employee concerns will be tracked as reported on physical hazard notification forms and employee logs, leading to investigation and resolution. Independent testing groups shall be jointly selected by the Association and the district. The district will remediate indoor air quality issues in conjunction with the joint labor-management indoor air quality committee.*

*The [name of committee] shall also be responsible for indoor air quality. Among other necessary work, it shall facilitate, monitor, research, and recommend solutions to indoor*

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<sup>10</sup> U.S. Centers for Disease Control and Prevention, “Frequently Asked Questions,” updated October 20, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/faq.html>. Accessed: October 21, 2020.

<sup>11</sup> Ibid.

*air quality issues and concerns. Employee concerns will be tracked by the committee as reported on physical hazard notification forms and employee logs, leading to investigation and resolution. Independent testing groups shall be jointly selected by the Association and the district. The district will remediate indoor air quality issues in conjunction with the joint labor-management indoor air quality committee.*

Bargaining for the Common Good (BCG) is one way that associations have successfully worked with stakeholders to advance broad interests.<sup>12</sup> Associations have already successfully utilized a BCG strategy during “normal” times. The current health and economic crisis creates a new opportunity to build power and make bold demands in order to both advocate for the needs of and provide protections for a broad range of stakeholders, including those for whom racial and economic disparities have undermined educational opportunities. Working with community stakeholders (see Section C below) can help pressure your employer to address this issue.

If your employer refuses to engage in discussions regarding IAQ, consider additional advocacy options—in coordination with your UniServ director, legal counsel, and others in the affiliate, as appropriate—such as filing grievances, demands to bargain, unfair labor practices, reporting unsafe practices to state or local public health and occupational health and safety agencies, and/or taking collective action.

### **C. Planning**

Within the Association and in coordination with existing bargaining or other labor-management work, identify Association members or individuals in other unions with whom you work who have expertise in ventilation systems. Reach out to them to see how they can help in planning and identifying needed changes. Chances are good that any onsite HVAC experts are already working on COVID-19-related responses and adjustments, so your work may be more in support of changes than in fighting to get the work going in the first place. If all HVAC-related work is done by contractors, identify which company or companies do the work and how they have been engaged to address the novel coronavirus.

State and local requirements for IAQ in schools vary. Some states require schools to designate a person responsible for IAQ in schools and to prepare and publicize IAQ reports, for example, so determine if such requirements exist in your state. In any case, ask for copies of HVAC reports going back two years, and check to see what problems were identified and if they were resolved. Determine what other documentation already exists related to IAQ. Ask for any reports related to specific areas of concern, such as isolation rooms, health offices, and bathrooms. If areas were repurposed to address COVID-19, ask for reports related to HVAC or other ventilation issues in those spaces; if spaces were repurposed, it is crucial that such considerations were addressed (see Section IV. C for more on exhaust systems in high-risk areas). Keep in mind that some schools make HVAC reports available online, so do not forget to search on your own, too.

The Environmental Law Institute maintains a database of excerpts of state laws related to indoor air quality in schools<sup>13</sup> and an overview of state laws related to ventilation in existing schools.<sup>14</sup>

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<sup>12</sup> National Education Association, “Bargaining for the Common Good.” <https://www.nea.org/your-rights-workplace/bargaining-educator-voice/bargaining-common-good>. Accessed: October 6, 2020.

<sup>13</sup> Environmental Law Institute, “Database of State Indoor Air Quality Laws,” March 2020. [https://www.eli.org/sites/default/files/docs/2020\\_schools\\_excerpt\\_3.3.20\\_bold.pdf](https://www.eli.org/sites/default/files/docs/2020_schools_excerpt_3.3.20_bold.pdf). Accessed: October 17, 2020.

<sup>14</sup> Environmental Law Institute, “Building Ventilation in Existing Schools: Overview of State Laws.” [https://www.eli.org/sites/default/files/docs/ventilation\\_tseh\\_5.pdf](https://www.eli.org/sites/default/files/docs/ventilation_tseh_5.pdf). Accessed: October 17, 2020.

Some ventilation-related actions may be required or prohibited by other laws, too. Building codes could establish requirements for altering the original characteristics of an HVAC system, for example, and fire-safety laws could contain restrictions on when doors and windows can be opened.

#### **D. Identifying and working with community allies**

Identify broader work being done to address COVID-19 within the school community and at the city, county, or state levels, and advocate to include the Association in those initiatives. Advocate for collaborative efforts to include all stakeholders, including teaching staff, education support professionals, school nurses and other specialized instructional support personnel, administrators, school board members, students, parents and guardians, and medical and public health officials.

#### **E. Addressing indoor air quality prior to returning to in-person instruction**

Keep in mind that even during remote instruction, some staff may still be working in school buildings, including maintenance/custodial workers, transportation services staff, and others. If they are, make sure the same ventilation safeguards are in place as are needed when students and classroom staff return. At the same time, much lower occupancy in school buildings than usual provides an excellent opportunity to make sure needed maintenance and preparations are done. ASHRAE has detailed checklists for pre-return ventilation work.<sup>15</sup>

#### **F. Assessing indoor air quality**

##### **1. School assessments**

Schools should regularly assess IAQ, including routinely checking HVAC systems. In fact, some states require that they do so. As part of your planning for IAQ work, you should have sought existing documentation on HVAC systems and problems (see Section II, C, above), and some of the steps outlined in this document may logically follow from your initial analysis.

If a recent IAQ assessment is not available and if regular inspections of HVAC systems do not take place, seek both. Testing IAQ can be complex, and the topic goes beyond the scope of this document.<sup>16</sup>

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<sup>15</sup> ASHRAE, “ASHRAE Epidemic Task Force: Schools & Universities,” updated October 7, 2020. [https://www.ashrae.org/file\\_library/technical\\_resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf](https://www.ashrae.org/file_library/technical_resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf). Accessed: October 8, 2020.

<sup>16</sup> Schools should engage qualified professionals to test indoor quality, but there are ways that non-experts can screen for indoor air quality by measuring things like ventilation, CO<sub>2</sub>, humidity, and temperature—all of which can provide a sense of how good the IAQ/ventilation is (i.e., potential for build up or spread of contaminants). EPA’s Ventilation Checklist and backgrounder list ways to measure/check ventilation. The checklist is here: Environmental Protection Agency, “Ventilation Checklist.” <https://www.epa.gov/sites/production/files/2014-08/documents/ventchk1st.pdf>. Accessed: October 9, 2020. The backgrounder is here: Environmental Protection Agency, “Background Information for Ventilation Checklist.” <https://www.epa.gov/sites/production/files/2014-08/documents/ventchk1stbkgd.pdf>. Accessed: October 9, 2020. The Harvard T.H. Chan School of Public Health has also published a short document that walks through the steps for checking ventilation rates in schools. Harvard T.H. Chan School of Public Health, “5-Step Guide to Checking Ventilation Rates in Classrooms.” <https://schools.forhealth.org/wp-content/uploads/sites/19/2020/08/Harvard-Healthy-Buildings-program-How-to-assess-classroom-ventilation-08-28-2020.pdf>. Accessed: October 6, 2020.

If you do not have a joint labor-management committee that oversees this ongoing process, you may want to consider adding contract language.

Language for bargaining and other labor-management engagement:

*The [district/school] shall conduct an audit of indoor air quality by [add date] and provide the results to the Association as soon as they are available.*

*The [district/school] shall provide to the Association copies of all new HVAC system reports and reports from the prior two years.*

*The [district/school] shall ensure that trained professionals conduct regular [monthly, for example] air quality inspections in all buildings and rooms, including air change rate, humidity, and temperature, as well as negative pressure in health rooms, isolation rooms, and bathrooms.*

## **2. Building walkthroughs and conversations with colleagues**

The Association and members can play an important supplemental role in identifying needed ventilation improvements. Consider coordinating with ongoing Association organizing activities in planning and carrying out building walkthroughs and conversations with colleagues.

The goal of a building walkthrough is to see, smell, hear, or feel signs that the HVAC system is not functioning properly or that other ventilation problems are occurring. As the EPA says, “A school walkthrough by the IAQ team is an integral part of IAQ management.”<sup>17</sup> Be sure to walk both the exterior and interior of the building. Ideally, walkthroughs will be conducted jointly with school administrators and HVAC system experts.

- Walking around the perimeter of buildings, for example, look for where fresh outdoor air comes into the building (i.e., does it come in through the roof, side of building, or ground level). Check to see if air intake vents are blocked; located so that water, snow, or debris can get in them; located in close proximity to pollutant sources such as idling buses or dumpsters; or located within 10 feet of exhaust vents.
- During the interior walkthrough, things to look for include covered or blocked air intakes and air exhaust vents; broken or disconnected controls, fans, and ductwork; signs of water damage or visible mold growth on ceiling tiles, walls, or other surfaces; microbiological growth such as standing water in drip pans, ductwork, coils, and humidifiers; and clogged or damaged filters. Listen for unusual equipment noises that may indicate potential problems.
- Seek objectionable odors such as musty odors or chemical smells. Feel for drafts, high or low humidity levels, or temperature extremes. Check for air flowing into and out of grilles and air vents.

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<sup>17</sup> U.S. Environmental Protection Agency, “Background Information for Walkthrough Inspection Checklist.” <https://www.epa.gov/sites/production/files/2014-11/documents/walkthruchk1stbkgd.pdf>. Accessed: October 22, 2020.

For more information on walkthroughs, see the EPA’s Walkthrough Inspection Checklist.<sup>18</sup> In total, EPA has produced 11 checklists for school staff and stakeholders involved in school inspections and IAQ management. You can find them all in the EPA’s Indoor Air Quality Tools for Schools Action Kit.<sup>19</sup>

Language for bargaining and other labor-management engagement:

*In coordination with the Association, the [district/school] shall conduct a building walkthrough prior to the resumption of in-person instruction to identify ventilation problems and potential solutions. When in-person instruction resumes, walkthroughs shall take place [monthly]. All walkthroughs shall include Association representatives, administrators, and HVAC/ventilation experts.*

Talk to Association members and other staff about problems they may have noticed—for example, inoperable or blocked supply or exhaust vents, mold growth or musty odors, or an unusual number of colds or respiratory complaints from students or staff in a particular classroom or area of a building. School nurses, health aides, and other in-school health care professionals are likely to have additional helpful information; seek their feedback on ventilation issues and solutions, including related to ventilation in dedicated health offices and temporary isolation rooms.

### **III. Integrate awareness of racial and social inequities into indoor air quality solutions**

Without an intentional focus on understanding how race and other social factors play into exacerbating IAQ problems in public schools, we could see a continuation of negative outcomes in school districts that primarily serve students of color. That is because it is more common for school districts serving primarily Indigenous, Black, and Latino students to receive less funding than districts serving a majority white student population.<sup>20</sup> Districts serving white students living in poverty also tend to receive greater funding than districts serving students of color living in poverty.<sup>21</sup> Those trends hold even when controlling for socioeconomic status.<sup>22</sup>

In a report on educational equity, The National Academies of Sciences, Engineering, and Medicine (NASEM) found, “Schools that are marked by concentrated poverty often lack the human, material, and curricular resources to meet the academic and socioemotional needs of their populations. Segregation also brings racial differences in exposure to concentrated poverty, leading to [students of color] being in schools with higher rates of concentrated poverty than other students.”<sup>23</sup> NASEM referred back to this report when, a year later, it analyzed returning to in-person instruction in the context of COVID-19. It determined, “In sum, any decision about school reopening and operation has to be informed by existing disparities in resources and infrastructure. Without careful attention to equity and inequity, plans for moving ahead in the 2020–2021 school

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<sup>18</sup> U.S. Environmental Protection Agency, “Walkthrough Inspection Checklist.” [https://www.epa.gov/sites/production/files/2014-11/documents/walkthruchk1st\\_0.pdf](https://www.epa.gov/sites/production/files/2014-11/documents/walkthruchk1st_0.pdf). Accessed: October 22, 2020.

<sup>19</sup> U.S. Environmental Protection Agency, “Indoor Air Quality Tools for Schools Action Kit.” <https://www.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit#tab-2>. Accessed: October 22, 2020.

<sup>20</sup> On average, white school districts receive \$23 billion more than districts with predominantly people of color, even though they serve the same number of students. EdBuild, “\$23 Billion,” February 2019, Appendix A. <https://edbuild.org/content/23-billion/full-report.pdf>. Accessed: September 23, 2020.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>23</sup> National Academies of Sciences, Engineering, and Medicine 2019. Monitoring Educational Equity. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25389>. Accessed: October 26, 2020.

year run a very real risk of exacerbating the existing inequities in ways that could have serious long-term, detrimental consequences for students, families, and communities.”<sup>24</sup>

Installing, rehabilitating, or replacing HVAC systems can be costly, and the needs are staggeringly broad.<sup>25</sup> Although this document identifies free or relatively low-cost steps that can be taken to help address IAQ problems in schools, some require funds, like obtaining equipment to measure carbon dioxide to monitor air quality in classrooms and procuring portable air filtering devices. We cannot let solving air-quality problems in schools fall victim to racial and socioeconomic disparities.

Associations should utilize impact assessments to ensure that racial justice and equity are centered in plans and work to resolve IAQ problems. Race Forward makes available a helpful Racial Impact Assessment Tool.<sup>26</sup> For additional resources on racial justice and equity, including tools for assessment, strategic planning, and action, see NEA’s Racial Justice in Education resource guide.<sup>27</sup>

Among the questions we should be asking are:

- What are the key differences among students and families we serve and how do we ensure their needs are addressed equitably?
- When it comes to resource expenditures and outcomes, who will benefit from the choices and decisions being made, and who will be harmed?
- Are we explicitly addressing racial and economic disparities and/or impacts? For whom?
- Whose conditions are being improved? Whose conditions are worsened?
- Whose voices are part of creating the solutions?
- Who is part of the decision-making process?

Language for bargaining and other labor-management engagement:

*The [district/school] and Association shall conduct an impact assessment to determine how and where racial and social inequities affect indoor air quality in the district, and they shall provide expedited solutions to address such inequities in the development of any indoor air quality initiative. Building-by-building assessments of demographics and ventilation shall be part of this process.*

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<sup>24</sup> National Academies of Sciences, Engineering, and Medicine 2020. Reopening K-12 Schools During the COVID-19 Pandemic: Prioritizing Health, Equity, and Communities. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25858>. Accessed: October 26, 2020.

<sup>25</sup> “For example, an estimated 41 percent of districts need to update or replace heating, ventilation, and air conditioning (HVAC) systems in at least half of their schools, representing about 36,000 schools nationwide that need HVAC updates.” U.S. Government Accountability Office, “School Districts Frequently Identified Multiple Building Systems Needing Updates or Replacement,” June 2020, p. 1. <https://www.gao.gov/assets/710/707374.pdf>. Accessed: September 22, 2020.

<sup>26</sup> Race Forward, “Racial Equity Impact Assessment.” [https://www.raceforward.org/sites/default/files/RacialJusticeImpactAssessment\\_v5.pdf](https://www.raceforward.org/sites/default/files/RacialJusticeImpactAssessment_v5.pdf). Accessed: October 28, 2020.

<sup>27</sup> National Education Association, “Racial Justice in Education.” <https://neajustice.org/wp-content/uploads/2018/11/Racial-Justice-in-Education.pdf>. Accessed: September 23, 2020.

## IV. Ensure that indoor air is appropriately replaced, recirculated, or exhausted

### A. Ensure that air changes happen frequently enough

Air changes per hour (ACH) is an important measure. It refers to how many times the air volume in a space is replaced with filtered or outdoor air. According to ASHRAE, schools should generally be seeking to have 6 ACH in classrooms.<sup>28</sup> Fresh outdoor air is measured in cubic feet per minute (CFM). According to the EPA, which cites ASHRAE, “If outside air is provided through a mechanical system, then at least 15 cubic feet per minute (cfm) of outside air must be provided for each occupant.”<sup>29</sup> State or local requirements may vary. One state put it this way: “In a space like a classroom, the air should be replaced at least every 15 minutes, which corresponds to an ACH of 4. Replacing the air at least every 10 minutes for an ACH of at least 6 is even better. There isn’t a ‘magic number’ for ventilation: the faster the air is replaced, the less risk it poses.”<sup>30</sup> Check for state or local guidelines on ventilation in the context of COVID-19, including ACH and CFM.

Language for bargaining and other labor-management engagement:

*The [district/school] shall ensure that classrooms have six air changes per hour and a minimum of 15 cubic feet per minute per person of fresh air, or, if higher, the targets set by state or local requirements.*

### B. Flush HVAC systems by running them earlier and longer than usual

Under most normal circumstances, mechanical air systems may shut off automatically or be manually turned off when not needed to save energy and money—during nights and weekends, for example. Under pandemic conditions, however, those systems should be started earlier than they otherwise would be, or they should be run longer or even continually. CDC and ASHRAE recommend starting systems two hours before the buildings they serve will be occupied and keeping them running until two hours after they have been occupied.<sup>31</sup>

Ask for a schedule of when systems are turned on relative to occupancy and about the size of the space those systems serve. Larger spaces may need longer running time. Do not shut off or reduce mechanical ventilation during before- or after-school hours when students or staff may still be in the building.

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<sup>28</sup> ASHRAE, “Re-Opening Our Schools: Activities and Recommendations.” [https://www.ashrae.org/file/library/professional\\_development/learning\\_portal/instructor-led\\_training/online\\_instructor-led/final\\_re-opening-our-schools-activities-and-recommendations\\_june-2020.pdf](https://www.ashrae.org/file/library/professional_development/learning_portal/instructor-led_training/online_instructor-led/final_re-opening-our-schools-activities-and-recommendations_june-2020.pdf). Accessed: October 6, 2020.

<sup>29</sup> U.S. Environmental Protection Agency, “Heating, Ventilation and Air-Conditioning Systems, Part of Indoor Air Quality Design Tools for Schools.” <https://www.epa.gov/iaq-schools/heating-ventilation-and-air-conditioning-systems-part-indoor-air-quality-design-tools>. Accessed: October 6, 2020.

<sup>30</sup> State of Rhode Island, Department of Health, “Addressing COVID-19 Through Air Circulation in Schools and Other Buildings.” <https://health.ri.gov/covid/indooraircirculation/>. Accessed: October 6, 2020.

<sup>31</sup> Centers for Disease Control and Prevention, “Operating Schools during COVID-19: CDC’s Considerations,” updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020.

ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

Language for bargaining and other labor-management engagement:

*The [district/school] shall start HVAC systems at least two hours before and after buildings will be or are occupied.*

### **C. Ensure that mechanical or other exhaust systems work effectively**

So far, we have been focusing on bringing more outside air into buildings, classrooms, offices, and other spaces. But ensuring appropriate IAQ requires more than just bringing clean outside air in. As noted earlier, some portion of the inside air is pulled back into the system and mixed with some portion of outside air and then recirculated. Or, the inside air has to be removed from the inside space—and that is the role of exhaust. ASHRAE includes checking that exhaust systems are working as intended in its list of COVID-19-related monthly system checks and verifications list.<sup>32</sup>

On its simplest level, an open window or door could achieve this goal, but relying on this alone could be problematic. It may also be impossible, like when rooms have no windows or doors, or if they exist but are inoperable. In many places, environmental conditions argue for closing windows and doors, such as when it is very hot or very cold, the humidity is too high, or pollen counts or smoke from forest fires pose a health risk to occupants. In addition, open windows and doors do not guarantee that air will be exhausted from all or part of the space, and they could work at cross-purposes with an HVAC system. CDC notes that fans must be used carefully so as “not to induce potentially contaminated airflow directly from one person over another.”<sup>33</sup> In this context, care should be taken to ensure that the process of exhausting air does not draw potentially contaminated air into school buildings.

Language for bargaining and other labor-management engagement:

*The [district/school] shall ensure on a monthly basis that all system exhaust functions are operating as intended and are not drawing potentially contaminated air from areas with an increased risk of having contaminated air, such as health offices, isolation rooms, and restrooms.*

### **1. Check and adjust localized mechanical exhaust systems**

Certain areas within schools should have localized mechanical exhaust systems to expel air to the outside, including restrooms, science labs, vocational classrooms, kitchens, and nurses’ offices. In the context of COVID-19, isolation rooms should also have exhaust systems leading directly out of the building, as ASHRAE notes.<sup>34</sup> They should be maintained with negative air pressure.<sup>35</sup> Isolation rooms and nurses’ offices operating in isolation mode are also recommended to have 100 percent outside air.<sup>36</sup> Where retrofits are not possible, ASHRAE recommends temporary nurse station trailers. The EPA notes that health officers, such as school nurses, need to be located in

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<sup>32</sup> ASHRAE, “ASHRAE Epidemic Task Force: Schools & Universities,” updated October 7, 2020. [https://www.ashrae.org/file\\_library/technical\\_resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf](https://www.ashrae.org/file_library/technical_resources/covid-19/ashrae-reopening-schools-and-universities-c19-guidance.pdf). Accessed: October 8, 2020.

<sup>33</sup> Centers for Disease Control and Prevention, “Operating Schools during COVID-19: CDC’s Considerations,” updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020.

<sup>34</sup> ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.

areas in which “air removed from the health office is separated from the ventilation system to avoid affecting other occupied areas of the school.”<sup>37</sup>

To help mitigate health concerns related to COVID-19, CDC also tells schools to ensure that “restroom exhaust fans are functional and operating at full capacity when the building is occupied” and to “[i]nspect and maintain local exhaust ventilation in areas such as restrooms, kitchens, cooking areas, etc.”<sup>38</sup>

Language for bargaining and other labor-management engagement:

*The [district/school] shall regularly inspect exhaust fans in health offices, isolation rooms, restrooms and other high-concern areas and ensure that they are functional, operating at full capacity, and safely exhausting to the outside when the building is occupied.*

*The [district/school] shall ensure that isolation rooms and nurses’ offices operating in isolation mode are maintained with appropriate negative air pressure, are supplied with 100 percent outside air, and safely exhaust air directly outside the building. When such design is not achievable, the [district/school] shall supply temporary nurse station trailers that are appropriately equipped and ventilated.*

## **2. Maintain negative pressure ventilation in high-risk locations**

As mentioned earlier, air naturally flows from areas of high air pressure to areas of lower air pressure. In the context of HVAC systems and the novel coronavirus, paying attention to negative and positive air pressure is important, as a space with positive air pressure can force air from that space into surrounding spaces. On the other hand, if there is a room under negative air pressure, the air in the space will not be forced outward. And here is why it matters: In indoor spaces used to treat suspected or confirmed cases of COVID-19— isolation rooms or health offices—it is safer to have negative air pressure.

For nurses’ offices and isolation rooms, ASHRAE indicates they should both be under negative pressure.<sup>39</sup> (Anterooms should be under positive pressure.)

Language for bargaining and other labor-management engagement:

*The [district/school] shall evaluate the air pressure in all spaces used to treat suspected or confirmed illnesses, isolation of individuals with confirmed or suspected illnesses, and restrooms. Appropriate negative air pressure shall be maintained.*

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<sup>37</sup> U.S. Environmental Protection Agency, “Health Officer and School Nurse Checklist from Indoor Air Quality Tools for Schools.” <https://www.epa.gov/iaq-schools/health-officer-and-school-nurse-checklist-indoor-air-quality-tools-schools>. Accessed: September 24, 2020.

<sup>38</sup> Centers for Disease Control and Prevention, “Strategies for Protecting K-12 School Staff from COVID-19,” updated October 21, 2020. [https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP\\_1\\_USCDC\\_10\\_4-DM35971](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP_1_USCDC_10_4-DM35971). Accessed: October 21, 2020.

<sup>39</sup> ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

### 3. Ensure appropriate separation between air intakes and exhaust outlets

Whether or not an exhaust system is for a high-risk area, it is important to make sure an HVAC system's air intake and exhaust are safely spaced. ASHRAE indicates that, generally, a minimum of 10 feet between air intakes and exhaust outlets is necessary to prevent or limit HVAC systems from pushing contaminants out but drawing them in again and recirculating them.<sup>40</sup>

Language for bargaining and other labor-management engagement:

*The [district/school] shall evaluate the location of all air intakes and exhaust outlets and ensure that they are spaced at least 10 feet apart.*

#### D. Increase outside airflow

The recommendation to increase outside air flow comes from CDC, the National Institute for Occupational Safety and Health (NIOSH), which is part of CDC, and ASHRAE.<sup>41</sup> Behind it is this: As long as it can be done safely, bringing in more outside air dilutes contaminated air and decreases the likelihood that someone will breathe in an amount of the novel coronavirus sufficient to cause COVID-19. It is not necessarily feasible to seek 100 percent outdoor air through HVAC systems in general-use areas, in part because systems may not be designed to achieve that goal and because outside temperature, humidity, and air quality could make it impossible for some systems to function effectively without recirculating at least some inside air.<sup>42</sup> On the other hand, isolation rooms and nurses' offices operating in isolation mode are recommended to have 100 percent outside air.<sup>43</sup>

NIOSH puts the need for increased outside airflow this way: "Adequate supply of outdoor air, typically delivered through the HVAC system, is necessary in any office environment to dilute

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<sup>40</sup> Local codes should be consulted to ensure that required distance between intakes and exhaust outlets exist. ASHRAE, "Reopening of Schools and Universities." <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

<sup>41</sup> CDC indicates, "Increase outdoor air ventilation, using caution when outdoor air quality is low." Centers for Disease Control and Prevention, "Strategies for Protecting K-12 School Staff from COVID-19," updated October 21, 2020. [https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP\\_1\\_USCDC\\_10\\_4-DM35971](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP_1_USCDC_10_4-DM35971). Accessed: October 21, 2020.

"ASHRAE says, "The underlying effort of the designer should be to increase outside air to the spaces and treat return air. The designer should also be concerned with mechanical filtration of the supply air and maintaining indoor comfort as defined by the design temperature and relative humidity." CDC says, "Consider ventilation system upgrades or improvements and other steps to increase the delivery of clean air and dilute potential contaminants in the school." ASHRAE, "Reopening of Schools and Universities." <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020. Centers for Disease Control and Prevention, "Operating Schools during COVID-19: CDC's Considerations," updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020.

<sup>42</sup> In guidance for office buildings, for example, CDC indicates, "the percentage of outdoor air, (e.g., using economizer modes of HVAC operations) potentially as high as 100% (first verify compatibility with HVAC system capabilities for both temperature and humidity control as well as compatibility with outdoor/indoor air quality considerations)." Centers for Disease Control and Prevention, "COVID-19 Employer Information for Office Buildings," updated September 11, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/office-buildings.html>. Accessed: October 21, 2020.

<sup>43</sup> ASHRAE, "Reopening of Schools and Universities." <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

pollutants that are released by equipment, building materials, furnishings, products, and people.”<sup>44</sup> In this context, doing it “safely” refers to ensuring that the outside air is properly filtered, so that wildfire smoke, pollen, or other contaminants don’t cause or exacerbate building occupants’ health concerns.

While bringing outside air into a building is the goal, just opening doors and windows may not be sufficient. In fact, while doing so may be helpful, it could also potentially cause problems, according to NIOSH, because the air may not circulate to all indoor areas, it may be unfiltered and contain pollen, dust, or other contaminants, and it may negatively affect an HVAC system’s ability to control temperature and humidity.<sup>45</sup>

Keep in mind that the overall goal of improving indoor air quality may be appropriately addressed, in part, by increasing the flow of clean outside air, but that it can also be addressed, in part, by limiting the number of people in particular spaces. The EPA recognizes this in a COVID-19-related reminder: “Increasing ventilation with all or mostly outside air may not always be possible or practical. In such cases, the effective rate of ventilation per person can also be increased by limiting the number of people present in the building in general, or in specific rooms.”<sup>46</sup>

Language for bargaining and other labor-management engagement:

*The [district/school] shall evaluate opportunities to safely increase the flow of clean outside air to all indoor spaces and shall maximize the flow of clean outside air to such spaces to the extent that it can be done safely and effectively. Necessary adjustments to HVAC systems, consistent with system specifications, shall be made to achieve this goal.*

### **1. Disable demand-controlled ventilation**

Demand-controlled ventilation (DCV) is a feature of HVAC systems designed to adjust how much outside air is brought into an inside space depending on how many people are in the space. With DCV, more people in a space can automatically lead to larger quantities of outdoor air being brought in, but the reverse can also be true: Fewer people in a space can lead to less outside air.

This recommendation is also from ASHRAE and CDC.<sup>47</sup> Here is what is behind it. DCV makes sense as a way to decrease energy usage when a building or classroom is not being used or when it is not being used to capacity, because it automatically reduces how hard the system works. In the context of COVID-19, though, limiting outside air when occupancy is low may lead to less-safe conditions, because there is less outside air diluting indoor air that is potentially contaminated with the novel coronavirus.

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<sup>44</sup> The National Institute for Occupational Safety and Health, “Indoor Environmental Air Quality.” <https://www.cdc.gov/niosh/topics/indoorenv/hvac.html>. Accessed: September 22, 2020.

<sup>45</sup> Ibid.

<sup>46</sup> U.S. Environmental Protection Agency, “Ventilation and Coronavirus (COVID-19).” <https://www.epa.gov/coronavirus/ventilation-and-coronavirus-covid-19>. Accessed: October 21, 2020.

<sup>47</sup> Centers for Disease Control and Prevention, “Operating Schools during COVID-19: CDC’s Considerations,” updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020. ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

As you approach this issue, keep in mind that DCV can take many forms, so what needs to be done to disable it will vary. For example, DCV could be based on occupancy or carbon dioxide levels, it may be on a timer, or it may be based on the weather.

The simplest way to address this issue will be to ask which specific systems have what type of DCV, and then ask for confirmation that they have been switched off. Although you don't really need to understand the specific systems in order to know that they have been disabled, knowing this information can be very useful when turning DCV back on or determining if adjustments can or should be made, because you will be able to think that through based on how the space is utilized. It will also be important when considering if a particular DCV system can be activated during certain hours; it may make sense for a system on a timer to be activated from midnight to 4:00 a.m. (for example), whereas a system based on an occupancy measure may need to be off entirely, because you wouldn't want the system to kick on in the late afternoon when the building was occupied by fewer people.

Language for bargaining and other labor-management engagement:

*The [district/school] shall ensure that demand-controlled ventilation (DCV) is disabled.*

## **2. Further open minimum outdoor air dampers as conditions permit**

A damper is part of an air-distribution system that modifies the amount of air flow, either increasing or decreasing the amount of air entering a system/building or shutting it off completely. Often, an HVAC system will be set to mix outside air with air recirculated from within a building, so that the air coming through vents into a room is a combination of the two. In the context of this recommendation, more (safe) outside air being brought in and mixed with recirculated air is better, so opening the damper to allow for more outside air—that is, to reduce the amount of air being recirculated from indoor spaces—can be helpful.

ASHRAE and CDC agree on the recommendation to open dampers. ASHRAE says to consider opening outdoor air dampers fully as indoor and outdoor conditions permit,<sup>48</sup> while CDC notes that the goal of adjusting dampers is “to reduce or eliminate HVAC air recirculation.”<sup>49</sup> Both recognize that this is easier to do in milder weather. When outside air is too cold, for example, too much outside air could freeze the system's heating/cooling coils.

Here is why the recommendations refer to milder weather: If it is extremely cold or hot, an HVAC system might not work properly if too much outside air is brought in.

Ask for a report on the settings for all systems that bring in outside air:

- Which systems have dampers for outside air?
- Are damper settings adjusted manually or remotely?
- What are the current settings for dampers?

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<sup>48</sup> ASHRAE, “ASHRAE Position Document on Infectious Aerosols,” April 14, 2020, p. 10. [https://www.ashrae.org/file%20library/about/position%20documents/pd\\_infectiousaerosols\\_2020.pdf](https://www.ashrae.org/file%20library/about/position%20documents/pd_infectiousaerosols_2020.pdf). Accessed: September 24, 2020.

<sup>49</sup> Centers for Disease Control and Prevention, “Operating Schools during COVID-19: CDC's Considerations,” updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020. ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

- Can you get a copy of the written rules for how often and under what conditions dampers will be adjusted?
- How are environmental factors (like pollen counts) worked into damper-adjustment rules?
- Is there a history of malfunctioning or complaints?

Language for bargaining and other labor-management engagement:

*The [district/school] shall ensure that outdoor dampers are opened to 100 percent as indoor and outdoor conditions permit. [District/school] shall maintain an up-to-date list of dampers that are not open to 100 percent.*

### **3. Use fans safely to draw in fresh air from open windows and doors**

When windows are used as a means of natural ventilation, consider ways to enhance their effectiveness, and ensure that it is done safely. For example, as CDC points out, “strategic window fan placement in exhaust mode can help draw fresh air into room via other open windows and doors without generating strong room air currents.”<sup>50</sup> In this context, it is important to recall CDC’s warning, noted above, that care must be taken not to allow open windows in other rooms to cause potentially contaminated air to be drawn from one person to another.<sup>51</sup> It is important to be aware of where the makeup air comes from, because, for example, an exhaust fan in a classroom could potentially pull air from a bathroom or nurse’s office directly across the hall that has its own window open.

When fans are being used to enhance exhaust, ask about procedures for ensuring that fans are positioned securely and carefully and that they are checked for proper placement. Ask about training or other materials to ensure that staff setting up fans do so safely and in a way that does not circulate potentially contaminated air from one person to another.

In addition, be careful that open windows and doors do not undermine the integrity of an existing HVAC system by, for example, changing the system’s intended air flow or the air pressure in particular locations.

Language for bargaining and other labor-management engagement:

*Where mechanical ventilation is insufficient, the [district/school] shall provide fans and ensure they are safely installed to enhance air flow and air exhaust, and shall ensure that they do not induce contaminated air flow from one person to another.*

## **V. Improve air filtration**

As noted above, HVAC systems generally mix outside air and recirculated air and distribute it throughout a space or building. Another important part of the ventilation process is filtration, or “cleaning” of the air before it is recirculated. There are several ways to filter indoor air.

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<sup>50</sup> Centers for Disease Control and Prevention, “Operating Schools during COVID-19: CDC’s Considerations,” updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020.

<sup>51</sup> Ibid.

## A. Use more-protective filters when possible

Filters work by allowing air to pass through while removing particles. How well they achieve that goal depends on many factors, including the type of particles they are designed to capture (that is, how “efficient” they are designed to be), how old or used they are (their service life), and whether they fit properly. CDC recommends: “Increase air filtration to as high as possible without significantly diminishing design.”<sup>52</sup>

Air filter efficiency is commonly measured by the Minimum Efficiency Reporting Value (MERV) rating system under standard conditions, on a scale from 1 to 20. A filter with a MERV rating of 17 or higher is a high efficiency particulate air (HEPA) filter. The higher the MERV, the more efficient the filter. According to ASHRAE, a filter with a MERV rating of 13 or higher is efficient at capturing viruses, although a MERV rating of 14 is preferred.<sup>53</sup> According to ASHRAE, MERV 13 filters are least 85 percent efficient at capturing droplets and aerosols of the size of concern related to the novel coronavirus, while MERV 14 filters are at least 90 percent efficient at capturing those particles.<sup>54</sup> HEPA filters are more than 99.97 percent efficient at capturing airborne viral particles associated with the novel coronavirus, according to ASHRAE.<sup>55</sup>

Keep in mind that more efficient filters can cause the pressure in an HVAC system to drop, because less air passes through the filter, and that can cause the system to be damaged or to perform poorly. The maximum MERV rating that a system can handle depends on the system specifications, so find out from a qualified HVAC professional, manufacturer’s material, engineer, or other knowledgeable source what the maximum MERV rating is for your system or systems.

Language for bargaining and other labor-management engagement:

*The [district/school] shall use MERV 13 or higher filters or the most-protective filters possible given system capacities. Filters shall be changed according to the manufacturer’s recommended schedule.*

## B. Make sure filters fit properly and are within their service life

If a filter doesn’t fit, air can get through the system—and into a building—without being filtered. This problem is called “filter bypass,” and you should ask about whether filters have been checked for proper fit. CDC recommends: “Inspect filter housing and racks to ensure appropriate filter fit

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<sup>52</sup> Centers for Disease Control and Prevention, “Strategies for Protecting K-12 School Staff from COVID-19,” updated October 21. [https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP\\_1\\_USCDC\\_10\\_4-DM35971](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP_1_USCDC_10_4-DM35971). Accessed: October 21, 2020.

<sup>53</sup> ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020. Note that some sellers of filters may use their own efficiency rating system. Home Depot, for instance, uses what it calls the “Filter Performance Rating (FPR) system, but notes, “While The Home Depot uses FPR, the industry standard is to use the air filter rating system of Minimum Efficiency Reporting Value (MERV).” If you are provided with efficiency ratings other than MERV, ask for a conversion to MERV.

Home Depot. <https://www.homedepot.com/c/ab/best-air-filters-for-your-home/9ba683603be9fa5395fab90e10394fb>. Accessed: September 24, 2020.

<sup>54</sup> ASHRAE, “Filtration and Disinfection FAQ,” <https://www.ashrae.org/technical-resources/filtration-and-disinfection-faq>. Accessed: October 5, 2020.

<sup>55</sup> Ibid.

and check for ways to minimize filter bypass” and “Check filters to ensure they are within service life and appropriately installed.”<sup>56</sup> Filters can be sealed to minimize bypass.

If filters are beyond their service life—if they have not been replaced according to the manufacturer’s recommendations and are overused or damaged—they will also be less efficient. Depending on conditions, filters may or may not need to be replaced frequently, so you should ask about filter-change schedules during various seasons. (If pollen counts tend to be high during a particular month, for example, filters may need to be changed more frequently in that time period.)

Custodial/maintenance staff must use appropriate personal protective equipment (PPE) when checking or replacing filters, according to CDC.<sup>57</sup> Using appropriate PPE and taking precautions in handling and disposing of old filters is important to limit staff and other building occupants’ exposure to contaminants.

Language for bargaining and other labor-management engagement:

*The [district/school] shall ensure that all filters properly fit and are within their service lives.*

*The [district/school] shall provide necessary personal protective equipment (PPE) to staff checking and/or changing filters in HVAC or other systems and shall provide necessary equipment to safely transport and dispose of old filters.*

### **C. Consider portable air cleaners with high efficiency particulate air (HEPA) filters**

CDC recommends that schools “Consider portable high-efficiency particulate air (HEPA) fan/filtration systems to help enhance air cleaning (especially in higher risk areas such as nurse’s office).”<sup>58</sup> Such filters can be particularly helpful when mechanical systems like HVAC systems are not present or not functioning or where particular concerns for filtration exist, as in nurses’ offices, isolation rooms, and bathrooms. The appropriate portable HEPA filtration system will depend on the space, so selection of a system should be done after an assessment by a qualified professional.

Language for bargaining and other labor-management engagement:

*The [district/school] shall provide portable high efficiency particulate air (HEPA) filtration systems where HVAC systems are unavailable or incapable of providing adequate air quality.*

### **D. Consider the cost, safety, and potential benefits of ultraviolet germicidal irradiation**

CDC describes ultraviolet germicidal irradiation (UVGI) as “a disinfection tool used in many different settings, such as residential, commercial, educational, and healthcare.” It suggests, “Consider using ultraviolet germicidal irradiation (UVGI) as a supplement to help inactivate

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<sup>56</sup> Centers for Disease Control and Prevention, “Strategies for Protecting K-12 School Staff from COVID-19,” updated October 21, 2020. [https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP\\_1\\_USCDC\\_10\\_4-DM35971](https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/k-12-staff.html?deliveryName=FCP_1_USCDC_10_4-DM35971). Accessed: October 21, 2020.

<sup>57</sup> Ibid.

<sup>58</sup> Ibid.

SARS-CoV-2, especially if options for increasing room ventilation are limited.”<sup>59</sup> The technology uses ultraviolet (UV) energy to inactivate (kill) microorganisms, including viruses, when designed and installed correctly.”<sup>60</sup> CDC indicates that UVGI does kill the virus that causes COVID-19.<sup>61</sup>

UVGI functions by inactivating viruses in the air and on surfaces. UVGI can be installed on walls and ceilings focused up and away from people or in HVAC systems (including ducts, coils, and drain pans). Other, emerging UVGI or other technologies also exist but need to be assessed more fully before their functionality in responding to the pandemic is clear. UVGI should not be considered an alternative to developing and implementing a cleaning and disinfection plan. The cost, safety, and potential benefits need to be analyzed carefully on their own and in context of opportunity costs.

Language for bargaining and other labor-management engagement:

*The [district/school] shall explore the viability of supplementing other indoor air quality measures with ultraviolet germicidal irradiation (UVGI) and shall provide a written report on the cost, safety, and potential benefits in specific locations.*

## **VI. Ensure that environmental conditions like temperature and humidity minimize risk**

ASHRAE indicates in its school and university guidance, broadly, to “Maintain proper indoor air temperature and humidity to maintain human comfort, reduce potential for spread of airborne pathogens and limit potential for mold growth...”<sup>62</sup> Recommended air temperature ranges are, generally, from 68 degrees to 78 degrees Fahrenheit.<sup>63</sup> ASHRAE recommends relative humidity of between 40 percent and 60 percent.<sup>64</sup> Given that temperature and humidity recommendations depend on seasons and locations within schools, advocating for a single temperature or relative humidity may not make sense. Instead, ensure that temperature and relative humidity are part of formal IAQ planning and that qualified professionals determine what they should be to minimize the spread of the novel coronavirus and other biological contaminants. Make sure you receive reports on how this is done.

If applicable, check to make sure in-room thermostats are functioning properly.

Language for bargaining and other labor-management engagement:

*The [district/school] shall maintain temperature and humidity at recommended levels for indoor spaces (generally 68 degrees to 78 degrees Fahrenheit and relative humidity of between 40 percent and 60 percent, depending on the space).*

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<sup>59</sup> Centers for Disease Control and Prevention, “Operating Schools during COVID-19: CDC’s Considerations,” updated September 1, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/schools.html>. Accessed: September 24, 2020.

<sup>60</sup> Centers for Disease Control and Prevention, “General Business Frequently Asked Questions,” updated September 14, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/community/general-business-faq.html>. Accessed: October 5, 2020.

<sup>61</sup> Ibid.

<sup>62</sup> ASHRAE, “Reopening of Schools and Universities.” <https://www.ashrae.org/technical-resources/reopening-of-schools-and-universities>. Accessed: September 24, 2020.

<sup>63</sup> In this context, ASHRAE is referring to “dry bulb” temperature, air temperature measured with a thermometer exposed to the open air. Ibid.

<sup>64</sup> Ibid.

## VII. Compilation of language for bargaining and other labor-management engagement

- 1) Use collective bargaining or other forms of labor-management engagement where bargaining over indoor air quality is not possible. Use existing or repurposed committees, or create new ones.**

*A joint labor-management indoor air quality committee will be created at the district level and in every building. The committee will facilitate, monitor, research, and recommend solutions to indoor air quality issues and concerns. Employee concerns will be tracked as reported on physical hazard notification forms and employee logs, leading to investigation and resolution. Independent testing groups shall be jointly selected by the Association and the district. The district will remediate indoor air quality issues in conjunction with the joint indoor air quality committee.*

*The [name of committee] shall also be responsible for indoor air quality. Among other necessary work, it shall facilitate, monitor, research, and recommend solutions to indoor air quality issues and concerns. Employee concerns will be tracked by the committee as reported on physical hazard notification forms and employee logs, leading to investigation and resolution. Independent testing groups shall be jointly selected by the Association and the district. The district will remediate indoor air quality issues in conjunction with the joint labor-management indoor air quality committee.*

- 2) Obtain existing reports or analyses of HVAC systems to develop a baseline on ventilation issues. If they don't already exist, push for them to be completed.**

*The [district/school] shall conduct an audit of indoor air quality by [add date] and provide the results to the Association as soon as they are available.*

*The [district/school] shall provide to the Association copies of all new HVAC system reports and reports from the prior two years.*

*The [district/school] shall ensure that trained professionals conduct regular [monthly, for example] air quality inspections in all buildings and rooms, including air change rate, humidity, and temperature, as well as negative pressure in health rooms, isolation rooms, and bathrooms.*

- 3) Conduct building walkthroughs and talk with colleagues about ventilation problems.** The EPA recognizes this as an important step for improving IAQ (EPA, “Background Information for Walkthrough).” The goal of a building walkthrough and talking to colleagues is to talk about, see, smell, hear, or feel indications that the HVAC system is not functioning properly or that other ventilation problems are occurring.

*In coordination with the Association, the [district/school] shall conduct a building walkthrough prior to the resumption of in-person instruction to identify ventilation problems and potential solutions. When in-person instruction resumes, walkthroughs shall take place [monthly]. All walkthroughs shall include Association representatives, administrators, and HVAC/ventilation experts.*

- 4) Integrate awareness of racial and social inequities into indoor air quality solutions.** Without an intentional focus on understanding how race and other social factors play into exacerbating IAQ problems in public schools, we could see a continuation of negative outcomes in school districts that primarily serve students of color (NASEM, “Reopening K-12 Schools”).

*The [district/school] and Association shall conduct an impact assessment to determine how and where racial and social inequities affect indoor air quality in the district, and they shall provide expedited solutions to address such inequities in the development of any indoor air quality initiative. Building-by-building assessments of demographics and ventilation shall be part of this process.*

- 5) Ensure that air changes happen frequently enough.** Air changes per hour (ACH) refers to how many times the air volume in a space is replaced with filtered or outdoor air. It is important that indoor spaces meet at least minimal ACH goals (ASHRAE, “Re-Opening Our Schools”) and that sufficient fresh air is provided (EPA, “Heating, Ventilation and Air-Conditioning Systems”).

*The [district/school] shall ensure that classrooms have six air changes per hour and a minimum of 15 cubic feet per minute per person of fresh air, or, if higher, the targets set by state or local requirements.*

- 6) Flush HVAC systems by running them earlier and longer than usual.** Under pandemic conditions, experts recommend that HVAC systems run earlier and longer than usual, to more effectively remove potentially contaminated air. CDC and ASHRAE recommend starting systems two hours before the buildings they serve will be occupied and keeping them running until two hours after they have been occupied (ASHRAE, “Reopening of Schools and Universities”) and CDC, “Operating schools during COVID-19).

*The [district/school] shall start HVAC systems at least two hours before and after buildings will be or are occupied.*

- 7) Ensure that mechanical or other exhaust systems work effectively.** Inside air has to be effectively removed—exhausted—from the inside space. ASHRAE includes checking that exhaust systems are working as intended in its list of COVID-19-related monthly system checks and verifications list. CDC calls attention to the need to make sure that exhausting inside air is done safely (ASHRAE, “Epidemic Task Force”) and CDC, “Strategies for Protecting K-12 School Staff”).

*The [district/school] shall ensure on a monthly basis that all system exhaust functions are operating as intended and are not drawing potentially contaminated air from areas with an increased risk of having contaminated air, such as health offices, isolation rooms, and restrooms.*

- 8) Check and adjust localized mechanical exhaust systems. Exhaust isolation rooms and nurse’s offices directly outside. Provide temporary nurse station trailers when necessary.** CDC calls for checking localized exhaust systems, like for bathrooms and health offices, and for exhaust systems to be fully functional (CDC, “Strategies for Protecting K-12 School Staff”). ASHRAE calls for high-risk areas to exhaust directly to the outside, for nurses’ offices

operating in isolation mode have 100 percent outside air, and for temporary nurse station trailers when retrofits are not possible (ASHRAE, “Reopening of Schools and Universities”). The EPA notes that health officers should be located in areas in which “air removed from the health office is separated from the ventilation system to avoid affecting other occupied areas of the school” (EPA, “Health Officer and School Nurse Checklist”).

*The [district/school] shall regularly inspect exhaust fans in health offices, isolation rooms, restrooms and other high-concern areas and ensure that they are functional and operating at full capacity.*

*The [district/school] shall ensure that isolation rooms and nurses’ offices operating in isolation mode are maintained with appropriate negative air pressure, are supplied with 100 percent outside air, and safely exhaust air directly outside the building. When such design is not achievable, the [district/school] shall supply temporary nurse station trailers that are appropriately equipped and ventilated.*

- 9) Maintain negative pressure ventilation in high-risk locations.** In the context of HVAC systems and the novel coronavirus, paying attention to negative and positive air pressure is important, as a space with positive air pressure can force air from that space into surrounding spaces. In indoor spaces used to treat suspected or confirmed cases of COVID-19— isolation rooms or health offices—it is safer to have negative air pressure (ASHRAE, “Reopening of Schools and Universities”).

*The [district/school] shall evaluate the air pressure in all spaces used to treat suspected or confirmed illnesses, isolation of individuals with confirmed or suspected illnesses, and restrooms. Appropriate negative air pressure shall be maintained.*

- 10) Ensure appropriate separation between air intakes and exhaust outlets.** ASHRAE indicates that, generally, a minimum of 10 feet between air intakes and exhaust outlets is necessary to prevent or limit HVAC systems from pushing contaminants out but drawing them in again and recirculating them (ASHRAE, “Reopening of Schools and Universities”).

*The [district/school] shall evaluate the location of all air intakes and exhaust outlets and ensure that they are spaced at least 10 feet apart.*

- 11) Increase outside airflow.** As long as it can be done safely, bringing in more outside air dilutes contaminated air and decreases the likelihood that someone will breathe in an amount of the novel coronavirus sufficient to cause COVID-19. CDC, NIOSH, and ASHRAE all make this recommendation (CDC, “Strategies for Protecting K-12 School Staff” and ASHRAE, “Reopening of Schools and Universities”).

*The [district/school] shall evaluate opportunities to safely increase the flow of clean outside air to all indoor spaces and shall maximize the flow of clean outside air to such spaces to the extent that it can be done safely and effectively. Necessary adjustments to HVAC systems, consistent with system specifications, shall be made to achieve this goal.*

- 12) Disable demand-controlled ventilation (DCV).** Demand-controlled ventilation (DCV) is a feature of HVAC systems designed to adjust how much outside air is brought into an inside space depending on how many people are present. CDC and AHRAE agree that limiting outside air when occupancy is low may lead to less-safe conditions (CDC, “Operating schools

during COVID-19” and ASHRAE, “Reopening of Schools and Universities.” ASHRAE, “Reopening of Schools and Universities”).

*The [district or school] shall ensure that demand-controlled ventilation (DCV) is disabled.*

- 13) Further open minimum outdoor air dampers as conditions permit.** ASHRAE and CDC agree on the recommendation to open dampers to increase outside airflow (ASHRAE, “Position Document on Infectious Aerosols” and CDC, “Operating schools during COVID-19”).

*The [district/school] shall ensure that outdoor dampers are opened to 100 percent as indoor and outdoor conditions permit. [District/school] shall maintain an up-to-date list of dampers that are not open to 100 percent.*

- 14) Use fans safely to draw in fresh air from open windows and doors.** Fans must be securely placed, windows and doors must be safely kept open, and, as the CDC warns, care must be taken not to allow open windows in other rooms to cause potentially contaminated air to be drawn from one person to another (CDC, “Operating Schools during COVID-19”).

*Where mechanical ventilation is insufficient, the [district/school] shall provide fans and ensure they are safely installed to enhance air flow and air exhaust, and shall ensure that they do not induce contaminated air flow from one person to another.*

- 15) Improve air filtration by using more-protective filters when possible.** Filters work by allowing air to pass through while removing particles. CDC recommends: “Increase air filtration to as high as possible without significantly diminishing design” (CDC, “Strategies for Protecting K-12 School Staff”). According to ASHRAE, a filter with a MERV rating of 13 or higher is efficient at capturing viruses, although a MERV rating of 14 is preferred (ASHRAE, “Reopening of Schools and Universities”).

*The [district/school] shall use MERV 13 or higher filters or the most-protective filters possible given system capacities. Filters shall be changed according to the manufacturer’s recommended schedule.*

- 16) Make sure filters fit properly and are within their service life.** If a filter doesn’t fit, air can get through the system—and into a building—without being filtered. If filters are beyond their service life—if they have not been replaced according to the manufacturer’s recommendations and are overused or damaged—they will also be less efficient (CDC, “Strategies for Protecting K-12 School Staff”).

*The [district/school] shall ensure that all filters properly fit and are within their service lives.*

*The [district/school] shall provide necessary personal protective equipment (PPE) to staff checking and/or changing filters in HVAC or other systems and shall provide necessary equipment to safely transport and dispose of old filters.*

- 17) Consider portable air cleaners with high efficiency particulate air (HEPA) filters.** CDC recommends that schools “Consider portable high-efficiency particulate air (HEPA) filtration

systems to help enhance air cleaning (especially in higher risk areas such as nurse’s office)” (CDC, “Strategies for Protecting K-12 School Staff”).

*The [district/school] shall provide portable high efficiency particulate air (HEPA) filtration systems where HVAC systems are unavailable or incapable of providing adequate air quality.*

- 18) Consider the cost, safety, and potential benefits of ultraviolet germicidal irradiation (UVGI).** UVGI should not be considered an alternative to developing and implementing a cleaning and disinfection plan. The cost, safety, and potential benefits need to be analyzed carefully on their own and in context of opportunity costs (CDC, “Operating Schools during COVID-19”).

*The [district/school] shall explore the viability of supplementing other indoor air quality measures with ultraviolet germicidal irradiation (UVGI) and shall provide a written report on the cost, safety, and potential benefits in specific locations.*

- 19) Ensure that environmental conditions like temperature and humidity minimize risk.** ASHRAE indicates, broadly, that it is important to ensure that indoor air temperature and humidity reduce potential for the spread of airborne pathogens, and it provides a range of generally applicable goals (ASHRAE, “Reopening of Schools and Universities”). Advocating for a single temperature or relative humidity may not make sense.

*The [district/school] shall maintain temperature and humidity at recommended levels for indoor spaces (generally 68 degrees to 78 degrees Fahrenheit and relative humidity of between 40 percent and 60 percent, depending on the space).*

## **VIII. Authoritative citations and additional resources**

### **A. Authoritative citations**

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## B. Additional resources

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