American Lung Association.

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Better Indoor Air Quality Management to Help Reduce COVID-19 and Other Disease Transmission in Buildings: Technical Assistance Needs and Priorities to Improve Public Health

Dear Ms. Smith and Mr. Lee:

Thank you for the opportunity to comment on the federal government's efforts to improve the quality of indoor air in buildings. The American Lung Association is the leading organization working to save lives by improving lung health and preventing lung disease, through research, education and advocacy. We have been championing clean air for all, indoors and out, for over 40 years. We are supportive of the administration's "clean air in buildings challenge" which aims to improve indoor air quality and reduce disease transmission through improved ventilation and filtration. If put into action, this program will reduce exposure to particles and contaminants and improve human health.

Overall, the federal government's approach to building health and indoor air quality should be comprehensive and government wide. Focusing solely on reducing the risk of disease transmission risks leaving other serious IAQ problems untouched. All activities to mitigate disease transmission should be carried out with awareness about the unintended consequences. For example, applying exhaust strategies to an environment may well reduce airborne disease exposure, but it could also easily affect airflow in a way that could increase exposure to indoor radon. Specific answers to questions are below.

3.1 In your opinion, what approach(es) could the Federal government consider deploying to move decision makers/owners/managers toward making and sustaining improved ventilation, filtration, and air cleaning practices to reduce the risk of disease transmission?

Managing indoor air quality presents unique challenges since each building has its own self-contained environment and corresponding unique challenges. As you work to incentivize decision makers/owners/managers, we suggest the following good practices:

- provide clear, accurate information about steps that could be taken in specific circumstances, and for each, information about their anticipated effectiveness, pros and cons, and estimated costs.
- provide resources to do the work—this can be funding itself, means of accessing funding, financial instruments and tools, or guidance on how to find and work with appropriate contractors.
- make well-equipped professional-level consultation available that goes beyond what is covered in the foundational documents to air quality managers. A combination of

confidential dialogue, public FAQs, and a publicly shared listserv where others can learn from questions posed and the corresponding replies are good examples of this kind of resource.

3.2 In your opinion, what are the near-term indoor air quality related actions that could help schools respond to a COVID-19 disease surge?

A 2020 study from the U.S. Government Accountability Office shows 41 percent of schools need to update or replace their ventilation systems and many are in disrepair[1]. Research has shown that poor indoor air quality is detrimental to student performance and reduces school attendance.

Correspondingly, improving the quality of indoor air has been shown to improve addition skills, number comparison, and reading comprehension. Cleaner air also reduces absenteeism due to lung diseases such as asthma.[2]

There are several variables beyond virus contamination that can cause poor indoor air quality such as mold and chemical infiltration, poor air filtration or air flow and air characteristics such as temperature and moisture (humidity) levels. Air pollutants can be gases or particles—carbon dioxide and carbon monoxide are the most common gas contaminants. Carbon monoxide may come from improperly vented furnaces or exhausted fumes returning into the building. Carbon dioxide mostly comes from exhaled air from students and teachers in the classroom and can be compounded with poor ventilation.

To comprehensively fix these issues, it is necessary for some schools to address decades of deferred maintenance keeping the overall needs of the school in mind. For example, these can be as simple as identifying long-standing problems with respect to the physical building—what is needed for HVAC system refurbishment and roofing repairs, for example, that can show up as often combined problems of moisture and mold growth in poorly ventilated areas of buildings. Comprehensive plans (including funding, timetables, and commitments to accomplish the work) regarding addressing the problems thus identified can be developed.

When deciding on mitigations needed, the following principles apply:

- a simple professional walkthrough assessment, with active cooperation of the building management, can routinely identify the significant IAQ problems in a building and their root causes. If funding is inadequate to support even this, a suitably motivated building manager could conduct their own walkthrough using a resource such as the EPA's Indoor Air Quality Tools for Schools guidance.
- clear sources of indoor air pollution should be identified and addressed (e.g., via means such as elimination, removal, reduction, substitution, or administrative controls).

[1] K-12 Education: School Districts Frequently Identified Multiple Building Systems Needing Updates or Replacement. US Government Accountability Office. June 2020. Accessed at https://www.gao.gov/assets/gao-20-494.pdf.

[2] Ransom MR, Pope CA III. Elementary school absences and PM10 pollution in Utah Valley. Environ Res 1992;58:204–219.

- adequate ventilation, both general and local, is key and should be considered one of the paramount things to assess and then ensure.

The COVID-related approaches for minimizing the potential for transmission are increasingly better characterized, both as to their effectiveness and as to their costs. Whatever become the primary information sources (for example, the Centers for Disease Control and Prevention (CDC), recommended "layered approach[3]" along with The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE's) building operations guidance[4]) need to pass an expedited but rigorous confirmation process after which they are referenced as the standards against which proposed interventions should be evaluated for implementation. Such documentation should also be subject to review and revision on a scheduled and frequent basis.

3.3 In your opinion, over the longer term, how can ventilation, filtration and air cleaning improvements be prioritized and made standard practices in building design, construction, commissioning, renovation, and operations and maintenance efforts (*e.g.*, building code adoption, training or other efforts to sustain proper practices such as operation and maintenance of HVAC systems as designed, weatherization and other retrofit programs)?

In the school setting, voluntary approaches have not been widely successful due to a chronic shortage of funds and the need to prioritize direct investment on students and teachers. Thus, a different and more comprehensive mechanism is needed.

As a general rule, after first ensuring that the decision-makers involved are suitably educated about the issues and trained on how to address them, when measures protective of life and health fail to be adopted and implemented voluntarily as a matter of morality or at least common sense, they need to be supported in stronger ways using both "carrots" (funding, incentives, technical support) and "sticks" (enforceable standards, codes, statutes, regulations).

3.6 In your opinion, what quantifiable metrics or targets could be helpful in evaluating or assessing ventilation, filtration, and air cleaning parameters in a building?

- **What types of tools or technologies could support real time assessment of ventilation, filtration and or air cleaning parameters in a building?**

Every building should be capable of monitoring carbon dioxide levels within the building. Carbon dioxide levels indicate the degree to which a building is being properly ventilated with air from outside. Adequate supply of outdoor air dilutes pollutants that are released by sources inside of the building and living beings (animals and people). ASHRAE standards dictate that indoor CO2 concentrations should be no greater than 700 parts per million (ppm) above outdoor CO2 concentrations.[5] According to the CDC,

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[3] Ventilation in Buildings. Centers for Disease Control and Prevention. June 2 2021. Accessed at https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html

[4] Guidance for Building Operations During the COVID-19 Pandemic. The American Society of Heating, Refrigerating and Air-Conditioning Engineers. May 2, 2020. Accessed at https://www.ashrae.org/file%20library/technical%20resources/ashrae%20journal/2020journaldocuments/72-74_ieq_schoen.pdf

[5] The American Society of Heating, Refrigerating and Air-Conditioning Engineers Informative Appendix D to ANSI/ASHRAE Standard 62.1-2016: Ventilation for Acceptable Indoor Air Quality

this is typically indoor concentrations below 1200 ppm since outdoor CO2 concentrations usually range between 420 to 500 ppm.[6]

In buildings that use combustion sources (such as a gas-powered appliance, or burning other kinds of fuels), carbon monoxide monitoring should be included. Standard procedures are also available to monitor for and prevent release of sewer gases into indoor environments.

- **What qualitative or quantitative features could be helpful in assessing or describing ventilation, filtration, and air cleaning parameters in a building?**

In addition to measurements produced from instrumentation about things such as airborne concentrations and air flow rates, it is important to survey building occupants to assess their sense of air quality adequacy. A problem situation may come to light quite readily simply by asking occupants rather than going to the trouble of a broad monitoring campaign. Questions should be included about thermal comfort and HVAC system noise, since dissatisfaction with either increases the likelihood that occupants will tamper with the system in ways that may decrease its effectiveness.

3.7 In your opinion, what changes would you recommend to the Clean Air in Buildings Challenge best practices document to improve public engagement and participation by a broad set of stakeholders?

We are concerned that the challenge's lack of enforcement renders it less effectual than it could be. Providing some requirements for participation, along with a mechanism for providing resources will assist the administration in achieving its stated goals. Early adopters are likely to perform the work regardless of incentive, so adding additional resources and recognition will ensure entities that would not otherwise perform additional activities.

3.8 In your opinion, how might lessons from the COVID pandemic be useful for long-term efforts to improve ventilation, filtration, air cleaning and other indoor air quality parameters in the nation's building stock?

The pandemic has provided a teaching moment to help people understand that indoor air must be assessed and managed on an ongoing basis. Recognizing that COVID and other contaminants are moved around in the air we breathe reminds us that air quality is something not to be taken for granted.

3.9 What else would you like to note about opportunities and issues that could improve indoor air quality in the nation's building stock?

It is critical to address the issue of how buildings are built and remodeled. While it may not be possible to retrofit all existing structures to meet appropriate standards, doing so in new and redone construction should be an attainable priority. It may take time and involve many moving parts, but such united leadership can result in building standards adopting the changes that are needed to implement those standards

[6] Id.

As the country continues to recover from the pandemic, we support the federal government's focus on indoor air and the importance of ensuring the air we breathe inside is free from pollution of all sorts, including airborne pathogens and the chemical compounds that come from burning fuel inside, as well as the other materials used within the building. A comprehensive approach that does not neglect one aspect of healthy indoor air for the sake of cleaning up another, will ensure Americans are as healthy as possible into the future. Thank you for the opportunity to comment.

Sincerely,

Harold P. Wimmer
National President & CEO