Federal Interagency Committee on Indoor Air Quality (CIAQ) Meeting Minutes

November 17, 2022

Moderator: Laureen Burton, U.S. Environmental Protection Agency (EPA)

Meeting Overview

- Welcome, Announcements and Introductions
- Indoor Air Quality (IAQ) Area of Interest Presentation

The American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE's) IAQ and COVID Guidance for Multifamily Buildings

Chandra Sekhar, Ph.D., Professor, Fellow, ASHRAE & ISIAQ, Department of the Built Environment, College of Design and Engineering, National University of Singapore

Iain Walker, Ph.D., Fellow, ASHRAE, Building Technologies and Urban Systems Division, Lawrence Berkeley National Laboratory

- Federal CIAQ Member Agency Updates (Pages 2–28)

- Post-Meeting Updates and Announcements
    - The next CIAQ meeting is scheduled for February 2023.

Consumer Product Safety Commission (CPSC)

Agency Point of Contact: Charles Bevington, 301-987-2009, cbevington@cpsc.gov

Note: The following comments are those of the CPSC staff and have not been reviewed or approved by, and may not necessarily reflect the view of, the Commission.

This report covers background and recent updates for the project areas below:

- Nanomaterials and 3D Printing
- Portable Generator Safety
- Voluntary Standards Related to IAQ
- Emerging Technologies
- Organohalogen Flame Retardants—Notice of Available Information
- Per- and Polyfluorinated Alkyl Substances Market Use Report—Request for Information
- Gas Ranges—Request for Information
- Notice of Competition for BPA Call Order Contract | Exposure Testing of Consumer Products Used Within Indoor Environments to Support CPSC Exposure Assessments
- Links to New CPSC IAQ Resources

Refer to previous CPSC CIAQ reports for information on project areas that do not have new updates.

Nanomaterials and 3D Printing

Project Contact: Joanna Matheson, 301-987-2564, jmatheson@cpsc.gov

Background

CPSC staff continue to work with other federal agencies and contractors to develop data on the exposure and toxicity of nanomaterials, focusing on (1) developing methods that identify, characterize and quantify nanomaterials in consumer products; (2) developing tools to prioritize nanomaterial research and model potential consumer exposure; and (3) performing literature searches for available toxicology data to assess potential adverse health effects.

New Updates

CPSC Continues to Work With Contractors

Work continues with the University of Cincinnati (UC). Final reports are expected in 2023 on literature reviews to fill data gaps and determine the appropriate dose metrics for *in vivo* and *in vitro* studies for nanosilver, nano titanium dioxide and carbon nanotubes, as well as on emerging nanomaterials (nano alumina, nanocellulose and graphene). Final reports are also expected in 2023 for a risk evaluation of nanosilver released from consumer products (emphasizing spray products) and a white paper on best practices for consideration on the evaluation of nanomaterials released from consumer products. The UC report on a literature review on the applications and uses of fire-retardant (FR) nanomaterials in

consumer products and the potential for consumer exposure was completed in 2022; the report will be posted to the CPSC website in 2023.

CPSC Staff Continues to Work With NIOSH, EPA and NIST

The National Institute for Occupational Safety and Health (NIOSH) is continuing a multiyear project assessing toxicological responses to aerosolized emissions from fused deposition modeling (FDM) 3D printers. The Phase 2 studies are continuing with a focus on (1) characterizing emissions from acrylonitrile butadiene styrene (ABS) and polylactic acid (PLA) filaments with other types of engineered nanoparticles (other than multiwalled carbon nanotubes—MWCNTs); (2) investigating pulmonary and microvascular responses, liver toxicity and neurotoxicity, as well as the biodistribution and biopersistence of emissions, after inhalation of polycarbonate (PC) filament emissions in rats; (3) evaluating responses in a murine experimental model of asthma; and (4) evaluating the toxicological effects on the reproductive system after exposure to PC filament emissions *in vitro* using commercially available human placental cells (Farcas et al. 2022).

Work continues on the NIOSH-EPA collaborative project that evaluates several 3D printers during operation and during feedstock recycling tasks to understand factors that influence release of emissions. Specifically, the aims of this project are to evaluate the influence of fused filament fabrication (FFF) 3D printer design, FFF feedstock filament and recycling of plastics to make filament and FFF 3D printing with recycled filaments. Furthermore, NIOSH is using the information generated from these studies for outreach publications, recognizing the concern for exposures in public and work spaces (Stefaniak 2021, Stefaniak 2022).

EPA is continuing a multiyear collaborative project with NIOSH on characterizing commercially available and commonly purchased FDM filament materials and quantifying the composition and release of organic and inorganic chemicals and materials from FDM printer filaments, waste and printed objects. The Phase 2 and Phase 3 studies continue, including identification of post-print-processing procedures for various FDM filament materials; compositional characterization of products and/or waste materials created from the printing process, as well as substances released from printed products and post-print-modified products under relevant and intended use conditions for the product lifecycle (e.g., microplastic and nanoplastic content); and the determination of product fragility under foreseeable use scenarios.

The National Institute of Standards and Technology (NIST) continues its project on performing a long-term (multiweek) release, accumulation and continuous monitoring study using multiple consumer-grade 3D printers to support downstream exposure assessment.

With the broad federal agency interest in exposure to 3D printer material components and emissions, the National Nanotechnology Coordination Office has proposed including 3D printers in its nanoEHS strategy.

Portable Generator Safety

Project Contact: Janet Buyer, 301-987-2293, jbuyer@cpsc.gov

Background

In November 2016, the CPSC voted to approve a notice of proposed rulemaking (NPR) to reduce the risk of carbon monoxide (CO) poisoning deaths and injuries associated with portable generators. The proposed rule limits portable generator CO emission rates. The proposed rule's CO emission rates are expected to lower the CO emission rate from that of current generators by 90 percent. This is achievable using existing and proven emission-control technologies already in the marketplace. The docket number is CPSC-2006-0057, and the *Federal Register* weblink is available here: https://www.federalregister.gov/documents/2016/11/21/2016-26962/safety-standard-for-portable-generators.

CPSC staff has been participating in voluntary standards development. On January 24, 2018, Underwriters Laboratories (UL) announced that UL 2201 had received ANSI approval (https://www.ul.com/portablegenerators). This standard has a requirement for a reduced CO emission rate of 150 g/hr and a shutoff when CO concentrations around the generator (1 foot above the center of the top surface of the portable generator) reach either an instantaneous reading of 400 parts per million (ppm) or a rolling 10-minute average of 150 ppm. On April 20, 2018, in a separate voluntary standard by the Portable Generator Manufacturers Association (PGMA)—G300 standard*, Safety and Performance of Portable Generators*—also received ANSI approval. This standard has a requirement for a CO sensing shutoff system that will shut off the generator when CO concentrations around the generator (1–2 inches above the center of the top surface of the portable generator) reach either an instantaneous reading of 800 ppm or a rolling 10-minute average of 400 ppm.

CPSC has an interagency agreement with NIST to estimate the effectiveness of the CO hazard-mitigation requirements in these standards. The plan for this evaluation is published in NIST TN 2048 (available online at http://dx.doi.org/10.6028/NIST.TN.2048). The plan was open for public comment from July 9, 2019, to September 9, 2019. CPSC and NIST evaluated the comments and revised the plan before execution. An additional report, NIST TN 2049 (http://dx.doi.org/10.6028/NIST.TN.2049), was published at the same time as the plan. This report documents testing that was done on generators that were shut off using the shutoff criteria in both voluntary standards.

CPSC and NIST evaluated the comments on NIST Technical Note 2048, and, on August 12, 2020, CPSC published a memorandum that documents the revisions to the plan, as well as staff's summaries of all the comments and staff's responses. The memorandum, titled *Revisions to the Plan Documented in NIST technical Note 2048: Simulation and Analysis Plan to Evaluate the Impact of CO Mitigation Requirements for Portable Generators*, can be found at https://www.cpsc.gov/s3fs-public/revisions-to-TN2048-and-comment-resolutions.pdf

New Updates

Staff completed their evaluation of the effectiveness of the voluntary standards and documented the results in a briefing package delivered to CPSC in February 2022, available at https://www.cpsc.gov/s3fs-public/Briefing-Package-on-Portable-Generator-Voluntary-Standards.pdf?VersionId=hLnAkKQ6bCD_SKin8RE6Iax.BjZsB5x3. The staff analysis concluded that the CO mitigation requirements in UL 2201 are more effective than those in PGMA G300-2018. UL 2201 would avert nearly all the deaths and result in relatively few of the survivors sustaining injuries from the reduced CO exposure, compared to PGMA G300-2018 averting about 87 percent of the deaths and resulting in more of the survivors sustaining injuries from the CO exposure that occurred. Staff also found that there was low compliance with the voluntary standards. Staff is now preparing a rulemaking briefing package for delivery to CPSC in fiscal year (FY) 2023.

Voluntary Standards Related to IAQ

Project Contact: Jacqueline Campbell, jcampbell@cpsc.gov

Background

Every year, CPSC is involved in several dozen voluntary standards activities with standard development organizations. Twice a year, CPSC publishes an update on its voluntary standards activities. A subset of standards focuses on the relationship between certain consumer products and IAQ. Standards focus on methods to directly measure products, emissions from products or concentrations of chemicals in the indoor environment, as well as managing emissions from products.

New Updates

The list below provides product areas where standards development work related to IAQ is underway, should soon start or was recently completed:

- Additive Manufacturing/3D printing
- Candles and Candle Accessories
- CO Alarms
- Gas Ranges
- Nanotechnology
- Portable Generators
- Spray Polyurethane Foam Insulation

CPSC is also leading an effort to develop a guide to define and categorize modeling approaches to support source characterization for indoor exposure assessment of many different kinds of consumer products. This is work item WK80812 under ASTM D22.05 (the Indoor Air subcommittee).

Emerging Hazards and Incident Reporting

Project Contact: Treye Thomas, 301-987-2560, tthomas@cpsc.gov

CPSC receives data reports through its National Electronic Injury Surveillance System https://www.cpsc.gov/Research--Statistics/NEISS-Injury-Data and Safer Products Database https://www.saferproducts.gov/.

These data sources, and others, are included in the Online Epidemiological Data Clearinghouse available at https://www.cpsc.gov/Data.

Consumers, local government agencies, state government agencies, federal government agencies, public safety entities, health care professionals, medical examiners/coroners and child-service providers can all submit incident reports to the SaferProducts Database at the link below:

https://www.saferproducts.gov/IncidentReporting

Meeting participants are encouraged to share these links with their stakeholders.

Organohalogen Flame Retardants—Notice of Available Information

Project Contact: Kris Hatlelid, khatlelid@cpsc.gov

Background

CPSC staff continue to work with other federal agencies and contractors to scope out and complete assessments of organohalogen flame retardant (OFR) subclasses. CPSC staff is following recommendations from the National Academies of Sciences that it adopted in its Staff Plan.

New Updates

CPSC staff is posting information to a website and companion docket. A market-use report describing uses and applications of OFRs across all the subclasses will be posted first. Next, CPSC staff will be publishing scope documents and related supporting files over the coming months.

Per- and Polyfluorinated Alkyl Substances Market Use Report—Request for Information

Project Contact: Kris Hatlelid, khatlelid@cpsc.gov

Background

CPSC continues to coordinate and collaborate work with other federal agencies on per- and polyfluorinated alkyl substances (PFAS). CPSC staff are engaged in an effort to develop an ASTM voluntary standard guide with information about how to test different kinds of consumer products that contain different PFAS chemistries.

New Updates

CPSC is working with RTI to complete a market-use report for PFAS substances used in consumer product applications. The report is expected in the fourth quarter of FY 2023.

Gas Ranges—Request for Information

Project Contact: Scott Ayers, sayers@cpsc.gov

Background

CPSC has been working with stakeholders for a little more than a year on an independent joint task force to review gas ranges and IAQ. There are three working groups. Working group one developed an inventory of existing standards related to gas ranges/stoves and related items, such as range hood efficiency. Working group two compiled existing short- and long-term toxicity reference values for CO, nitrogen dioxide and fine particulate matter. Working group three is developing language that can be used in voluntary standards to describe how to test gas ranges/stoves in chambers to derive emission rates for CO, nitrogen dioxide and fine particulate matter. Completion of a voluntary standard test method will likely take 12–18 months.

New Updates

CPSC staff will publish a request for information in the second quarter of FY 2023 to queue up questions related to gas range emissions, indoor air concentrations and potential health effects.

Notice of Competition for BPA Call Order Contract

Project Contact: Charles Bevington, 301-987-2009, cbevington@cpsc.gov

CPSC is advertising the availability of a new five-year BPA Call Order titled "Exposure Testing of Consumer Products Used Within Indoor Environments to Support CPSC Exposure Assessments." Interested parties are encouraged to review the statement of work and submit a bid. There is the potential for award to more than one vendor.

Links to New CPSC IAQ Resources

CPSC 2022. Fatal Incidents Associated with Non-Fire Carbon Monoxide Poisoning from Engine-Driven Generators and Other Engine-Driven Tools 2011–2021. https://www.cpsc.gov/content/Fatal-Incidents-Associated-with-Non-Fire-Carbon-Monoxide-Poisoning-from-Engine-Driven-Generators-and-Other-Engine-Driven-Tools-2011-2021.

Stefaniak et al. 2021. Use of 3-Dimensional Printers in Educational Settings: The Need for Awareness of the Effects of Printer Temperature and Filament Type on Contaminant Releases. *ACS Chemical Health & Safety* 28(6): 444-456.

Stefaniak et al. 2022. Towards sustainable additive manufacturing: The need for awareness of particle and vapor releases during polymer recycling, making filament, and fused filament fabrication 3-D printing. Resources, *Conservation and Recycling* 176: 105911. Published online September 2021.

Farcas et al. 2022. Evaluation of pulmonary effects of 3-D printer emissions from acrylonitrile butadiene styrene using an air-liquid interface model of primary normal human-derived bronchial epithelial cells. *International Journal of Toxicology* 41(4): 312-328.

Centers for Disease Control and Prevention (CDC)

National Center for Environmental Health (NCEH)

Division of Environmental Health Science and Practice (DEHSP)

Asthma and Community Health Branch

Evaluation of Home Assessment Training for Asthma Triggers:

- In the past, we presented the CDC, EPA, and the Department of Housing and Urban Development (HUD) with co-branded, evidence-based home assessment training that focuses on asthma triggers. CDC is working with HUD and EPA to conduct an evaluation of the training. Specifically, CDC will collect the following information from participants of the evidence-based home assessment training on their experience taking the training:
    - Demographics (background on years of experience in Healthy Home Visits)
    - Perceptions of the level of difficulty of training content
    - Pre-/post-test of concepts in the training slides
    - Recommendations for improvement of the training slides

The information collected will be used to help CDC, EPA and HUD assess whether the training content and structure are appropriate for the intended audience (e.g., the material and which areas of the training could be modified if comprehension is a problem).

Emergency Management, Radiation and Chemical Branch

- The Environmental Public Health Tracking Program includes radon test data from national laboratories and state health department partners at the county level on its Data Explorer tool: National Environmental Public Health Tracking Network | Indicators and Data (cdc.gov).

- We were engaged in the development of the recent National Radon Action Plan (2021–2025) as a U.S. Department of Health and Human Services representative: National Radon Action Plan | RADONLEADERS.ORG (published January 2022).

- Our radon web pages have been updated:
  - Radon | NCEH | CDC
  - Reduce Radon Levels in Your Home | NCEH | CDC
  - Radon and Your Health (cdc.gov)

- The carbon monoxide web pages were recently updated: Carbon Monoxide Poisoning | CDC.

- We launched the CO Poisoning MMG piloting cohort in January 2022. CDC is in the process of finalizing its guide. Case Surveillance News – May 2022 | CDC

Agency for Toxic Substances and Disease Registry (ATSDR)

- Presented the following at the International Society of Exposure Science Annual Meeting, September 28, 2022:
  - Title: *Determining Source Attribution for Indoor Air Contaminants at Vapor Intrusion Sites Using Forensics & Probabilistic Modeling*
  - Authors: Tonia Burk, Sandra Miller, James Durant, Miranda Mitchell, William Morgan, Danielle Langmann

- Shared two methods for differentiating whether indoor air contaminants are from the subsurface (vapor intrusion) or from indoor or outdoor air background sources.
  - Developed refinements to the contaminant ratios approach that compares the ratio of contaminants in indoor air versus that in the soil gas.
  - Shared results from a new probabilistic R vapor intrusion model developed by ATSDR. The model predicts a range of indoor air concentrations that may occur from vapor intrusion of subsurface sources.

- Provided technical assistance for a master's thesis: ETD | Systematic Review of Microplastics and Nanoplastics in Outdoor and Indoor Air: Human Exposure Assessment | ID: cv43nz086 | Tesis y Disertaciones Electrónicas de Emory.
  - Objectives: To provide a human exposure assessment of microplastics (MPs) in the air using systematically reviewed literature of articles that provided dose or concentration of measured MPs in indoor and/or outdoor air, as well as doses used in animal and human toxicology studies of MPs.
  - Conclusions: This study is the first systematic review of inhalational MP exposure from indoor and outdoor air. It also provides inhalational exposure doses estimated from animal models or human exposure to MPs and human *in vitro* toxicology studies.

National Institute for Occupational Safety and Health (NIOSH)

Respiratory Health Division

- Field studies for an international collaborative study of characterizing mixed exposures in school classrooms in South Korea have been completed. More than 250 air, elevated surface dust, floor dust and air conditioner (or air purifier) filter dust samples were collected from 33 classrooms in 12 schools. NIOSH is currently analyzing these samples for bacterial and fungal DNAs, and classroom and outdoor particulate matter (PM) samples have been analyzed for chemical components by Korean collaborators. The study will compare microbial communities in floor dust between U.S. and Korean schools and examine associations of microbiomes among the different sample media within classrooms, as well as associations of microbial communities in classrooms with chemical components of airborne PM_{10} and $PM_{2.5}$.

- In December 2018, NIOSH released the Dampness and Mold Assessment Tool (DMAT). In 2022, an article to guide documentation and data analysis of dampness and mold using NIOSH DMAT was published in the journal *Buildings*. The article describes DMAT and potential health effects from exposure to dampness and mold in detail and demonstrates how to apply the tool to effectively manage indoor dampness and mold-related damage, including data entry and analyses. The article and supplementary material of the Excel file template for data entry are open access and can be found on the journal website: Buildings | Free Full-Text | NIOSH Dampness and Mold Assessment Tool (DMAT): Documentation and Data Analysis of Dampness and Mold-Related Damage in Buildings and Its Application (mdpi.com).

U.S. Department of Energy (DOE)

Agency Point of Contact: Chris Early, 202-586-0514, chris.early@ee.doe.gov

Regulation of Air Cleaners

DOE published a *Federal Register* notice on October 18, 2022, proposing to establish definitions, a test procedure, and sampling and representation requirements for air cleaners. Currently, air cleaners are not subject to DOE test procedures or energy conservation standards. DOE proposes a test procedure for measuring the integrated energy factor for air cleaners. The proposed test method references the relevant industry standard, with certain proposed modifications. DOE is seeking comment from interested parties on the proposal. DOE will accept comments, data and information regarding this NPR on December 19, 2022. DOE will hold a webinar on Wednesday, November 9, 2022, from 1:00 p.m. to 4:00 p.m. See this web page for information: https://www.regulations.gov/document/EERE-2021-BT-TP-0036-0018.

Fact Sheet for Improving Air Quality in Small Businesses

"Healthy Buildings Guide for Small Businesses: A Quick Reference to Improve Indoor Air Quality (Restaurants Excluded)." This six-page fact sheet was published by the DOE National Renewable Energy

Laboratory in conjunction with the DOE Better Buildings Alliance Space Conditioning Technology Research Team. https://www.nrel.gov/docs/fy22osti/82174.pdf.

> Abstract: This guide provides steps, in conjunction with public health guidance, that small businesses can take to improve and maintain IAQ. Small businesses often have unique ownership structures—the building owner and business owner can be different parties—so this guide addresses both building and business owner action items. Best results are achieved through a comprehensive approach combining various strategies, including those discussed in this guide.

The Better Buildings Alliance Space Conditioning Technology Research Team is part of DOE's Better Buildings Initiative, which is a market transformation program through which partners collaboratively pursue ambitious energy, waste, water and greenhouse gas reduction goals. More than 900 partners work with DOE in this effort, including 35 Fortune 100 companies. They share their real-world pathways for achieving significant savings in their buildings, industrial facilities and multifamily homes. To find out what resources are available, visit the website and read the Better Buildings Initiative 2020 Progress Review at https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/DOE_BBI_2022_Progress_Report.pdf.

Recorded Webinar Conducted on July 28, 2022, as Part of the DOE Better Buildings Initiative

"Breathe Easy: Indoor Air Quality in Education Spaces." Speakers: Anisa Heming, U.S. Green Building Council; Rachel Romero, National Renewable Energy Laboratory; Shannon Oliver, Adams 12 School District. https://betterbuildingssolutioncenter.energy.gov/webinars/breathe-easy-indoor-air-quality-education-spaces.

Research Papers, Presentations and Other Work by the Lawrence Berkeley National Laboratory (LBNL)

- Presentation for the Energy and Environmental Building Alliance's September 2022 Summit: "Ventilation and IAQ in New US Homes: Preliminary Results from the Building America Field Study," by Brett Singer of LBNL and Chrissi Antonopoulos of the Pacific Northwest National Laboratory (PNNL).

- "Simulation-Based Analysis of Impacts of Reduced Envelope and Duct Air Leakage on Indoor Air Pollutant Concentrations in Occupied Manufactured Homes," June 2022, by Delp, William W., Brennan Less, Haoran Zhao, Spencer M. Dutton, Wanyu R. Chan, Brett C. Singer. https://indoor.lbl.gov/publications/simulation-based-analysis-impacts.

  Summary: The 2007 Energy Independence and Security Act mandated that DOE develop energy conservation standards for manufactured housing. The standards would necessarily expand and supersede elements of the Manufactured Housing Construction and Safety Standards set by HUD code that are relevant to energy use. Results of modeling described in this report are cited in the

Final Environmental Impact Statement for the efficiency rule, which was published in the *Federal Register* (87 *FR* 32728, pages 32728–32824) on May 31, 2022.

The simulations considered acrolein and formaldehyde emitted from continuous indoor sources; acrolein, NO_2 and $PM_{2.5}$ from cooking; $PM_{2.5}$ from dispersed occupant activities; and NO_2 and $PM_{2.5}$ from outdoors using historical data to identify typical levels. The impacts in homes operating or not operating whole-house mechanical ventilation equipment, kitchen and bath exhaust fans, and window openings as ventilation approaches were examined.

The analysis found that DOE's proposed standards would lead to substantial improvements in the protection that manufactured homes provide to occupants against outdoor air pollution. It also found that concentrations of pollutants from indoor sources may be expected to increase with DOE's proposed standards if all material emissions and behavioral factors are unchanged. The analysis also found that increases would be lower in homes using mechanical ventilation that is required in the HUD code (and would continue to be required, without changes, in the proposed rule) and that increasing use of mechanical ventilation could lead to lower exposure.

- "A Time-Varying Model for Predicting Formaldehyde Emission Rates in Homes." *International Journal of Environmental Research and Public Health*, May 28, 2022. Residential Building Systems Group and Indoor Environment Group, Lawrence Berkeley National Laboratory, https://doi.org/10.3390/ijerph19116603.

- "Thirdhand Exposures to Tobacco-Specific Nitrosamines through Inhalation, Dust Ingestion, Dermal Uptake, and Epidermal Chemistry." *Environmental Science & Technology*, September 2022. Tang, Xiaochen, Neal Benowitz, Lara A. Gundel, Bo Hang, Christopher Havel, Eunha Hoh, Peyton Jacob III, Jian-Hua Mao, Manuela Martins-Green, Georg E. Matt, Penelope J. E. Quintana, Marion L. Russell, Altaf H. Sarker, Suzaynn F. Schick, Antoine M. Snijders, Hugo Destaillats.

- "Dilution of airborne contaminants from through-wall exhausts located on the side of multi-family residential buildings." *Building and Environment,* August 2022. https://www.sciencedirect.com/science/article/abs/pii/S0360132322006126.

  Summary: Researchers conducted a series of wind tunnel experiments and computational fluid dynamics (CFD) simulations measuring dilution of a horizontally directed exhaust from a test building. They then compared these measurements to existing models and assessed the models' validity. Lastly, they gathered dilution criteria for several contaminants of interest and used wind tunnel and CFD results along with published emission rates to specify a separation distance that is likely to result in acceptable air quality at neighboring intakes. Results show that mitigation of chronic health concerns from cooking and smoking in dwelling units, as well as odor concerns from bathrooms, can likely be achieved with separation distances of 5 feet or less. To prevent irritation from smoking in neighboring units, a separation distance of 10 feet is recommended. The researchers did not find that furnace exhaust can be diluted sufficiently with separation distances that are feasible on multifamily buildings.

- "Analysis of Zoned Residential Ventilation Systems." Conference paper for the AIVC/ASHRAE IAQ 2020 Conference. Published May 2022. Walker, Iain S., Brennan Less, David M. Lorenzetti, Michael D. Sohn. https://homes.lbl.gov/publications/analysis-zoned-residential.

  Summary: Computer simulations confirm that compartmentalization and smart ventilation can limit contaminant transport for all ventilation systems.

Additional LBNL Work

- LBNL continues to work with experts and manufacturers on improving the capture efficiency of air and emissions of kitchen range hoods and developing test methods for determining capture efficiency.

- LBNL provided a first round of technical assistance to support the Alameda County Healthy Homes group to develop an assessment protocol and guidance for homeless shelters to mitigate the risk of airborne infectious diseases.

Results of Work Sponsored by DOE's Emerging Technologies Research Group in the Office of Energy Efficiency and Renewable Energy

"Development of an Innovative, High-Efficiency Radon Mitigation Fan." Research paper by Mechanical Solutions, Inc. presented at FAN 2022–*International Conference on Fan Noise, Aerodynamics, Applications and Systems*, August 2022. A new fan that would fit into the envelope of an existing house radon fan to provide a more efficient design to reduce the cost of operating the fan. https://tuprints.ulb.tu-darmstadt.de/21714/.

National Institute of Standards and Technology (NIST)

NIST Net-Zero House

NIST Net Zero Energy Research Test Facility (NZERTF)

Project Contact: Lisa Ng, 301-975-4853, lisa.ng@nist.gov

The NIST NZERTF is a two-story, four-bedroom house incorporating energy-efficient construction, space conditioning systems and appliances, as well as solar water heating and solar photovoltaics to meet the house's energy needs. For general information on the house, view the video at http://www.youtube.com/watch?v=xSzu83fyQaQ. All publications can be found at the NIST NZERTF web page at http://www.nist.gov/el/nzertf/. A tracer gas system that measures both SF_6 and CO_2 has been installed in the home to obtain continuous air change rate measurements and to investigate the performance of CO_2 demand control and other ventilation control approaches. An ozone monitor has been installed to record ozone in each level of the home. A CO_2 heat pump water heater has been installed, and a CO_2 geothermal heat pump will be installed this year.

NIST Chemical Assessment of Surface and Air (CASA) Research Campaign

Project Contact: Dustin Poppendieck, 301-975-8423, dustin.popendieck@nist.gov

In spring 2022, NIST hosted the CASA research campaign. A team of 12 external research groups used environmental and chemical perturbations in the NZERTF to investigate the chemistry of indoor environments. Chemical transformation induced by ozone, smoke, ammonia, carbon dioxide, insecticide and VOC additions were investigated. Real-time instruments used in this campaign included a chemical ionization mass spectrometer, two proton transfer reaction-mass spectrometers, an aerosol mass spectrometer, a water-soluble gas analyzer and thermal desorption aerosol gas chromatography instruments. Formaldehyde, NOx, ozone and ultrafine particles were measured with other lab-grade instruments. A range of consumer-grade sensors were also deployed throughout the NZERTF during the study. In addition, a variety of surfaces were placed in NZERTF for varying lengths of time to examine the impact of indoor air chemistry changes on surfaces and the role surfaces play in influencing indoor air chemistry. These surfaces will be analyzed offsite at collaborators' laboratories. Initial data analysis was presented in six presentations at the Indoor Air 2022 and American Association for Aerosol Research 40th Annual conferences. Two additional presentations were made at the American Geophysical Union Fall 2022 Conference. A number of journal articles are also being prepared.

Single-Zone Simulations Using Fate and Transport of Indoor Microbial Aerosols (FaTIMA) for Reducing Aerosol Exposure in Educational Spaces

Project Contact: Lisa Ng, 301-975-4853, lisa.ng@nist.gov

FaTIMA was applied to a classroom, portable classroom and assembly room. NIST evaluated the relative effectiveness of various measures to reduce exposure to infectious aerosols, including wearing masks, increasing ventilation, increasing filtration, using portable air cleaners and using exhaust fans. Multiple controls can be implemented in spaces and HVAC systems to reduce exposure as part of a broader risk-reduction strategy that might be pursued by a building owner or manager. As noted by ASHRAE, engineering and other controls should be part of a larger, layered risk reduction strategy that includes hand washing, surface cleaning, social distancing and reduced occupant density. The report can be downloaded at https://doi.org/10.6028/NIST.TN.2150.

In collaboration with the CDC Foundation and CDC, a set of results from the classroom was incorporated into a new Interactive School Ventilation Tool on the CDC website: https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/interactive-ventilation-tool.html. With this tool, users can select between two HVAC system types and up to four ventilation/filtration options. The tool displays the reduction in particles over the course of a six-hour school day.

ASHRAE Standard 62.1

The 2022 version of Standard 62.1, Ventilation and Acceptable Indoor Air Quality, was recently published by ASHRAE. Among many other changes, the new version of the standard contains the following: (1) a reorganization of Section 5, "Systems and Equipment," to better reflect the path of airflow and the relationship of buildings, systems and equipment; (2) improvements to the performance-based IAQ procedure; (3) requirements for maximum dewpoint temperatures in

mechanically cooled buildings; (4) clarified air density adjustments; and (5) removal of items related to transient occupancies that now fall under Standard 62.2. More information is available at https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2.

ASHRAE Standard 62.2

The 2022 version of Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings, was also recently published by ASHRAE. Among many other changes, the new version of the standard contains more stringent compartmentalization requirements for attached dwelling units and a new requirement for supply or balanced dwelling–unit mechanical ventilation systems for attached dwelling units on enclosed corridors. More information is available at https://www.ashrae.org/technical-resources/bookstore/standards-62-1-62-2.

ASHRAE Standard 189.1

Project Contact: Andrew Persily, andyp@nist.gov

The committee responsible for ASHRAE/ICC/IESUSGBC SSPC 189.1, Standard for High-Performance Green Buildings Except Low-Rise Residential Buildings, is approaching the final stages of the update to the 2020 version of the standard. The updated version will be published in 2023. This standard comprises the technical content of the *2021 International Green Construction Code*. The committee holds monthly virtual meetings, which are open to all interested parties. More information on the 189.1 committee activities can be found on the ASHRAE website, where you can sign up for notifications of public reviews and other information at https://www.ashrae.org/resources--publications/free-resources/listserves.

ASHRAE Guideline 44P

Project Contact: Steven Emmerich, steven.emmerich@nist.gov

The ASHRAE committee developing the guideline titled *Protecting Building Occupants from Smoke During Wildfire and Prescribed Burn Events* continues to meet virtually each monthly with a goal of publishing the guideline in the fall of 2022. The interim planning framework document, *Planning Framework for Protecting Commercial Building Occupants from Smoke During Wildfire Events* (available online from ASHRAE at https://tinyurl.com/yxyuqh72), published last year, has been downloaded more than 1,000 times and formed the basis of an EPA Tools & Resources Webinar titled “Preparing for Wildland Fire Smoke,” which was held in May 2022.

ASHRAE Guideline 45P

Project Contact: Lisa Ng, 301-975-4853, lisa.ng@nist.gov

The ASHRAE committee developing the guideline titled *Measurement of Whole Building Performance for Occupied Buildings Except Low-Rise Residential Buildings* has been meeting virtually every three weeks.

The committee is rewriting the ASHRAE *2010 Performance Measurement Protocols for Commercial Buildings* into a guideline.

CO_2 Monitoring Outreach

Project Contact: Andrew Persily, andyp@nist.gov

The use of CO_2 monitoring in schools and other buildings has increased in efforts to identify poorly ventilated spaces. In support of these and other activities, Andrew Persily published a paper titled "Development and Application of an Indoor Carbon Dioxide Metric" in the journal *Indoor Air*, available at https://onlinelibrary.wiley.com/doi/10.1111/ina.13059. The paper refers to an online tool, QICO2, that can be used to estimate a space-specific CO_2 concentration based on the target ventilation rate of the space and its occupancy, which can serve as a ventilation rate metric. That tool is available at https://pages.nist.gov/CONTAM-apps/webapps/CO2Tool/#/ and is described in NIST Technical Note 2213 Indoor Carbon Dioxide Metric Analysis Tool, which is available at https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2213.pdf.

ASHRAE Green Guide Version VI

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The sixth revision of the *ASHRAE Green Guide* is scheduled to be published later this year. Version VI will be intended for more experienced building professionals, whereas the previous versions contained more introductory content. NIST took the lead editorial roles on the IEQ and Water Efficiency chapters.

ASTM: D22.05 Subcommittee on Indoor Air

Project Contact: Dustin Poppendieck, dustin.popendieck@nist.gov

The subcommittee is starting a new effort to produce a guide (ASTM WK81752, *Guide for Determination of Airborne PFAS in the Indoor Environment*) on methods for analyzing PFAS in indoor air. The intent of the guide is to help the user understand the range of chemical properties of PFAS found in air, the applicability of various sampling media and extraction methods, and the applicability of various analytical equipment used for detection. The goal of this effort is to ballot a draft this year.

Project Contact: Dustin Poppendieck, dustin.popendieck@nist.gov

The subcommittee has also started a workgroup to produce a standard method for testing air cleaning technologies (ASTM WK81750 Standard Test Method for Chemical Assessment of Air Cleaning Technologies). This method is designed to be agnostic to the air-cleaning technology, quantify the removal performance of multiple target chemicals, and investigate a range of potential byproducts. The goal is to ballot this standard in summer 2023.

Project Contact: Andrew Persily, andyp@nist.gov

The subcommittee also is in the process of revising ASTM D6245, *Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation*. A revision is being considered for a subcommittee ballot in January 2023.

Project Contact: Dustin Poppendieck, dustin.popendieck@nist.gov

Other existing standards are continually undergoing review and revision on a five-year rotation.

International Society of Indoor Air Quality and Climate (ISIAQ) STC34

Project Contact: Steven Emmerich, steven.emmerich@nist.gov

ISIAQ Scientific and Technical Committee (STC34) aims to continuously monitor, collect and organize information about indoor environmental quality (IEQ) guidelines worldwide. In 2021, STC34 created an open, integrated IEQ database that is freely accessible at www.ieqguidelines.org. Currently, the database is focused on IAQ parameters. The committee continues to meet to expand the database to include standards, regulations and guidelines related to ventilation, comfort, acoustics and lighting.

National Academies

Andrew Persily recently published a paper in *The Bridge,* the journal of the National Academy of Engineering, co-authored by Jeffrey Siegel, titled Improving Ventilation Performance in Response to the Pandemic. The paper is part of a special issue on microbiomes of the built environment as they relate to the COVID-19 pandemic.

U.S. Environmental Protection Agency (EPA), Indoor Environments Division (IED)

COVID-19

Important information on COVID-19 and indoor air is posted on the EPA website at https://www.epa.gov/coronavirus. This information helps the public understand the evolving science related to transmission of COVID-19 and what can be done to maximize protection indoors.

The indoor air COVID-19 content on this site is among the most visited of EPA web areas. The indoor air COVID-19 content can be found at https://www.epa.gov/coronavirus/indoor-air-and-coronavirus-covid-19.

For multilingual web content on COVID-19 and IAQ (as well as other indoor air environmental health issues), visit https://www.epa.gov/lep. EPA is continuing to add multilingual content and updating the FAQ list, so please consider checking it routinely.

Clean Air in Buildings Challenge

The "Clean Air in Buildings Challenge" is a call to action and a set of guiding principles and best practices to assist building owners and operators with reducing risks from airborne viruses and other

contaminants indoors. The Clean Air in Buildings Challenge highlights a range of recommendations and resources available for improving ventilation and IAQ, which can help to better protect the health of building occupants and reduce the risk of COVID-19 spread.

Key actions outlined in the Clean Air in Buildings Challenge include:

- Create a clean indoor air action plan.
- Optimize fresh air ventilation.
- Enhance air filtration and cleaning.
- Conduct community engagement, communication and education.

Request For Information (RFI) for the Clean Air in Buildings Challenge: Building on the Biden–Harris administration's Clean Air in Buildings Challenge, a key component of the president's National COVID-19 Preparedness Plan, IED is seeking public comment to inform efforts by EPA and others to support the widespread adoption of actions that lead to improvements in IAQ in the nation's building stock, with a particular emphasis on schools and commercial buildings, to help reduce disease transmission indoors and improve public health. IED will review information received during this public comment period to support the potential development, improvement and implementation of technical assistance efforts, including tools, training, guidance and other strategies to support sustained ventilation, filtration, air cleaning and other IAQ improvements in buildings. Comments were to be submitted by December 5, 2022. For more information, see FR Docket ID No. EPA-HQ-OAR-2022-0794.

Science

***IED-Hosted Webinar on National Academies Consensus Study Report* Why Indoor Chemistry Matters**

On July 7, 2022, IED hosted a webinar in the IAQ Science Webinar Series titled *Why Indoor Chemistry Matters: Findings from a National Academies Consensus Study.* The webinar featured a presentation by Dr. David Dorman, Chair of the study committee. Dr. Dorman presented the main conclusions and recommendations of the IED co-sponsored study report, which identifies gaps in the current understanding of indoor chemistry and new approaches that can be applied to measure, manage and limit chemical exposures. Following the presentation, Dr. Dorman was joined by a panel of seven members of the study committee to discuss questions from the audience of 365 live participants on a broad range of topics related to indoor chemistry. A recording of the webinar is available on the EPA YouTube channel: https://www.youtube.com/watch?v=iJJVFi3e0dE.

The National Academies consensus study report *Why Indoor Chemistry Matters*, commissioned by EPA, the Sloan Foundation, CDC and NIEHS, is available to download for free from the National Academies Press website.

National Academies Report on Indoor Exposure to Fine Particulate Matter and Practical Mitigation Solutions

The National Academies of Science, Engineering and Medicine Committee on Health Risks of Indoor Exposures to Fine Particulate Matter and Practical Mitigation Solutions is conducting a consensus study

that will review the recent scientific literature on the health risks of exposure to fine particulate matter indoors and will offer recommendations for engineering solutions and interventions to reduce risks of exposure to it, including practical mitigation solutions to reduce exposure in residential settings. This study will be completed in early 2023. More information can be found on the study web page.

New Web Page Available: Sources of Indoor PM

A new web page specifically focused on sources of indoor PM is now available on the EPA Indoor Air Quality website. This new content provides the public with valuable new information and guidance on indoor PM and strategies to reduce exposure. Sources detailed on the website include PM from outdoor air pollution, cooking, combustion and heating sources, indoor dust, biological contaminants, consumer products, printers and copiers, and hobbies. View the new web content here: https://www.epa.gov/indoor-air-quality-iaq/sources-indoor-particulate-matter-pm.

IAQ Emergency Preparedness, Response and Recovery

EPA Grants for Wildfire Smoke Preparedness in Community Buildings

Through November 14, 2022, EPA collected feedback on the design of a new $4 million grant program for wildfire smoke preparedness in community buildings and related activities. Feedback was solicited and collected through a general public listening session on October 13, through EPA's National Environmental Justice Community Engagement call on October 18, and via an open email mechanism.

EPA will consider this stakeholder input to inform a request for applications that EPA is planning to publish in February 2023, and grants are expected to be awarded by the end of summer 2023. For more information, visit the Wildfire Smoke Preparedness in Community Buildings Grant Program.

New Resources on Flood Cleanup and IAQ Now Available on EPA Website

EPA released two new resources for members of the public who need to clean up their homes after a flood event:

- Web Page: Flood Cleanup to Protect Indoor Air and Your Health
- Poster: Flood Cleanup: Tips for a Healthy Home (available in color and grayscale)

These resources summarize key points from existing resources on flood cleanup and provide practical tips for safely and effectively cleaning up a home after a flood. These resources complement the Flooded Homes Cleanup Guidance website, which has a series of videos aimed at helping the public perform safe flood cleanup in homes, and general guidance for reducing flood-related health and safety risks.

IAQ Emergency Preparedness, Response and Recovery Resources Now Available in Additional Languages

EPA has released several newly translated web pages and resources in Spanish and eight other limited English proficiency (LEP) languages, including the following:

- Available in Spanish, Arabic, Haitian Creole, Korean, Russian, Simplified Chinese, Traditional Chinese, Tagalog and Vietnamese
    - Emergencies and IAQ
    - Power Outages and Indoor Air Quality
    - Flood Cleanup Infographic
- Available in Spanish, Arabic, Korean, Russian, Simplified Chinese, Traditional Chinese, Tagalog and Vietnamese
    - Create a Clean Room to Protect Indoor Air Quality During a Wildfire
- Spanish captions available
    - Video: Wildfire Smoke and Indoor Air Quality: How to Create a Clean Room at Home

IAQ Emergency Preparedness Response and Recovery (EPRR) Support for Hurricane Response and National Preparedness Month 2022

In September 2022, IED's IAQ EPRR Team conducted outreach in English and Spanish via GovDelivery mass emails and Twitter in support of the response to Hurricanes Fiona and Ian and to promote National Preparedness Month. Communications highlighted new flood cleanup resources and translated materials detailed elsewhere in this update, as well as other relevant resources on the impact of power outages and wildfire smoke on IAQ. To receive future updates on IAQ EPRR resources and activities, subscribe to our mailing list or follow @EPAair on Twitter.

IAQ and Tribal Communities

Tribal Indoor Air Quality Training & Resource Directory

In September 2022, IED announced the availability of the Tribal Indoor Air Quality Training & Resource Directory. This resource directory, developed in collaboration with the National Tribal Air Association (NTAA) and the Institute for Tribal Environmental Professionals, is a comprehensive compilation of resources and information to help tribes identify and access various IAQ resources and funding to support the creation or expansion of tribal IAQ programs. The directory is divided into the following sections: Healthy Homes, Schools and Buildings; Asthma; Mold and Moisture; Radon; Commercial Tobacco and Secondhand Smoke; Home Heating, Cooking and Energy; Disaster Preparedness & Mitigation; Disaster Response & Recovery; COVID-19 and Other Pathogens; Funding; Alaska Resource Addendum; and Helpful IAQ Contacts.

Please visit the Indoor Air Quality in Tribal Communities website to learn more and to download the Resource Directory.

Household Energy (cooking, heating, and lighting in low- to middle-income countries)

Biden Administration Engagement on Cookstoves/Household Energy

In April 2021, President Biden committed to rejoin the Paris Agreement and took executive action to tackle the climate crisis in the United States and around the world. In coordination with the president's

action, Administrator Michael Regan announced that the Biden administration will resume and strengthen EPA's commitment to the United Nations Foundation's Clean Cooking Alliance and will work with the Alliance, foreign governments and partners at every level to reduce emissions from home cooking and heating that contribute to climate change and affect the health and livelihood of almost 40 percent of the world's population.

During the past year, EPA has continued leading an effort to broaden and strengthen a whole-of-government approach to addressing this issue. At the 27th meeting of the Council of Parties (COP27), in Sharm El-Sheikh, Egypt, in November 2022, EPA organized a key event with the Clean Cooking and Climate Consortium titled "Reducing Emissions from Cooking to Achieve Nationally Determined Contribution (NDC) Goals." During this event, Administrator Regan discussed the whole-of-government approach to address this challenge. EPA is working closely with CDC, DOE, the National Institutes of Health (NIH), the U.S. Department of State and the U.S. Agency for International Development to implement this climate, health, gender and livelihood initiative.

Advancing Sustainable Household Energy Solutions (ASHES) Initiative at Colorado State University

EPA cooperative partner Colorado State University is collaborating with Berkeley Air Monitoring Group to implement a household energy solutions and air quality initiative called Advancing Sustainable Household Energy Solutions, or ASHES. This work includes a webinar series that shares the latest household energy findings from numerous researchers and their organizations. ASHES webinars have highlighted the work of the World Health Organization's household energy initiatives, EPA Science to Achieve Results (STAR) grantees, the World Bank and other research programs. For more information on ASHES or to watch ASHES webinars, please go to www.ashes-csu.org.

Working with Countries to Implement Their NDCs

Every country in the world is required under the Paris Climate Agreement to submit a plan to reduce climate emissions, called their NDCs. Sixty-seven countries have now included references to reducing emissions from household energy in their NDCs that were submitted at COP26 in Glasgow.

EPA is working with its consortium of partners—called the Clean Cooking & Climate Consortium (4C)—to support countries in meeting their climate goals by reducing CO_2, methane, black carbon and other short-lived climate pollutants. The consortium has been hosting a series of expert consultations to facilitate more direct interaction with and support for countries in the development of household energy components in their NDCs, organizing their measurement, reporting and verification (MRV) activities; financing opportunities; and best practices for scaling clean cooking programs to meet their national climate goals. This support is facilitating progress in two groups of countries: large group consultations for any interested countries and stakeholders, and small group consultations where 4C offers one-on-one support to three countries leading in this sector—Rwanda, Uganda and Ghana.

Clean Cooking Forum 2022

The Clean Cooking Alliance (CCA) and partners from around the world organized the Clean Cooking Forum 2022 from October 11 to 13 in Accra, Ghana. Co-hosted by CCA and the government of Ghana,

the Clean Cooking Forum convened global leaders, policymakers, entrepreneurs, investors, donors and other key partners to discuss plans to help bring clean cooking to the billions who live without it. EPA, NIH and other U.S. government agencies helped fund Forum activities and organize a "State of the Evidence" workshop to showcase the advances made in the clean cooking evidence base. With partners from the 4C, EPA also helped organize a Monitoring Technology Side Event and an in-person expert consultation with stakeholders from the Ghanaian government to discuss the household energy climate emission reduction targets in Ghana's NDC. EPA's participation in these events will help mobilize the necessary funding, partnerships and policies to achieve clean cooking for all and accelerate progress toward global climate and development goals.

Radon

National Radon Action Plan (NRAP)

IED continues to support the growing national network of federal agencies, private sector entities, nongovernmental organizations (NGOs) and states to prevent lung cancer deaths through the NRAP. The NRAP presents a long-range strategy for eliminating avoidable radon-induced lung cancer in the United States. On July 20, 2022, the NRAP Leadership Council met to discuss the results from a questionnaire for states and tribes, the development of a protocol and plan for building a radon resource library, and the strategic direction for NRAP strategies in FY 2023.

The NRAP Leadership Council invites leaders who are serious about saving lives; building in health protection where we live, work and learn; eliminating preventable disease; and realizing a high return on investment in a healthier future to join the NRAP Leadership Council.

State and Tribal Indoor Radon Grants (SIRG)

EPA continues to support programs aimed at risk reduction through the SIRG program. Funding for state and tribal radon grants in FY 2022 was appropriated at approximately $8.295 million. This is an increase of $500,000 from the previous year. EPA is currently operating in FY 2023 under a continuing resolution until at least mid-December and does not yet have a final SIRG program budget for FY 2023.

SIRG Performance Partnership Grant (PPG) Class Exception

In fall 2022, EPA's Office of Grants and Debarment approved a class exception to include the SIRG public list requirements for states and tribes in all PPGs with SIRG funding. EPA's Office of Air and Radiation (OAR) believes the public list requirement is necessary for public health protection and should be applied to SIRG funding included as part of a PPG.

- The requirement for SIRG recipients to "maintain and make available to the public, a list of firms and individuals in the State that have received a passing rating under the EPA proficiency rating program" will be applied consistently for all state and tribal radon grants, including PPGs.

- This class exception applies to all new and existing PPGs that include SIRG program grants and will be in place until such time EPA can revise the PPG award regulatory text.

Building Codes

EPA continues to collaborate with industry and states to actively engage in efforts to promote adoption of radon-resistant new construction practices through international, national, state and local building codes. These efforts are mandated by the Indoor Radon Abatement Act and are also a key component of the National Radon Action Plan.

The most recent code change proposal to remove the EPA radon zone map as a reference document for Appendix F in the International Residential Code was disapproved. EPA wanted to remove the reference to encourage testing and mitigation everywhere regardless of zone. Some of the committee members felt that by taking the EPA map of radon zones out of the code, no guidance is left for the local building officials to make determinations of how close they are to higher-prone areas. EPA is awaiting the results of the final public comment hearing and the corresponding online voting that took place in Louisville, Kentucky, from September 11 to 14, 2022.

Radon Credentialing

EPA's work on radon credentialing is part of the Agency's responsibility to promote and support the availability of quality radon services to the public. Professionals who provide radon testing and mitigation services play a key role in public health protection efforts. Because of the substantial risk resulting from exposure to radon, it is critical for radon service providers to possess the necessary skills to provide quality services and ensure consumer protection. Over the last several years, EPA has been working, through consultation with states, the public and industry—and in response to congressional direction—to develop a contemporary framework to guide the credentialing of radon service providers going forward. EPA remains committed to facilitating access to a qualified workforce through a national nonregulatory framework that will help establish a quality standard for state-run and independent programs that credential radon service providers. The Agency plans to soon post an updated proposal online that reflects stakeholder feedback and hold an information session on the proposal. For more information about EPA's proposal, visit the EPA radon website at EPA's Draft Criteria for Radon Credentialing Organizations, where the most up-to-date information will be posted.

EPA's Radon Reference and Intercomparison Program (ERRIP)

There are annual requirements for secondary radon chambers to be certified to perform radon measurement and calibration services for the radon industry participating in the National Radon Safety Board (NRSB), the American Association of Radon Scientists and Technologist's National Radon Proficiency Program (AARST-NRPP) and state radon programs. The first steps in these certifications are to participate in ERRIP, managed and operated by the EPA Office of Radiation and Indoor Air's National Analytical Radiation Environmental Laboratory (NAREL), located in Montgomery, Alabama. NAREL works with these secondary radon chambers by providing the only U.S. radon reference that is NIST traceable. There are currently three industry-certified secondary radon chambers for use by the U.S. radon community. These radon chambers are as follows: Bowser-Morner, Inc., Dayton, Ohio; TCS Industries, Inc., Harrisburg, Pennsylvania; and KSU Radon Chamber, Manhattan, Kansas.

In June and July 2022, NAREL completed all three commercial radon chamber intercomparisons. The ERRIP provided the intercomparison radon reference certificates to NRSB and AARST-NRPP for use in their certification program. The commercial radon chambers will again participate in next year's radon intercomparison with the ERRIP.

Asthma

Federal Collaboration on Asthma Disparities

EPA staff continue to participate in the monthly Asthma Disparities Subcommittee of the President's Task Force (PTF) on Environmental Health and Safety Risks to Children. The task force includes 17 federal agencies and is the focal point for federal government agencies to coordinate for the betterment of children's environmental health. The monthly meetings feature reporting from the PTF supporting subcommittees that address three priority areas: (1) climate, emergencies and disasters; (2) asthma disparities; and (3) lead exposures.

EPA staff also participate in the monthly Asthma Disparities Workgroup (ADWG) Leadership Meetings. The ADWG is an extension of the Federal Asthma Disparities Action Plan and is co-chaired by EPA, the U.S. Department of Health and Human Services (HHS), and the U.S. Department of Housing and Urban Development (HUD). The goal of the ADWG is to help minimize the inequities in comprehensive asthma care. During the meetings, members discuss strategies to advance the three major priority areas of the Asthma Disparities Subcommittee, which are focused on expanding sustainable financing for in-home asthma interventions, closing research gaps, and creating equitable expectations for asthma outcomes for all patients and caregivers.

On October 31, 2022, EPA, in collaboration with CDC, HUD and NIH, hosted the ADWG Full Subcommittee meeting. The ADWG Full Subcommittee is composed of more than 60 federal stakeholders committed to coordinating activities and leveraging resources to address nationwide disparities in asthma health outcomes. Discussion topics for this meeting included progress of the Centers for Medicare & Medicaid Services Asthma Control Affinity group program; review of EPA's definition of indoor environmental determinants of health and how these terms contribute to the broader consideration of the social determinants of health; HUD's smoke-free housing policy and impacts on children with asthma and disparities and future evaluation plans; and CDC's effects of climate change on respiratory health, including asthma disparities and its Climate and Health Program.

Allergy and Asthma Network Summit

On November 11, 2002, EPA staff attended the 2022 USAsthma Summit hosted by the Allergy and Asthma Network. The USAsthma Summit brings together asthma coalitions, state asthma programs, doctors, school nurses, community health workers, patients, advocates and other key stakeholders involved in asthma care. During the daylong summit, attendees discussed asthma issues, advanced guidelines-based care, and shared best practices and lessons learned from asthma programs. EPA's 2022 winner of the National Environmental Leadership Award in Asthma Management, the Utah Department of Health, shared its award-winning program strategies with participants.

Asthma Community of Practice

On September 13, 2022, EPA hosted the first of a series of three webinars on asthma disparities and community health, titled "Innovations in Financing Environmental Asthma Home Visits Within Medicaid." The webinar series will showcase solutions to help communities reduce indoor environmental risks to improve asthma disparities and community health. The solutions include health care reimbursement for multisector workforces that deliver home environmental asthma interventions. This webinar featured health leaders from California and partners from the community who spoke about the best asthma care strategies that align with environmental health equity goals. In addition, the speakers shared technical solutions that state health care policymakers and community partners are pioneering to improve asthma outcomes, reduce health disparities and cultivate health equity. The on-demand video is available at AsthmaCommunityNetwork.org.

AsthmaCommunityNetwork.org

An important component of EPA's Asthma Program is equipping stakeholders with ongoing technical knowledge and capacity building. This is accomplished through AsthmaCommunityNetwork.org, an online resource that facilitates peer-to-peer engagement and action learning events. Currently, almost 4,700 members are registered. EPA hosts technical webinars throughout the year, and they are archived on https://asthmacommunitynetwork.org. In addition, the website features more than 600 asthma educational materials in the resource bank and offers mentoring opportunities for registered members, and you can also find more information on the asthma award winners and sustainable financing. If you are not a member, join today!

Comprehensive IAQ Interventions in Homes

Indoor airPLUS: New Homes

IED's Indoor airPLUS program is a voluntary partnership and labeling program that helps new home builders address customer health concerns through construction practices and product specifications that minimize exposure to airborne pollutants and contaminants. Indoor airPLUS continues to see sustained growth, with 30 to 50 new partner applications per month over the last quarter. In the second quarter of calendar year 2022, EPA recorded more than 4,300 Indoor airPLUS–labeled homes—the highest quarter yet—and by the end of the next reporting period, EPA anticipates a total of 50,000 labeled homes and apartments in the marketplace.

The Indoor airPLUS team has been working on significant changes to the overall program model and certification scheme in developing version 2, which EPA has been discussing with stakeholders at events and conferences, such as the recent North American Passive House Conference and the 2022 EEBA Summit in late September 2022. EPA will release a revised draft of the newly proposed version 2 program model (including a tiered certification system) and specifications for public comment in the months ahead.

The Indoor airPLUS team also announced the 2022 Indoor airPLUS "Leaders of the Year" during the EEBA Summit. For more information on the award cycle or to see profiles of all the award winners, visit the website at https://www.epa.gov/indoorairplus/indoor-airplus-leader-award-winners.

Comprehensive IAQ Interventions in Communities

In September 2022, the National Center for Healthy Housing announced grants awarded to six communities as part of the organization's Building Systems to Improve Indoor Air Quality initiative. The awarded projects, funded through a cooperative agreement with EPA, will help communities build local capacity and advance evidence-based efforts to improve IAQ through policy and system change. Specific projects include activities to strengthen local policies and housing codes, enhance code enforcement activities, develop new programs to increase available resources, expand accessible data to increase community engagement and drive action, and reform local Community Development Block Grant allocations. For more information about the selected communities, please visit https://nchh.org/build-the-movement/grants-and-scholarships/2022-building-systems-to-improve-iaq-mini-grants.

Comprehensive IAQ Interventions in Schools

Indoor Air Quality, Healthy Green Cleaning and Preventive Maintenance in Schools

As a result of the COVID-19 pandemic, EPA's Schools Program is focused on the increased interest in healthy indoor environments in schools, increased urgency to respond to IAQ issues in schools, and leveraging key partnerships to expand our network of stakeholders. EPA recently participated in several key events and webinars on IAQ in schools.

On July 8, 2022, EPA participated on a webinar titled "Benefits of Improving Air Quality and Ventilation in Schools." EPA joined officials from U.S. Department of Education, the White House COVID-19 Coordinator, and experts from CDC to deliver a webinar on the importance of improving air quality in schools and issue a call to action for schools to use during the summer months to assess school needs and make improvements. Speakers also addressed the health and academic benefits of improving air quality.

On July 26, 2022, EPA participated in the U.S. Department of Education's ceremony to recognize the 2022 Green Ribbon Schools Award winners. EPA officials spoke about the importance of IAQ to student health and learning and highlighted the successful approaches schools are using to improve IAQ during energy efficiency upgrades. The Green Ribbon program recognizes schools, school districts and post-secondary institutions for efforts to improve sustainability, protect health and advance environmental education.

On August 16, 2022, the Biden-Harris administration released an Indoor Air Resource for Back-to-School—2022 Back-to-School Fact Sheet. The Back-to-School Fact Sheet lays out key supports and guidance for protecting students, teachers and school communities during the school year, and for managing and mitigating the risks of COVID-19 spread. This guidance spotlights federal resources, including some important EPA resources, available for three specific strategies:

- Using COVID-19 vaccines and boosters as the first line of defense to protect in-person learning.
- Providing robust access to COVID-19 testing at schools to help detect infection early.
- Improving IAQ across America's school buildings.

On October 11, 2022, EPA participated in the White House Summit on Indoor Air Quality. The summit was hosted by White House COVID-19 Response Coordinator Dr. Ashish Jha and featured a series of expert panel discussions on the topics of IAQ metrics and mitigation approaches; IAQ improvements in schools; and the business case for good IAQ, benefits and innovations. The aim of the summit was to promote and accelerate the adoption of IAQ improvements to provide health protections, including reducing the spread of infectious diseases, such as COVID-19.

On October 26, 2022, EPA hosted the School Health and Indoor Environments Leadership Development (SHIELD) Network Meeting. SHIELD Network Partners include representatives from NGOs; school districts with established, sustainable IAQ management programs; industry leaders; government agencies; and community-based asthma coalitions focused on schools and/or healthy indoor environments. Representatives from DOE's Efficient and Healthy Schools Campaign, the U.S. Green Building Council–Center for Green Schools, the National Association of State Energy Officials, the White House Office of Science and Technology Policy, and others attended. EPA facilitated discussions on how the SHIELD Network can use its collective assets and resources to capitalize on the momentum from COVID-19 to institute sustainable improvements for healthy indoor environments in schools through technical assistance, recruitment and recognition of schools and school districts. OAR's Principal Deputy Assistant Administrator, Joe Goffman, provided remarks to affirm EPA's commitment to create, support and sustain healthy indoor environments in schools through policy and practice, collaboration, and partnerships.

Collaboration with Federal Partners to Promote School Environmental Health

EPA and the U.S. Department of Education are working to sustain and expand a collaborative partnership on healthy infrastructure, IAQ investments, and health and learning in schools. This collaboration is prioritizing good IAQ in schools as essential for achieving learning outcomes, health and wellbeing and has a special focus on schools serving low-income communities.

EPA continues to collaborate with DOE's Efficient and Healthy Schools campaign. The campaign aims to help K–12 schools—especially those serving low-income student populations—to identify practical HVAC solutions and upgrades to improve energy efficiency while promoting healthier spaces for teaching and learning. This campaign will promote peer-to-peer learning among school participants and will recognize schools for their best practices and exemplary solutions. The campaign will also engage such supporters as designers, engineers, consultants and program implementers to better support schools that are investing in efficient and healthy school buildings.

EPA Engagements and Webinars on Schools

EPA continues to support healthy indoor environments in schools during the COVID-19 pandemic. View IED-hosted webinars in the series Healthy Indoor Environments in Schools: Plans, Practices and Principles for Maintaining Healthy Learning Environments.

Expanding the Reach for School IAQ Training

EPA also continues to promote *the Indoor Air Quality Tools for Schools: Preventive Maintenance Guidance* documents to help school personnel take a holistic, proactive approach to IAQ issues. The guidance leads school personnel through the steps to develop and implement an IAQ preventive maintenance plan and offers a framework to make the case using a value proposition for an IAQ preventive maintenance plan and gain buy-in from the school community.

EPA continues to actively deliver technical assistance to the schools community through two professional training webinar series: IAQ Master Class Professional Training Webinar Series and IAQ Knowledge-to-Action Professional Training Webinar Series. Since 2015, both series have had more than 22,000 views from live webinars and on-demand recordings online. EPA is eager to drive even more action in school districts by spreading the IAQ Master Class Professional Training Webinar Series across more networks and platforms. Please contact iaqschools@epa.gov if your organization would like to use your existing training platforms and vehicles to host or link to the webinar series.

Consider Subscribing to Email Alerts on IAQ Topics

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