BROWN
Pandemic Center

Clean Indoor Air

A Guide For State Leaders to Improve Indoor Air Quality

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This guide was developed in partnership with experts across public health, building science and design, healthy housing, healthy schools, policy, and law.

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INTRODUCTION

The purpose of this guide is to help state and local leaders—including lawmakers, building officials, governors' teams, agency heads, and school districts—improve indoor air quality *with an evidence-based menu of options for policies and actions. Citizens and advocates can use it too, to push for practical changes in their communities.*

Executive Summary

Clean indoor air matters. It affects people's health, how clearly they think, and how easily germs spread. We spend 90% of our time indoors, and face increasing threats from wildfire smoke, allergens, and respiratory disease, yet most buildings nationwide do not have clean indoor air. Cleaner indoor air can reduce respiratory disease by up to 80%, help students stay in school for 13% more days, and save up to $38 billion for workplaces. The solution is simple: move more air through filters and bring in more fresh, outdoor air when possible.

Even though the return on investment is clear, there has been limited progress in the U.S. Most decisions about indoor air quality (IAQ) are made at the state and local levels, from schools to municipal buildings to local building codes. However, many state and local governments lack clear targets and awareness of IAQ. They don't have smart incentives or strong, practical standards to push for better indoor air.

This guide provides an evidence-based menu of options for states to improve indoor air quality across public and private buildings. We developed the guide in consultation with state decision-makers—including health and energy officials, elected officials, building code authorities, advocates, and indoor air quality experts.

The guide focuses on three key areas for action:

- **Strengthen coordination and capacity**. Identify an indoor air coordinator. Publish guidance and targets for indoor air quality.
- **Accelerate indoor air quality improvements**. Adopt minimum building standards and codes. Provide financial incentives and implementation support. Monitor indoor air quality in buildings.
- **Target high-priority sectors**. Prioritize clean indoor air in schools, homes, long-term care facilities, and workplaces. Engage with local leaders in these sectors to promote voluntary action.

Throughout the guide, we provide case studies of successful actions taken by state and local leaders to improve IAQ. Some states and cities use incentives for proven green and healthy building certifications (like LEED or WELL). Pilot programs are bringing cleaner air to nursing homes, schools, and areas affected by wildfire smoke. School districts nationwide are developing IAQ management plans, upgrading their HVAC systems, and installing IAQ monitors.

State and local leaders can learn from each other and pick the strategies that make sense for their community, needs, and budget. Citizens and advocates can use this to take action and push for changes in their communities.

Recommendations

I. STRENGTHEN COORDINATION AND CAPACITY	
Identify an indoor air coordinator	Governor's office
Publish guidance and resources	State health department
Set targets for indoor air quality	State health department
II. ACCELERATE INDOOR AIR QUALITY IMPROVEMENTS	
Adopt minimum standards and building codes	State and local building code authorities
Lead by example in state and municipal buildings	State and local general services departments
Provide incentives and implementation support *(financial incentives, pilot programs, staffing capacity, workforce training)*	State legislature City or county council
III. TARGET HIGH-PRIORITY SECTORS	
Schools	State education department School districts
Homes	State and local health and housing departments
Long-term care facilities	State health department
Workplaces	State labor departments

What is Indoor Air Quality (IAQ)?

Indoor air quality refers to the air quality in buildings, specifically factors that influence the health and comfort of occupants. It includes the presence and concentration of air pollutants, including but not limited to:

- **Particulate matter (PM)**: Tiny solid or liquid particles suspended in the air, such as dust, dirt, soot, and smoke.
- **Biological contaminants**: Bacteria, viruses, mold, and allergens like pet dander, dust mites, and pollen.
- **Volatile organic compounds (VOCs)**: A broad group of chemicals that easily evaporate into the air, often emitted from building materials, furnishings, and cleaning products. Common examples include formaldehyde and benzene.
- **Carbon monoxide (CO)**: A colorless, odorless, and toxic gas produced by the incomplete combustion of fuel in stoves, furnaces, or vehicles.
- **Radon**: A naturally occurring carcinogenic radioactive gas that can accumulate indoors, especially in basements and poorly ventilated areas.
- **Nitrogen dioxide (NO_2)**: A harmful gas produced by indoor appliances.
- **Carbon dioxide (CO_2)**: A naturally occurring gas that is exhaled by humans and produced by combustion. While not toxic at typical indoor levels, elevated concentrations can indicate poor ventilation and reduce brain function.

Why Indoor Air Matters

- Americans spend 90% of their time indoors
- Indoor air can be 2 to 5 times—or even 100 times—more polluted than outdoor air
- The U.S. economy could gain up to $38 billion annually with improved ventilation

Clean indoor air is essential for health, productivity, and economic growth. It affects how we think, feel, and work. The average American spends 90% of their time indoors, but concentrations of certain pollutants indoors can be 2 to 5 times—or even 100 times—higher than outdoor air. However, most buildings have not been designed or maintained with health in mind.

The health impacts of indoor air quality are clear. Poor indoor air is linked to asthma, cardiovascular disease, and other chronic health conditions. Roughly 230,000 to 300,000 Americans die each year from exposure to fine particulate matter (PM2.5), and the majority of this exposure occurs indoors. Indoor air is also the primary way many respiratory diseases like the flu, RSV, and COVID-19 spread. Children, elderly Americans, and those with underlying conditions are especially vulnerable.

Indoor air doesn't just impact health—it affects learning outcomes, workplace productivity, and the resilience of hospitals and other critical services. Clean indoor air reduces sick days and worker absenteeism, and boosts performance and productivity in the workplace. The U.S. economy could gain $38 billion annually with improved ventilation.

The cost of inaction is high. When kids get sick or suffer from asthma, parents miss work and can end up with expensive medical bills. Asthma is one of the leading causes of student absenteeism, affecting 5 million children in the United States. Families and taxpayers ultimately bear the financial burden—the total medical and absenteeism cost of asthma in the United States is $80 billion.

At the same time, wildfire smoke poses an increasing threat, undoing decades of progress towards cleaner air. In 2020, nearly 25 million Americans were exposed to unhealthy levels of smoke. The Lawrence Berkeley National Laboratory estimates that roughly 80% of exposure to smoke from wildfires will occur indoors.

Despite the clear risks, the vast majority of buildings lack clean indoor air. Why?

We know how to provide clean indoor air—the solutions are simple. We need better *ventilation* to bring in fresh outdoor air when possible, *filtration* to remove harmful pollutants, and *source control* to remove pollutants at their source. We can do this easily by moving air through filters in HVAC systems and portable air cleaners. The bottleneck to cleaner indoor air is implementing these solutions on a routine basis and having someone in charge to make sure they happen.

While most buildings must meet ventilation standards, these standards vary widely across states and localities. Most standards only apply at the time of construction or during major renovations, not to subsequent operations. There are models for other types of routine building safety, such as fire protection and carbon monoxide detection, which require annual building and restaurant inspections. However, building codes do not typically have inspection requirements for indoor air and prioritize specific safety risks rather than comprehensive health outcomes. There are generally no enforced standards for building ventilation maintenance and performance, and newer health-based standards have not yet been widely adopted.

Ventilation standards for construction alone are insufficient. Many buildings and homes were built decades ago and are not well-maintained. We face a major gap in building infrastructure operations and maintenance—the average school building in the nation is 50 years old, and there is an $85 billion funding gap for school facilities. These funding challenges put additional strain on performing important IAQ maintenance, such as changing filters in HVAC systems or conducting annual inspections. Healthy indoor air also depends on taking a comprehensive approach, including proper ventilation, effective filtration, source control of pollutants, and moisture management to prevent mold.

Just as past public initiatives have provided us with clean water, eliminated indoor smoking, and improved fire safety, there is an opportunity to bring cleaner indoor air to buildings across America, especially for schools and other public buildings.

Resource: Database of State Indoor Air Quality Laws

The Environmental Law Institute maintains an annually updated database of state laws reflecting a wide range of state policy strategies to improve indoor air quality across pollutants, practices, and building types. The database also includes excerpts of state laws for schools, mold, and radon.

I. STRENGTHEN COORDINATION & CAPACITY

Identify an indoor air coordinator

GOVERNOR'S OFFICE

Indoor air quality often falls between the cracks of various government programs and agencies. Often, there is no clear point person in charge of indoor air quality at the state level, or the responsibility is diffused across multiple state agencies. **To improve coordination, the governor's office or state leadership should appoint an Indoor Air Coordinator to bring together voices from across the state departments.**

This Coordinator can make IAQ a shared priority and support coordination across agencies. State agencies relevant to indoor air quality may include: departments of health, education, energy, environment, general services, housing, labor, and transportation. Indoor air quality is often not the primary responsibility of any department, despite the significant public benefits of cleaner indoor air. While IAQ programs typically sit within health departments, many energy departments have ventilation programs and IAQ may fall within the scope of existing air quality and wildfire smoke programs within environmental departments.

Additionally, depending on state and local needs, states could further establish:

- **An indoor air quality program** within a state health or environment department.
- **An interagency coordinating body** with representatives from the departments of health, environment, and other entities. Depending on state needs, the coordinating body can take the form of a formal interagency coordinating body, a task force, or a more informal working group, and should be established by the governor or enacted through legislation.
- **An IAQ advisory council** with external advisors, experts, and community members. This body could provide recommendations, help the state develop IAQ targets, provide industry and technical expertise, and support community partnerships and education.

In establishing an IAQ coordinating body or advisory council, relevant stakeholders include:

- **Leadership**: Governor's office, legislators, key agency leads
- **Public agencies**: Health, education, environment, labor, housing, commerce, emergency management, energy, building codes, emergency management, forestry
- **Experts**: Public health, medicine, ventilation, building science, housing, finance
- **Community voices**: Advocates, non-profits, local leaders
- **Industry partners**: HVAC professionals, building owners and developers

Case Study: California IAQ Task Force

Following the release of California's SMARTER Plan in 2022, upon request from the Governor's office, the California Department of Public Health (CDPH) convened an interagency IAQ Task Force to coordinate state agency action and develop recommendations for advancing clean indoor air. In addition to CDPH, members included:

- California Air Resources Board
- California Department of Education
- California Energy Commission
- California Department of Community Services and Development
- California Department of General Services
- California Department of Housing and Community Development
- Office of Environmental Health Hazard Assessment
- Office of Planning and Research

Case Study: The Maine Indoor Air Quality Council

The Maine Indoor Air Quality Council is an interdisciplinary cooperative of professionals formed in 1998 to promote the improvement of indoor air environments in the state. The Council brings together a diverse group of professionals—including physicians & nurses, engineers, maintenance managers, lawyers, toxicologists, insurers, industrial hygienists, respiratory therapists, educators, architects, legislators, and public policy decision-makers—to advance cleaner indoor air.

Resource: Johns Hopkins Model Clean Indoor Air Act

In 2023, the Johns Hopkins Center for Health Security published the Model Clean Indoor Air Act, a model law for consideration by state legislatures to help improve IAQ in public buildings. As possible template language, the model bill includes a section requiring the state to create an advisory body to the Governor and State agencies responsible for implementing or overseeing IAQ measures, actions, or requirements. See the appendix for excerpt language on establishing an IAQ council.

Publish guidance

STATE AND LOCAL HEALTH DEPARTMENTS

There is a need to strengthen education on indoor air quality in the United States. For example, during wildfires or periods of poor outdoor air quality, many residents are unsure of how to protect themselves. Clear guidance can help households understand what actions to take—such as improving home ventilation or using portable air cleaners—and when those actions are most important, including during wildfires or surges in respiratory illness.

State health departments can publish IAQ guidance, including targeted guidance for high-priority sectors such as schools, homes, and long-term care facilities. States may choose to develop their own guidance or amplify existing resources from trusted sources, including:

- **Environmental Protection Agency**: IAQ Guidance and Tools for Schools
- **Centers for Disease Control and Prevention**: How Much Ventilation is Enough
- **Harvard Healthy Buildings**: Indoor Air Quality Research
- **ASHRAE**: Standards 62.1 & 62.2 Ventilation for Acceptable Indoor Air Quality
- **ASHRAE:** Standard 241: Control of Infectious Aerosols
- **International WELL Building Institute**: Evidence Behind the Air Concept
- **U.S. Green Building Council Center for Green Schools:** IAQ Fact Sheets

Outreach and education strategies include:

- Launch public campaigns to highlight the benefits of cleaner indoor air.
- Issue health advisories during high-risk periods, such as wildfire smoke events or respiratory disease outbreaks.
- Share or link to existing resources for key audiences such as schools, long-term care facilities, businesses, and homeowners.
- Conduct outreach to local health departments and jurisdictions.
- Host training sessions or webinars with relevant experts.
- Coordinate with forestry and/or emergency response agencies to ensure that messaging during wildfire smoke events is consistent and coordinated.

Case Study: King County, Washington

King County, Washington published a set of IAQ resources, including guidance documents, strategies to improve IAQ, technologies to improve IAQ, and recommendations for specific settings. These resources include accessible and easy-to-understand short documents.

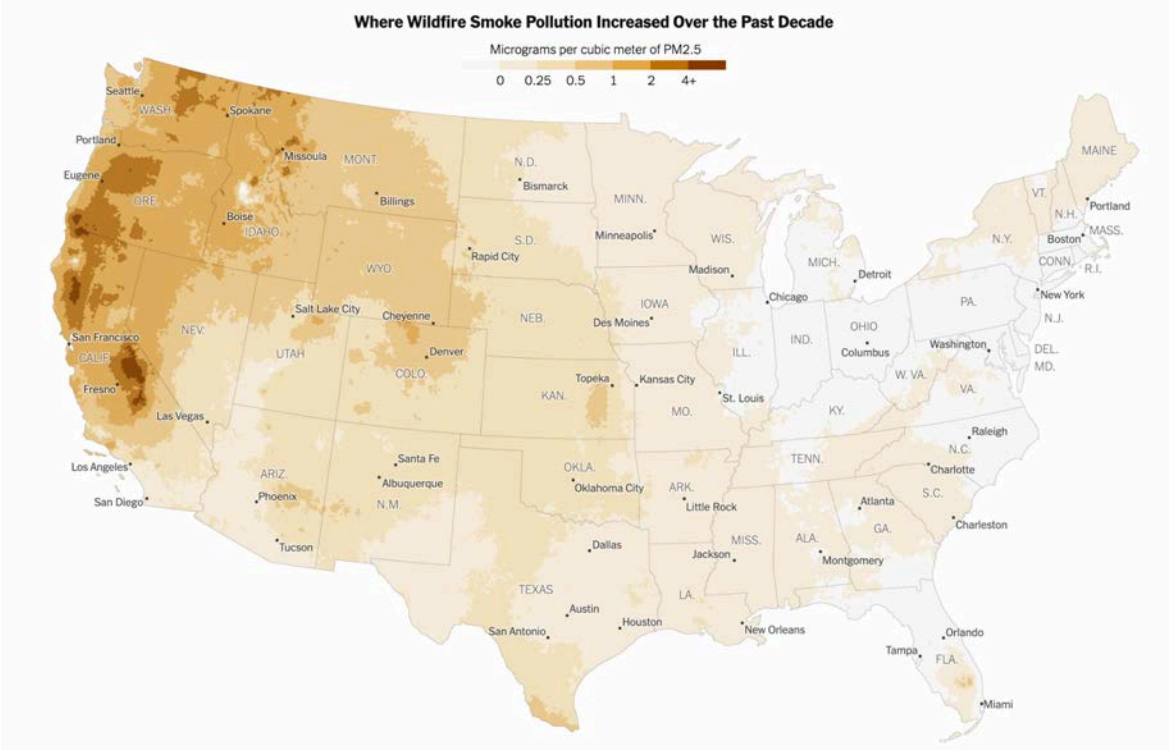
When to consider issuing guidance:

- Wildfire smoke events or periods of poor outdoor air quality
- Allergy season
- Back-to-school season (25% of all childhood asthma hospital visits occur in September)
- Respiratory disease surges (for example, flu season)

Wildfire Smoke

Wildfire smoke poses an increasing risk to public health. Tens of millions of Americans are exposed each year to unhealthy levels of pollutants from wildfires, leading to increased rates of asthma, lung cancer, heart disease, and other chronic health conditions. Importantly, most wildfire smoke exposure occurs indoors, with roughly 80% of exposure to smoke occurring in homes, schools, and workplaces. During wildfire season and smoke events, state and local health agencies can play a vital role in reducing public exposure by issuing timely guidance, health advisories, and mitigation recommendations.

In regions where prescribed fire is used as a land management strategy to reduce wildfire risk, prescribed fires can still be a source of localized PM2.5 exposure. State and local health departments may wish to coordinate with forestry and land management agencies to ensure that messaging is consistent and coordinated.



Source: New York Times

Case Study: Montana Department of Public Health and Human Services

The Montana Department of Public Health and Human Services developed a set of educational resources, including a Wildfire Smoke Response Toolkit, Clean Air Center Resource Guide, and Wildfire Smoke Toolkit for Schools. The toolkit includes example social media posts, flyers, checklists, and more detailed guidance. The department also hosts technical training for building and HVAC managers on managing wildfire smoke.

Case Study: California Wildfire Smoke Grant

The Wildfire Smoke Clean Air Centers for Vulnerable Populations Incentive Pilot Program provides funding to upgrade ventilation systems and purchase portable air cleaners to create a network of clean air centers, where vulnerable populations can find respite from wildfires and other smoke events.

Set targets for indoor air quality

STATE HEALTH DEPARTMENTS

There are no widely adopted national targets for indoor air quality, including concrete goals for ventilation and indoor air pollutant concentrations. While the EPA's Air Quality Index (AQI) sets outdoor air thresholds (based on its National Ambient Air Quality Standards) that help the public know when to take precautionary measures, no equivalent federal targets exist for indoor environments. Targets are important because they help the public understand *what* to aim for and *when* to take action.

In the absence of federal action, state health or environmental departments should point to existing air quality targets from reputable sources, including:

- Centers for Disease Control and Prevention: Aim for 5 air changes per hour
- U.S. Environmental Protection Agency: National Ambient Air Quality Standards
- World Health Organization: Global Air Quality Guidelines
- Health Canada: Residential Indoor Air Quality Guidelines

If states have capacity, they can also develop their own targets tailored to local needs and building types. To develop independent targets, a state health department may wish to convene an advisory committee of experts in indoor air quality or consult organizations from which targets are referenced.

To serve as a reference, the table below contains existing targets for particulate matter (PM2.5 and PM10), nitrogen dioxide, formaldehyde, radon, ozone, and carbon dioxide. We selected these seven pollutants given their outsized burden of disease and relative ease of measurement.

Case Study: California Air Resources Board

In 2005, the California Air Resources Board (CARB) developed IAQ guidelines for nitrogen dioxide as part of their 2005 Indoor Air Quality Report to the California State Legislature. CARB is a regulatory body part of the California Environmental Protection Agency and is the primary state agency responsible for actions to protect public health from the harmful effects of air pollution, setting enforceable ambient air quality standards (AAQS) for outdoor air, and publishing voluntary standards for indoor air quality. CARB is in the process of evaluating and updating its guidelines for nitrogen dioxide to ensure their consistency with recent evidence on the health effects of indoor exposure. During public workshops, CARB shared and gathered feedback on strategies to update the NO_2 guideline, including a primary strategy to adopt existing guidelines set by Canada's health department. CARB is considering this approach to build off of existing research because developing their own guideline would take years longer to develop, but would likely fall in the same proposed range.

Indoor Air Quality Guidelines from Reputable Sources				
Pollutant	**US EPA** National Ambient Air Quality Standards[1]	**Health Canada** Residential IAQ guidelines	**World Health Organization** Guidelines for IAQ 2021	**International Experts** Mandating Indoor Air Quality for Public Buildings (2024)[2]
$PM_{2.5}$	9 µg/m^3 (1 year) 35 µg/m^3 (24 hour)	No safe threshold	15 µg/m^3 (24 hour) 5 µg/m^3 (1 year)	15 µg/m^3 (1 hour)
PM_{10}	150 µg/m^3 (24 hour)		45 µg/m^3 (24 hour) 15 µg/m^3 (1 year)	
Nitrogen Dioxide	100 ppb (1 hour) 53 ppb (1 year)	11 ppb (24 hour) 90 ppb (1 hour)	25 µg/m^3 (1 hour) 10 µg/m^3 (1 year)	
Formaldehyde	0.007 mg/m^3 Inhalation reference Concentration (2024)	40 ppb (8 hour) 100 ppb (1 hour)		
Radon	4 pCi/L (2012)	5.4 pCi/L	2.7 pCi/L (100 Bq/m^3) (2023)	
Ozone	0.070 ppm (8 hour)	20 ppb (8 hour)	60 µg/m^3 (peak season) 100 µg/m^3 (8 hour)	
Carbon Dioxide[3]		1000 ppm (24 hour)		800 ppm (threshold)

It's important to note that occupational exposure limits, such as OSHA's Permissible Exposure Limits (PELs), are insufficient for the general public. OSHA recognizes that many of its PELs are outdated and inadequate for ensuring the protection of worker health. These limits are also typically far higher than what is appropriate for sensitive populations like children, older adults, or individuals with underlying health conditions.

[1] The EPA National Ambient Air Quality Standards were designed for outdoor air applicability.
[2] A group of 36 international experts in 2024 proposed indoor air quality parameter levels for adoption in public buildings.
[3] Carbon dioxide is often used as an indirect measure for ventilation. It differs from other pollutants from this table in that targets for carbon dioxide are often set to minimize short-term cognitive effects and ensure adequate ventilation, opposed to minimizing long-term health effects.

II. ACCELERATE INDOOR AIR QUALITY IMPROVEMENTS

Adopt minimum building standards and codes

STATE & LOCAL BUILDING CODE AUTHORITIES

Building codes are a powerful tool that states and localities can use to improve indoor air quality. These codes govern the construction of new buildings, additions, and some renovations. Indoor air quality provisions within building codes are primarily addressed through mechanical ventilation standards, which set requirements for ventilation systems in buildings. While jurisdictions with existing codes can raise the bar by updating or strengthening IAQ requirements, others may still need to establish baseline ventilation or indoor air quality standards where few or none currently exist.

To improve indoor air quality in new and existing buildings, states and jurisdictions can:

- Adopt mechanical ventilation standards into state and/or local building codes.
- Ensure the adoption of the most recent code editions.
- Create state-level standards for certain building types, such as schools, government buildings, or long-term care facilities.
- Collect data on compliance with mechanical ventilation standards in public and private buildings.
- Encourage routine ventilation maintenance in buildings.

Most states and jurisdictions do not develop their own codes from scratch, but adopt or modify existing model codes and standards. For example, the International Mechanical Code (IMC) is a widely adopted model code for mechanical ventilation systems. ASHRAE Standards 62.1 and 62.2—which set ventilation and indoor air quality requirements for commercial (62.1) and residential (62.2) buildings—are directly referenced in national model energy codes such as ASHRAE 90.1, and in many green building certification programs. Some states and jurisdictions also adopt ASHRAE 62.1 and 62.2 directly into building codes.

Building code authority varies widely across the United States. Most building codes are adopted at the state and local levels, with local authorities having jurisdiction (AHJs) often holding the most authority. Some states adopt statewide building codes, while others leave most code decisions to local governments. Regardless of the adoption pathway, enforcement responsibilities generally fall to local governments. At the federal level, building code oversight is limited to certain federally owned or operated facilities, such as government buildings and defense installations.

It's important to note that building codes primarily apply to new construction and major renovations, which represent only a small fraction of the total building stock. While updated codes can help ensure newer buildings have cleaner indoor air, most codes do not apply to ongoing operations or maintenance. As a result, indoor air quality challenges in existing buildings remain widespread. Many U.S. buildings—including schools, offices, homes, and long-term care facilities—do not meet minimum standards for ventilation, filtration, or pollutant control. Many still lack mechanical ventilation altogether.

Commonly referenced model codes and standards for mechanical ventilation include:

- International Mechanical Code (IMC)
- ASHRAE Standards 62.1 and 62.2 (Ventilation and Acceptable Indoor Air Quality)
- ANSI/ASHRAE/ASHE Standard 170 (Ventilation of Health Care Facilities)
- Sections of the International Energy Conservation Code (IECC), International Fuel Gas Code (IFGC), and International Residential Code (IRC)

Lead by example in state and municipal buildings

STATE & LOCAL GENERAL SERVICES DEPARTMENTS

State and local governments can create market demand for cleaner indoor air by leading by example in the buildings they own, operate, and fund. By setting higher standards for indoor air in public buildings, governments can demonstrate feasibility, drive broader market adoption, and protect the health of public employees and building occupants. Key actions include:

- **Require healthy building certification**: State and local governments can require new construction, major renovations, or leased facilities to achieve third-party certification under healthy building standards, such as LEED or WELL. These certifications often include indoor air requirements that exceed minimum code requirements.
- **Monitor indoor air quality**: States and municipalities can establish programs to monitor IAQ through periodic inspections or real-time monitoring in public buildings such as state offices, schools, and healthcare facilities. Monitoring can help ensure ongoing performance and identify issues.
- **Conduct regular HVAC assessments and inspections**: States can require periodic HVAC inspections and performance assessments for government-owned buildings to ensure that ventilation systems are functioning properly and are regularly maintained.
- **Integrate IAQ into capital planning and procurement:** IAQ can be embedded in state and local capital investment programs, procurement policies, and facility management contracts to ensure ongoing attention to IAQ across the full life cycle of public buildings.

Case Study: Colorado High Performance Certification Program

Under Colorado Revised Statute § 24-30-1305.5, all new construction, additions, and major renovations of state-owned buildings must comply with the High Performance Certification Program (HPCP) if they meet all of the following criteria:

- The project receives 25% or more of state funds, and
- The new facility, addition, or renovation project contains 5,000 or more building square feet, and
- The building includes a heating, ventilation, and air conditioning (HVAC) system, and
- In the case of a renovation project, the cost of the renovation exceeds 25% of the current value of the property.

For projects that meet these applicability criteria, the High Performance Certification Program requires projects to receive third-party verification through LEED or Green Globes Certification.

Case study: U.S. General Services Administration Ventilation Verification Program

During the COVID-19 pandemic, the U.S. General Services Administration (GSA) launched a Ventilation Verification Program, recognizing the important role of ventilation in ensuring occupant health. While the initial motivation was respiratory disease prevention, GSA advanced this work to further the broader health and wellbeing of building occupants. They conducted ventilation assessments in 20% of the federally owned physical footprint, checking for compliance with ASHRAE 62.1. GSA found that a number of buildings had inadequate ventilation and made plans for how to bring those buildings back up to standard. This work motivated GSA to incorporate building recommissioning (regular check-up of ventilation and other systems) into their best practices.

Healthy Building Certification Programs

Building certification programs are third-party certifications that assess and recognize buildings for meeting specific standards related to health, sustainability, and performance. These programs provide frameworks for improving the design, construction, operations, and maintenance of buildings, and assess aspects of buildings such as energy efficiency and indoor environmental quality. Many certification programs include mandatory IAQ components and/or offer IAQ-related credits that contribute towards achieving certification.

Building certification programs can help improve IAQ by:

- Setting above-code standards for indoor air quality, ventilation, and filtration.
- Encouraging performance-based monitoring, such as continuous measurement of CO_2 or particulate matter.
- Creating accountability through third-party verification and regular recertification.
- Requiring performance testing and validation (e.g., as required in the WELL Building Standard).
- Driving demand for certified green and healthy buildings.

Healthy Building Certification Programs	
LEED (Leadership in Energy and Environmental Design)	LEED certification provides a globally recognized, validated system of best practices for achieving health, decarbonization, resilience, and biodiversity.
WELL Building Standard	The WELL Building Standard is a globally recognized healthy building certification program focused exclusively on enhancing human health and well-being.
Fitwel	Fitwel benchmarks building performance to enhance occupant quality of life and optimize asset value for properties.
UL Verified Healthy Building Mark	The UL Verified Healthy Building Mark is a healthy building certification program for indoor environmental quality and occupant comfort, health and wellness.
RESET Air Project Certification	The RESET Air Standard is an indoor air quality standard focused on performance monitoring and real results.
Enterprise Green Communities Certification	Green Communities Certification is a green building program for the affordable housing sector. Through a partnership with IWBI, Green Communities projects are dual certified to WELL.

Provide incentives and implementation support

STATE LEGISLATURE & STATE AGENCIES

To accelerate cleaner indoor air, states can offer a range of incentives and implementation support. These strategies can reduce cost barriers, build local capacity, and incentivize voluntary action. Key options include:

- Provide financial incentives for cleaner indoor air, including tax credits, property tax abatements, reduced permitting fees, and expedited permitting.
- Set IAQ standards for state and locally funded buildings and/or require healthy building certification.
- Launch pilot programs to install air purifiers, monitor IAQ, and improve ventilation and filtration.
- Host training programs for facilities managers and HVAC contractors in partnership with relevant professional associations.

Financial Incentives

State and local jurisdictions can offer targeted financial incentives (tax credits, property tax abatements, reduced permitting fees, and expedited permitting) to motivate building owners and operators to invest in indoor air quality. These incentives can help reduce the costs of assessments and capital improvements, making it more affordable to invest in cleaner indoor air. Credits could also target high-priority settings such as long-term care facilities and schools. Eligible activities might include:

- **HVAC assessments**: Conducting HVAC assessments and testing by a qualified professional.
- **Air filter upgrades**: Upgrading to filters that meet or exceed MERV 13 standards, or purchasing portable air purifiers that meet certain criteria.
- **HVAC upgrades**: Replacing or retrofitting HVAC systems to meet existing building codes, such as ASHRAE 62.1
- **Healthy building certification**: Achieving third-party certification for healthy buildings, such as LEED or WELL, or the dual LEED+WELL Certification Pathway.

Case Study: Nevada Green Building Tax Abatement (GBTA) Program

Nevada's Green Building Tax Abatement (GBTA) program, launched in 2005 and administered by the Governor's Office of Energy, was one of the nation's earliest large-scale efforts to incentivize sustainable building practices through property tax relief. The GBTA program offered partial property tax abatements for buildings that achieved certification under established green building rating systems:

- LEED Silver: 25% abatement
- LEED Gold: 30% abatement
- LEED Platinum: 35% abatement

Abatements lasted for up to 10 years for new construction and 5 years for retrofits. Qualifying buildings had to demonstrate energy performance beyond the state baseline, with specific energy point thresholds required for each certification level. While the program ended in 2021, it demonstrates how property tax policy can drive market transformation toward healthier, more efficient buildings.

Pilot Programs

Pilot programs are a tool for state and local governments to support IAQ improvements across different building types and communities. These programs provide a way to identify effective interventions, demonstrate impact, and inform future policy or funding decisions. Pilot efforts can focus on specific facility types or types of interventions.

Target Facilities: States can launch pilot programs tailored to the needs of specific facility types.

- Schools
- Long-term care facilities (through state department of health CMS penalty funds)
- Clean air centers (for wildfire events)
- Public housing
- Public transportation
- Small businesses

Types of Pilot Interventions: Pilot programs can target a few key IAQ interventions, providing data and insights for broader rollout.

- Portable air purifiers
- IAQ monitoring
- HVAC assessments, repairs, and upgrades
- Integrated energy and resilience improvements

Case Study: Rhode Island

The Rhode Island Department of Health received EPA funding to launch a pilot program monitoring indoor and outdoor air quality for communities affected by asthma in Providence, RI. The project is installing 70 IAQ monitors and 50 air purifiers in PHAs in public housing family developments and community spaces. The project aims to increase community awareness around IAQ, asthma, and healthy housing, develop community action plans for mitigating PM2.5 pollution, and inform future state and local policies.

III. TARGET HIGH-PRIORITY SECTORS

Schools

SCHOOL DISTRICTS & STATE EDUCATION DEPARTMENTS

Improving indoor air quality in schools is essential for student and teacher health, well-being, and learning. Clean indoor air improves test scores, reduces sick days and absenteeism, and helps prevent infectious and chronic diseases such as asthma and influenza. For example, asthma is a leading cause of school absenteeism, accounting for more than 11 million missed school days.

Yet, providing students with clean air has been a challenge for our aging school buildings. According to the EPA, nearly half of the nation's schools have reported to have problems related to indoor air quality. An estimated one-third of schools needed HVAC system updates, and HVAC systems are the building system or feature most frequently in need of repair. As a result, millions of children and educators face significant hazards from mold, heat, infectious disease, pollutant exposure, and insufficient ventilation.

The strategies in this section to provide clean indoor air in schools focus on five pillars:

1. **Publish guidance and educational materials:** Set the foundation for healthy air in schools by developing evidence-based and locally-tailored guidance.
2. **Encourage local IAQ management plans**: Encourage or require districts to develop IAQ management plans and designate a district IAQ coordinator.
3. **Set standards for school construction and performance**: Adopt enforceable standards for indoor air quality into school building codes. Third-party certification systems, such as WELL and LEED, provide frameworks for healthy, high-performance school design and operation.
4. **Enhance transparency and accountability**: Establish transparency and accountability measures, such as IAQ management plans, HVAC inspections, and real-time monitoring to ensure schools meet minimum standards and that buildings operate as designed.
5. **Provide implementation support**: Provide direct funding, technical assistance, and equipment, such as air purifiers or monitors, to help schools implement IAQ improvements, especially in under-resourced districts.

Publish guidance for schools

State health and education departments should publish clear guidance, technical resources, and educational materials. This guidance can help school districts, facilities staff, administrators, and school boards better understand best practices for managing IAQ, navigating available resources, and implementing effective policies.

States can link to or adapt resources such as:

- **EPA**: Tools for Schools
- **U.S. Green Building Council**: School District IAQ Management Plan Toolkit
- **American Lung Association**: Indoor Air Quality in Schools Guide
- **Environmental Law Institute**: Indoor Air Quality in Schools

Case Study: Minnesota

The Minnesota Department of Health (MDH) publishes comprehensive guidance for indoor air quality in schools tailored for school administrators, facilities staff, teachers, and parents. State laws (§123B.595 & 124E.03) require public schools to implement health and safety programs aligned with best practices for IAQ management. To support implementation, MDH developed an IAQ Management Plan Development Package, which includes model plans, EPA checklists, and training resources. MDH also hosts annual trainings and other classes when requested.

Resource*: *National Center for School Infrastructure

The National Center on School Infrastructure (NCSI) is a national resource hub that supports states and school districts in the stewardship of America's elementary and secondary public school facilities. NCSI's comprehensive resource library offers easy access to high-quality guidance and practical tools for building, maintaining, and improving school buildings and grounds, including many useful resources on improving indoor air quality in schools.

Resource*: *School IAQ Fact Sheet Series

The USGBC Center for Green Schools, in partnership with ASHRAE, developed a School IAQ Fact Sheet Series. The IAQ Fact Sheet Series is designed to help people without a technical background understand details about IAQ so that they can make important decisions for their schools. The series includes explainers on ventilation, filtration, portable air cleaners, germicidal ultraviolet light, green cleaning, IAQ monitoring, IAQ during wildfires, and more.

Develop an IAQ management plan

IAQ management plans help school districts establish clear policies and procedures for preventing, identifying, and addressing indoor air quality issues across their facilities. Importantly, IAQ management plans require designating an IAQ Coordinator, or someone in charge of the school's indoor air quality. A comprehensive IAQ management plan serves as a district-wide framework for maintaining healthy indoor environments through operations and maintenance practices, staff training, communication protocols, and compliance with local, state, and federal regulations. IAQ management plans should be written, regularly updated, accessible to staff, and tailored to district resources and priorities.

IAQ management plans typically address a range of key factors, including but not limited to:

- Ventilation and filtration performance
- Mold and moisture control
- Integrated pest management
- Cleaning products and protocols
- Building inspections and preventive maintenance
- Continuous air quality monitoring
- Extreme weather preparedness and response
- Designation of an IAQ Coordinator responsible for oversight and implementation

Resource*: *EPA Tools for Schools & USGBC School District IAQ Management Plan Toolkit

Example IAQ management plans include EPA's Tools for Schools and the U.S. Green Building Council's School District IAQ Management Plan Toolkit. Both model IAQ management plans recommend the establishment of an IAQ coordinator at the district level to lead IAQ management.

Funding Opportunity: Go Green Initiative & National School Boards Association

The Go Green Initiative partnered with the National School Boards Association on an EPA-funded program to improve IAQ and reduce greenhouse gas emissions in low-income and Tribal school districts. Each year ten school districts will be chosen to receive on-the-ground technical assistance and $50,000 in grant funding to enact IAQ Management plans.

Set standards for school construction and performance

School building codes: States and school districts can promote clean indoor air by integrating IAQ standards into building codes that apply to new school construction, major renovations, and facility upgrades. By establishing clear design and performance requirements, building codes can ensure that new and renovated school buildings protect student and staff health from the start. For example, schools should make sure they meet ASHRAE Standard 62.1 for ventilation and acceptable indoor air quality.

In addition, states may require or recommend higher-efficiency HVAC filtration to improve the removal of airborne particles. Many states and districts have established MERV-13 (Minimum Efficiency Reporting Value 13) filters as the baseline for schools. MERV-13 filters capture smaller particles—including fine dust, pollen, mold spores, bacteria, and respiratory aerosols—that other common filters do not capture, providing enhanced protection against allergens and airborne pathogens such as viruses. The use of MERV-13 or higher filters has become a widely endorsed best practice for schools.

Building certification programs: States may also promote or require third-party green and healthy building certification programs that incorporate comprehensive indoor air quality measures. These programs establish voluntary or mandatory frameworks for design, construction, and ongoing operations, and can provide schools with recognized benchmarks for IAQ performance. Examples of commonly used certification programs include WELL and LEED (*see Building Certification Programs for more details.*)

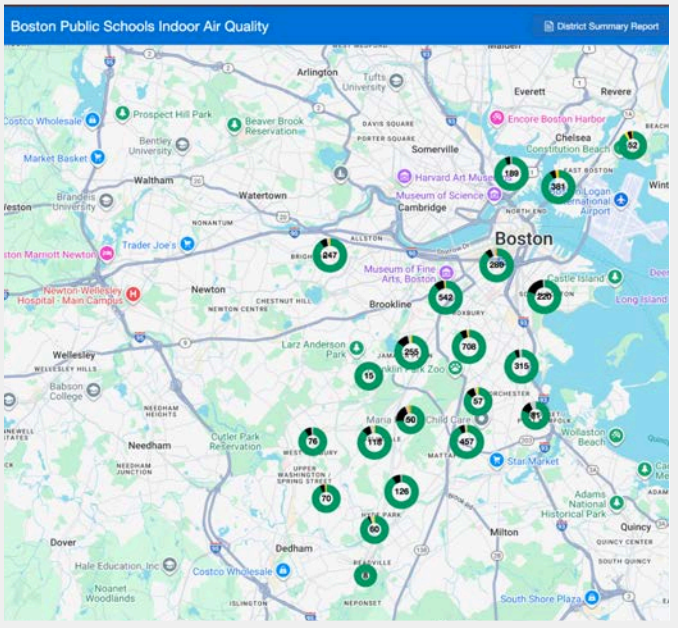
Case Study*: *Rhode Island

Rhode Island requires new school construction and major renovations to comply with the Northeast CHPS Verified Program (NE-CHPS), which mandates that schools meet indoor air quality standards under ASHRAE 62.1 and develop an indoor environmental quality management plan. Since 2018, Rhode Island has approved over $5 billion in new school construction, and new and majorly renovated schools must comply with NE-CHPS.

> ***We welcome IAQ regulations and standardized guidance for schools because when you're able to point to regulations, compliance issues, or state and federal recommendations, the support and access to resources, such as funding and staff capacity, quickly improve.***
>
> ***- Katherine H. Walsh, Boston Public Schools***

IAQ Monitoring Programs: School districts can implement indoor air monitoring through either periodic spot checks or continuous real-time monitoring. Monitoring can track key indicators and pollutants such as carbon dioxide, particulate matter (PM2.5), temperature, and humidity. Both point-in-time assessments and continuous monitoring help identify ventilation issues, verify HVAC system performance, prioritize maintenance, and increase transparency for teachers, parents, and local communities.

Case Study: Boston Public Schools



Boston Public Schools (BPS) installed 4,500 IAQ sensors in every classroom, Nurse's Office, and Main Office, measuring real-time carbon dioxide, carbon monoxide, particulate matter (PM2.5 and PM10), temperature, and relative humidity. The sensors report the data publicly in real-time through an online dashboard, allowing schools, caregivers, and community members to view the data. BPS Facilities Management also uses the data to make operational improvements and long-term capital investments in school buildings, and entered into a research partnership with the Boston University School of Public Health.

HVAC and Ventilation Inspections: Routine inspections and preventative maintenance of school ventilation systems are essential to identifying deficiencies in HVAC systems and ensuring they operate as intended. States and districts can require periodic inspections by qualified professionals to verify that HVAC systems meet ventilation, filtration, and maintenance standards, and to address problems proactively before they impact student health.

Case Study: Connecticut

Connecticut state law requires school districts to conduct (1) an annual inspection and evaluation of indoor air quality in each school building and (2) an inspection and evaluation of the HVAC system in each school building once every five years. For the annual inspections, school districts must use the EPA's Tools for Schools program. Inspection results must also be publicly available online.

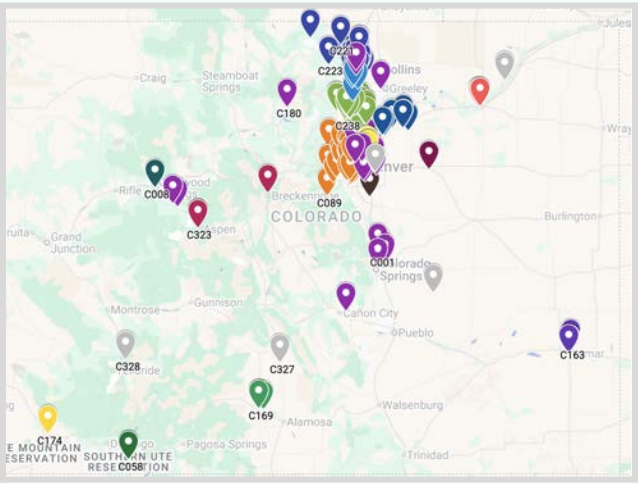
Provide implementation support

Portable air cleaner programs: States can distribute portable air cleaners to schools to supplement existing ventilation and filtration in schools. Particularly for schools with aging infrastructure or limited mechanical ventilation, portable air cleaners are a cost-effective way of removing indoor pollutants and reducing disease transmission.

Case Studies: Utah & Colorado

Utah: The Utah Department of Health and Human Services launched a pilot program in collaboration with Utah Physicians for a Healthy Environment and placed air purifiers in 70% of schools and 55% of daycare centers.

Colorado: The Colorado Department of Public Health & Environment Clean Air for Schools Project provided portable air cleaners for 30,000 classrooms in 50-70% of the K-12 schools across Colorado (1,000 to 1,400 schools). In partnership with the University of Colorado Boulder, the state implemented an air monitoring network in 2,400 classrooms.



Grant programs: Funding is a key barrier to improving indoor air quality in schools. States and local jurisdictions can administer grant programs to help districts install, upgrade, and maintain their HVAC systems, purchase sensors or filters, and train facilities staff and school administrators. States can also leverage federal funding opportunities when available.

Case Studies: Michigan & Minnesota

Michigan: In 2023, Michigan appropriated $50 million to establish the Healthy Schools Program to support schools in reducing energy costs and improving health outcomes at school facilities. Eligible activities include indoor air quality improvements.

Minnesota: The Minnesota Air Ventilation Pilot Grant Program (HVAC Program) offers one-time grants of up to $50,000 per school to support HVAC assessments, upgrades, and energy efficiency improvements. The HVAC Program was created by the state legislature and appropriated $1 million to the Department of Commerce for the program.

Photo: Ken Zirkel

This section was written in collaboration with the National Center for Healthy Housing

Housing

STATE AND LOCAL HEALTH & HOUSING DEPARTMENTS

Most of the time Americans spend indoors is at home, where they are often exposed to a multitude of indoor air contaminants. Unlike other public buildings, homes are not subject to regular IAQ monitoring or clear regulatory standards. Housing includes many different types: single-family, multifamily, public housing, subsidized housing, and both renter- and owner-occupied homes. Policies and funding for IAQ vary across these housing types and often lack coordination, making policies fragmented and hard to navigate.

Successful healthy housing programs include identifying IAQ hazards through assessments, conducting healthy housing training for community health workers, providing model assessment tools, and conducting environmental sampling. After identifying hazards, programs can establish remediation guidelines and mitigation strategies.

Residential IAQ programs are most effective when they function as part of a larger package of programs, policies, and incentives, especially in collaboration between departments of housing, health, energy, and environment.

Case Study: New York

The New York State Healthy Neighborhoods Program seeks to reduce the burden of housing related illness and injury through a holistic, healthy homes approach. The program provides in-home assessments and interventions to reduce negative health outcomes from asthma and poor IAQ.

Set standards for healthy housing

Statewide housing standards are key tools for ensuring safe and healthy homes and improving IAQ, including building codes, property maintenance codes, certification systems, and pollutant-specific standards. While building codes set minimum standards for the design and construction of new buildings, property maintenance codes apply to the maintenance, quality, and safety of *existing* residential buildings. Housing certification programs can set additional standards for the design and/or performance of housing, and pollutant-specific policies can protect occupants from certain contaminants.

Case Study: California

California's Health & Safety Code declares a residential building substandard if dampness or visible mold poses a health hazard to occupants. Landlords are required to disclose the potential health risks of mold exposure to prospective tenants.

Building Codes

- **International Residential Code**: Certain provisions of the International Residential Code (IRC) set higher standards for indoor air quality, such as requiring carbon monoxide detectors in new homes with fuel-burning appliances or attached garages.
- **ASHRAE Standard 62.2**: Ventilation and Acceptable Indoor Air Quality in Residential Buildings sets requirements to achieve acceptable IAQ.

Property Maintenance Codes

- **National Safe and Healthy Housing Standard.** The National Center for Healthy Housing, in partnership with the American Public Health Association and experts, developed the National Healthy Housing Standard (NHHS) to link housing conditions directly to health outcomes. NHHS complements the International Property Maintenance Code and other existing federal, state, and local housing policies.
- **International Property Maintenance Code.** States can incorporate the International Property Maintenance Code (IMPC) into state property maintenance codes and, if necessary, amend sections to include stronger IAQ requirements such as minimum ventilation requirements, radon control, carbon monoxide detectors, and mold identification and remediation code standards.

Healthy Housing Certification

- **Enterprise Green Communities Criteria.** Enterprise Green Communities Criteria is a national standard for affordable housing that includes requirements for health, safety, energy efficiency, and climate resilience. 27 states already require or incentivize this initiative, typically through the state's Qualified Allocation Plan (QAP) for low-income housing tax credits. Through a partnership between Enterprise and IWBI, affordable housing projects certified to Enterprise's Green Communities are also certified to WELL.
- **LEED certification.** LEED certification can apply to residential design and construction.

Pollutant-Specific Standards

- **HUD and EPA radon guidelines.** These guidelines require compliance with radon testing and abatement standards in multifamily housing. States can also align their policies with EPA's radon action limits.
- **Smoke-free multi-unit housing policies.** 1 in 4 Americans lives in multi-unit housing, where secondhand smoke can spread between units. States can follow HUD's lead in requiring smoke-free policies in public housing and expand this to rental properties.
- **Mold remediation standards.** Use mold remediation guidelines to ensure mold problems are addressed safely and effectively.

Enhance transparency and accountability

Statewide agencies, policymakers, and advocates can increase transparency and accountability on residential IAQ:

- **Collect and track data.** Information about IAQ exposures and health outcomes is collected and shared by different stakeholders in ways that make them difficult to analyze. State policymakers can improve data collection on housing conditions and make the data broadly available. States could launch data collection efforts to survey IAQ across homes, similar to the U.S. Department of Housing and Urban Development's American Healthy Homes Survey. Assessment programs and tools can be found here.
- **Promote proactive rental inspections and rental registries.** In a complaint-based system, property maintenance issues are only investigated and cited by code enforcement officials if a tenant files a complaint with the code enforcement department. However, tenants are often reluctant to file code complaints due to fear of retaliation and eviction. Proactive rental inspection programs inspect rental units on a periodic and systematic basis to identify potential code violations and IAQ hazards. This shifts enforcement from being reactive to preventive.

Provide implementation support

Housing Repair and Rehabilitation Programs

Housing repair and rehabilitation programs can provide financial assistance to tenants and homeowners to improve IAQ, through loans or grants to help perform home improvements. State policymakers can support low-and no-interest loan programs to assist property owners (including low-and middle-income rental property owners) to identify and address health hazards. These programs can:

- Install radon mitigation systems
- Eliminate leaks and openings that let in moisture and pests
- Install kitchen exhaust hoods
- Install carbon monoxide detectors
- Increase ventilation
- Install enhanced filtration systems

Case Study: Pennsylvania

The Pennsylvania Department of Community and Economic Development provides funding to local governments and non-profit service providers to implement the Whole-Home Repairs Program to residents of their counties. Programs support up to $50,000 per unit in repairs for homeowners and small landlords to support upkeep and weatherization.

Leverage federal funding opportunities

States can use federal programs to support IAQ improvements and healthy housing. While states must conform with federal rules and guidelines, they can influence policy priorities and implementation.

- **Low Income Housing Tax Credit**. States can utilize the Department of Treasury's Low Income Housing Tax Credit (LIHTC) Program to address IAQ contaminants and concerns in new construction. The LIHTC program aims to create new, affordable housing and preserve existing affordable housing. Each state housing finance agency creates a Qualified Allocation Plan (QAP) that establishes eligibility priorities and criteria for awarding tax credits to developers. State housing finance agencies can include priorities and criteria in their QAPs to ensure that tax credits distributed through this program promote healthy indoor air.
- **Community Development Block Grant Program**. HUD's Community Development Block Grant (CDBG) Program provides funding directly to states, cities and other jurisdictions. This grant funding is flexible and can be used for IAQ-related housing programs, support activities, and repairs. After natural disasters, states can also use CDBG program funds to rebuild homes, and HUD then requires that post-disaster reconstruction complies with green and healthy housing standards.
- **Healthcare Financing.** States can leverage Medicaid's Children's Health Insurance Program (CHIP) to help finance healthy housing programs or initiatives that include IAQ interventions. States including Michigan, Ohio, Maryland, and Rhode Island have used this approach. Maryland, for example, obtained Medicaid/CHIP waivers to help finance asthma home-based interventions.
- **Weatherization Assistance Program.** All states receive funding from the Department of Energy's Weatherization Assistance Program (WAP). WAP funding includes support for health and safety measures, usually at 15% of program operations. State agencies determine how rehab projects get points in their Qualified Action Plans and can prioritize IAQ focused rehabilitation project activities. WAP also requires homes to meet ASHRAE Standard 62.2.
- **Healthy Homes Production Grants**. HUD awards Healthy Homes Production Grants to state and local government agencies, nonprofit organizations, and tribes and tribal agencies to identify and address health and safety hazards in homes, including mold and moisture, poor indoor air quality, pests, and carbon monoxide.
- **Utilize the Environmental Public Health Tracking Network Program.** The CDC's Tracking Program funds states to run their own tracking programs including for air quality, asthma, and carbon monoxide. The Tracking Program allows public health practitioners, healthcare providers, community members, and policy makers to make data-driven decisions that affect resident health.

Case Studies: Maine and Connecticut

Maine's Home Repair Network: Maine's Department of Economic and Community Development provides state CDBG funding for housing rehabilitation to communities that don't receive CDBG entitlement funds. The program is operated regionally by community action agencies. IAQ risk management activities, including testing and repair for asbestos and radon, are eligible under this program.

Connecticut's Radon Program: The Connecticut Department of Public Health provides radon education, testing, and mitigation using State Indoor Radon Grant (SIRG) funding. When the state housing department hosts information sessions, the Department of Public Health's Radon Program presents their radon information on measurement and mitigation basics. Consultants who work with communities then receive assistance through CDBG funding requests and distribute free radon test kits from the program.

Long-Term Care Facilities

STATE HEALTH DEPARTMENTS

Long-term care (LTC) facilities, including nursing homes, house over 1.2 million residents across the U.S. This elderly population is particularly vulnerable to poor indoor air quality because of compromised immune systems and close living quarters. Improving indoor air quality can reduce infections, prevent avoidable deaths, and enhance cognitive function and asthma management. Cleaner indoor air would improve quality of life for nursing home residents and staff. State health departments can take the following actions:

- **Publish guidance and resources:**
    - **American Health Care Association**: Improving Indoor Air Quality During the Winter Months
    - **ANSI/ASHRAE/ASHE:** Standard 170: Ventilation of Health Care Facilities
    - **CDC**: Ventilation in Healthcare Facilities
- **Set standards for health-based indoor air quality in LTC facilities**, such as requiring facilities to implement ASHRAE Standard 241.
- **Require IAQ and ventilation assessments as part of regular facility inspections**. Life code safety inspections (ensuring building code compliance and fire safety) and health inspections (used for the CMS Five-Star Quality Rating) are conducted on a roughly annual basis by state health departments. IAQ could be incorporated into these inspections.
- **Launch programs to distribute portable air purifiers or IAQ monitors** to incentivize cleaner indoor air.
- **Utilize funds from the Civil Money Penalty Reinvestment Program** to support IAQ in LTC facilities. The Civil Money Penalty (CMP) Program collects monetary penalties from nursing homes not in compliance with CMS standards, after inspectors are sent out by state health departments. A portion of these funds are returned to states through the CMP Reinvestment Program, and funds can be used to support quality of care or quality of life improvements for residents. State health departments could encourage nursing homes to request CMP funds to purchase portable air cleaners and coordinate a broader effort to catalyze IAQ improvements with these funds.

Workplaces

STATE LABOR DEPARTMENTS

Workplaces play a critical role in protecting the health and safety of individuals. Many workplaces in particular—such as healthcare settings, the food industry, construction, and manufacturing—face higher risks from exposure to indoor pollutants and airborne infectious diseases. However, most workplaces have no enforceable IAQ requirements beyond the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PELs), which OSHA acknowledges are outdated and inadequate for ensuring the protection of worker health. Most OSHA PELs have not been updated since 1970.

States can set standards for specific facilities or choose to set broader requirements. For example, many states require the construction or major renovation of healthcare facilities to meet the FGI Guidelines for Design and Construction for hospitals, outpatient facilities, and residential health, care, and support facilities, and ASHRAE Standard 170, Ventilation of Health Care Facilities.

Broadly, states can take two steps to provide cleaner indoor air in workplaces:

- **Set voluntary or mandatory standards for workplaces.** States can develop IAQ standards and pollutant targets to protect workers across a variety of sectors. For example, this could include recommending or requiring minimum ventilation and filtration rates, pollutant targets, and IAQ monitoring and reporting.
- **Set voluntary or mandatory standards for buildings where public employees work**. As described above, state and municipal governments can lead by example by setting IAQ standards for the workplaces they own, operate, or lease.

Case Studies: Maine and New Jersey

Maine: ME LD1407 directs the Maine Department of Labor Board of Occupational Safety and Health to develop IAQ standards for buildings where public sector workers are employed. The board is directed to either (a) set individual standards for several target pollutants, or (b) develop an indoor air quality index. Any standards set regarding aerosolized particles are expected to meet or exceed standards set by ASHRAE Standard 241.

New Jersey: The New Jersey Indoor Air Quality Standard (N.J.A.C. 12:100-13) sets standards for indoor air quality in existing buildings occupied by public employees during their regular working hours. The Indoor Air Quality Standard is one of the only state indoor air quality standards in the U.S.

APPENDIX

A. Resources

Portable Air Cleaners & IAQ Monitors

- **EPA**: Guide to Air Cleaners in the Home
- **Corsi-Rosenthal Foundation**: How to build your own Corsi-Rosenthal Box
- **AHAM**: AHAM Verifide Certification for Room Air Cleaners
- **EPA**: Low–Cost Air Pollution Monitors and Indoor Air Quality

Guidelines

- **World Health Organization**: WHO global air quality guidelines
- **Health Canada**: Residential indoor air quality guidelines
- **International Society of Indoor Air Quality and Climate:** Indoor Environmental Quality Guidelines Database
- **Academic experts**: Mandating indoor air quality in public spaces
- **Rocky Mountain Institute**: The Need for US Indoor Air Quality Guidelines
- **GO AQS**: Global Open Air Quality Standards

Building Certification Programs

- **USGBC**: LEED (Leadership in Energy and Environmental Design)
- **International WELL Building Institute:** WELL Building Standard
- **Fitwel**: Fitwel
- **UL Solutions**: UL Verified Healthy Building Mark
- **RESET**: RESET Air Project Certification

Wildfire Smoke

- **EPA**: Wildfires and Indoor Air Quality and Smoke-Ready Toolbox for Wildfires
- **ASHRAE**: Guideline 44-2024, Protecting Building Occupants From Smoke During Wildfire and Prescribed Burn Events
- **Environmental Law Institute**: Wildfire Smoke State Policies for Reducing Indoor Exposure

Radon

- **EPA**: Radon resources and National Radon Action Plan
- **CDC**: Radon resources
- **American Lung Association:** Radon

Healthy Housing

- **EPA:** Protect Indoor Air Quality in Your Home
- **National Center for Healthy Housing:** Indoor Air Quality Tools Inventory
- **Environmental Law Institute**: Indoor Air Quality Guide for Tenants
- **ASHRAE Standard 62.2**: Ventilation and Acceptable Indoor Air Quality in Residential Buildings
- **Enterprise Community Partners**: Green Communities

Schools

- **EPA**: Tools for Schools
- **U.S. Green Building Council**: School District IAQ Management Plan Toolkit, School IAQ Fact Sheets
- **National Center on School Infrastructure:** Indoor Air Quality Resources
- **Environmental Law Institute**: Indoor Air Quality in Schools, Ventilation in Schools: A Review of State Policy Strategies, and State Funding for School Ventilation: A Review of State Policies, 2020-2022
- **Asthma and Allergy Foundation of America**: 2025 State Honor Roll Report
- **American Lung Association**: Indoor Air Quality in Schools Guide
- **National Energy Management Institute:** Indoor Air Quality Resources

Long-Term Care Facilities

- **ANSI/ASHRAE/ASHE:** Standard 170: Ventilation of Health Care Facilities
- **CDC**: Ventilation in Healthcare Facilities

Workplaces

- **Commit to C.A.R.E.:** Indoor Air Quality Tools
- **Occupational Safety and Health Administration:** Indoor Air Quality
- **American Industrial Hygienist Association**: Indoor Air Quality Resources
- **UC Davis and California Department of Public Health**: Indoor Air Quality

B. Costs and Benefits

Documents summarizing the costs and benefits of improved IAQ:

- **American Industrial Hygiene Association:** The Value of IAQ
- **International Well Building Institute**: ROI of Healthy Buildings
- **Lawrence Berkeley National Labs**: IAQ Scientific Findings Resource Bank
- **Harvard Healthy Buildings**: The COGfx Study & The Business of Healthy Buildings
- **Johnson Controls**: Measuring the return on Indoor Air Quality investment
- **Commit to C.A.R.E.:** The ROI of Indoor Air Quality

Productivity & Economic Impacts

- Increasing the minimum ventilation rate from 8 to 15 L/s per person could yield $37.5 billion in economic benefits.
- The increased productivity of an employee from enhanced ventilation is over 150x greater than the resulting energy costs. Doubling the ventilation rate from ASHRAE standards improves the performance of workers by 8%—equivalent to a $6,500 increase in employee productivity each year—while costing less than $40 per person.
- During wildfire smoke events, an additional day of smoke exposure reduces quarterly earnings by about 0.1%

Student Absenteeism & Test Scores

- A study of 27 schools in California estimated that increasing ventilation rates from 4 L/s-person to 7 L/s-person would decrease absenteeism by 3.4% and increase attendance linked funding to schools by $33 million each year, with $4 million in increased annual energy costs.
- A randomized control trial in Milan installed air purifiers in primary school classrooms, reducing indoor PM2.5 concentrations by 32% and student absenteeism by 13%.
- Asthma is a leading cause of school absenteeism, causing an estimated 13.8 million missed school days annually.
- Improvements in performance with increased ventilation rates can range from a few percent to 15%.
- A U.S. study of 5th grade classrooms found that the percentage of students passing the standardized math test increased by 2.9% for each 2.1 cfm (1 L/s) per student increase in ventilation rate, and the percentage of students passing the standardized reading test increased by 2.7% for each 2.1 cfm (1 L/s) per person increase in ventilation rate.

Health

- In 2012, the estimated mortality burden in the U.S. from PM2.5 was roughly 230,000 to 300,000 deaths. Indoor exposure to PM2.5 of outdoor origin is typically the largest total exposure, accounting for ~40–60% of total mortality, followed by residential exposure to indoor PM2.5 sources.
- The total cost of asthma in the United States was $81.9 billion in 2013, or $3,266 per person.

C. Hiring Qualified HVAC Professionals

This section was written in collaboration with SMART and NEMI

Having trained and certified HVAC professionals work on your building is one of the best ways to ensure healthy indoor air. Skilled professionals know how to design, install, maintain, and upgrade systems so they work efficiently, last longer, and keep the air clean. When hiring HVAC professionals, consider looking for people with recognized certifications. These credentials are based on recommendations from ASHRAE and the University of California Davis.

These certifications are often accredited under the ANSI ISO/IEC 17024 standard, which means they meet rigorous, nationally recognized requirements for fairness, quality, and technical competence. In other words, ANSI-accredited credentials give you confidence that the professional's training and testing have been independently verified.

There are three main certifying agencies for testing, adjusting, and balancing (TAB) technicians. TAB is a process that ensures HVAC systems operate as designed, and meet performance, comfort, and efficiency standards.

- Testing, Adjusting and Balancing Bureau (TABB)
- Associated Air Balance Council (AABC)
- National Environmental Balancing Bureau (NEBB)

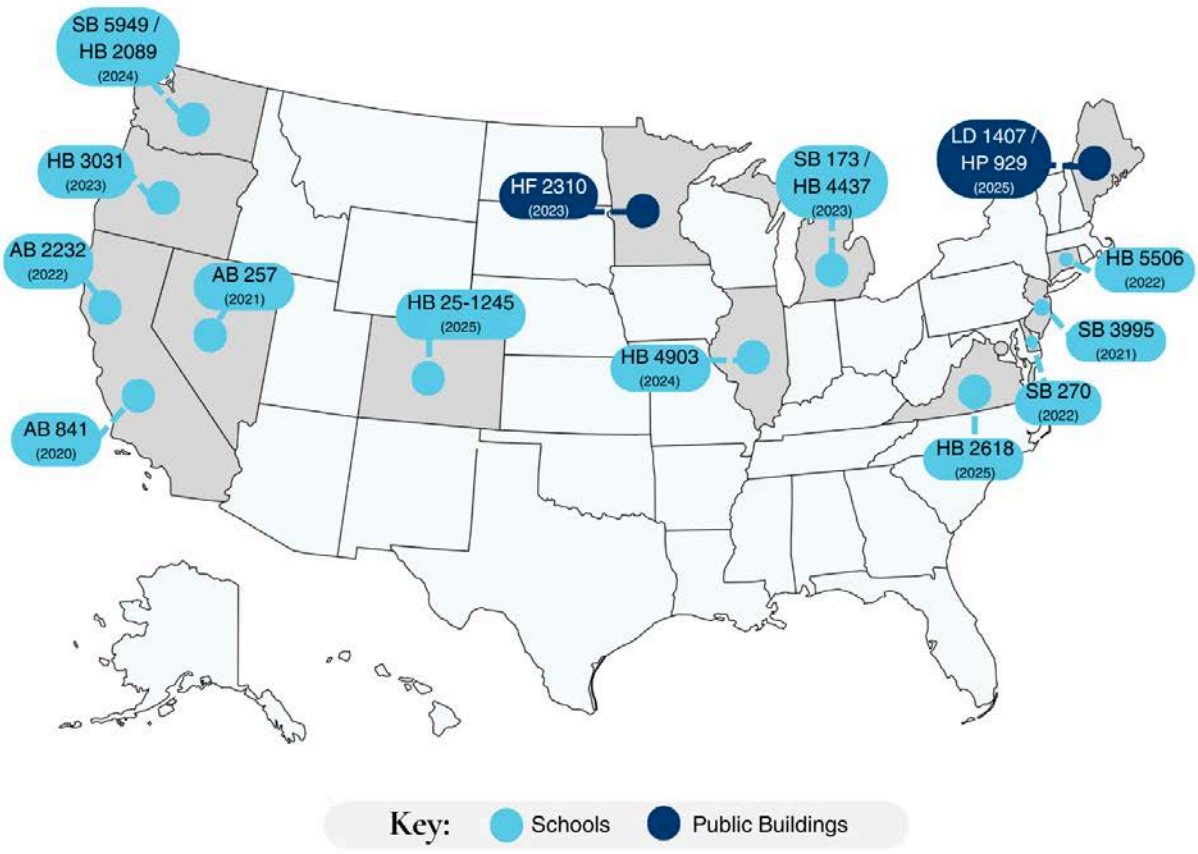
These certifications especially help for projects aligned with:

- **SMACNA guidelines**. SMACNA is a professional association that represents sheet metal and air-conditioning contractors and publishes IAQ guidelines.
- **ANSI/ASHRAE standards**. ANSI is a national organization that oversees the development of voluntary consensus standards, including for buildings. ASHRAE is a professional association of HVAC engineers that publishes numerous standards for various aspects of HVAC systems. For example, ANSI/ASHRAE Standards 62.1 and 62.2 are commonly adopted in buildings and homes.

In addition to certification for TAB technicians, the workforce performing HVAC and IAQ testing should have proper skills, training and certifications. A significant percentage of these workers should be graduates of a registered apprenticeship program in the state or province where the work is being performed, for the relevant construction occupation. These standards help ensure consistent, high-quality work across projects. Several states have passed IAQ legislation that includes these workforce standards.

D. Recently Passed State IAQ Legislation

For a more comprehensive list of state IAQ legislation, see this database. Thank you to ASHRAE and SMART for their contributions in compiling this list.



BILL	STATE	YEAR	DESCRIPTION
AB 2232	California	2022	Requires schools to meet updated ventilation and filtration standards where feasible, including MERV 13 filters and continuous CO2 monitoring in classrooms, while state agencies work to establish mandatory CO2 monitor standards.
AB 841	California	2020	Funds public schools to assess and improve ventilation systems, requiring MERV 13 filters, CO2 monitors, and compliance with state ventilation standards, with verification reports made publicly accessible.
HB 25-1245	Colorado	2025	Requires schools using federal or combined federal-state funds for HVAC upgrades to meet specific requirements for the installation, inspection, and maintenance of their HVAC systems.

HB 5506, Sec. 367, 368, 370	Connecticut	2022	Establishes a $75 million HVAC grant program to reimburse school districts for projects improving IAQ and requires schools to conduct assessments using the Tools for Schools program.
SB 270	Delaware	2022	Requires public schools to follow IAQ standards set by the Division of Public Health, including routine monitoring, contractor certification, and a formal process for receiving and investigating IAQ complaints.
HB 4903	Illinois	2024	Tasks the State Board of Education, in partnership with the Department of Public Health, to compile and share resources for assessing air quality and maintaining school ventilation systems, with outreach to elementary and secondary schools.
LD 1407 / HP 929	Maine	2025	Directs the Dept. of Labor to report findings from the Indoor Air Quality Advisory Group and develop IAQ standards for buildings where public employees work.
SB 173, Sec. 12a / HB 4437	Michigan	2023	Directs the Dept. of Education to establish a $50 million healthy schools grant program to fund IAQ improvements, energy upgrades, toxin remediation, and drinking water system enhancements, with a 50% matching requirement from grantees.
HF 2310, Sec. 123B.663	Minnesota	2023	Directs the Department of Commerce to establish a $1 million air ventilation pilot grant program, prioritizing schools. Sets requirements for eligible activities, mandated reporting, filtration rates, and workforce performing the upgrades.
AB 257	Nevada	2021	Requires schools to assess and improve ventilation and filtration systems as funding allows, use the highest efficiency MERV filters when possible, comply with the Uniform Mechanical Code, and complete assessment and district-wide reports.
SB 3995	New Jersey	2021	Creates the School and Small Business Energy Efficiency Stimulus Program fund at the Board of Public Utilities to upgrade HVAC systems in schools. Requires the Dept. of Health to study IAQ in public schools, identify contaminants, and recommend mitigation measures.
HB 3031	Oregon	2023	Requires school districts using state or federal funds for HVAC upgrades to conduct ventilation verification, CO2 monitoring, HVAC assessments, and submit verification reports to the Oregon Dept. of Education.
HB 2618 / SB 1413	Virginia	2025	Requires school boards to set preventative maintenance schedules for HVAC systems and ensure IAQ through inspections every two years, with industry-recognized evaluations at least every four years.
SB 5949 / HB 2089	Washington	2024	Appropriates $45 million for FY2024 grants to improve school IAQ and energy efficiency, with about one-third reserved for small districts. Funded projects include HVAC upgrades and air quality improvements. Requires facility assessments with cost estimates to be reported to the legislature.