# Addressing Indoor Air Quality in School Energy Efficiency Upgrades

*Review of Selected State Policies*

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# Executive Summary

Energy efficiency continues to be an important component of federal, state, and local efforts to reduce greenhouse gas emissions. School facility upgrades that increase energy efficiency can help school districts advance their educational mission by reducing energy and other operating costs. Facility upgrades that protect and improve indoor air quality (IAQ) also support the core mission of schools by promoting staff and student health, productivity, and attendance. There is now broad recognition that it is possible to achieve both energy efficiency and indoor air quality goals as part of a school retrofit project. When undertaking energy efficiency and other facility upgrades, early consideration of IAQ issues can help schools avoid unintended, negative consequences and reap the twin benefits of energy savings and a healthier, more productive school environment.

State laws, regulations, and guidance can facilitate the integration of IAQ and energy efficiency goals. This report discusses three areas of potential policy development: state funding for school facility upgrades, energy savings performance contracting, and regulation of indoor pollutants during renovation. While these are not the only policy areas ripe for consideration, the examples described throughout the report reflect a variety of strategies for maximizing the health benefits of energy retrofits and other school facility upgrades.

## State Funding for School Facility Upgrades

States operate a variety of programs that provide grants, loans, and other financing for school energy efficiency retrofits and other facility upgrades, and these programs are particularly important for school districts that have limited resources for capital-intensive measures. Currently there are few state funding programs that affirmatively require or encourage the integration of IAQ and energy goals, however the report highlights examples of policy strategies that have been adopted and could be expanded in the future. These include:

- Establishing energy-related IAQ improvements as allowable or priority uses of energy efficiency funding;
- Considering non-energy benefits, such as enhanced IAQ, in awarding energy-efficiency funding; and
- Establishing IAQ measures as priorities for general school renovation and repair programs.

## Energy Savings Performance Contracts

Many school districts carry out energy efficiency projects by entering into an energy savings performance contract (ESPC) with an energy services company (ESCO). Typically, an ESCO guarantees that the project will generate a minimum level of energy savings and the school district pays for the project through those savings. Most states have laws that authorize school districts to enter into ESPCs, and these policies present an opportunity to encourage the integration of IAQ goals into an energy

project. Following are examples of policy approaches taken by some states and considerations for expanding these approaches:

- Include explicit statutory and regulatory ESPC provisions that allow IAQ measures to be carried out and financed through the ESPC;
- Establish criteria for cost-effectiveness, payback, contract length, and other ESPC features that enable performance contracts to capture non-energy benefits, including enhanced IAQ;
- Provide guidance documents and other educational materials that emphasize the importance of IAQ considerations in the ESPC process and reference technical materials, such as EPA's *Energy Savings Plus Health* guidelines, for integrating IAQ and energy efficiency; and
- Develop model ESPC contract documents that include clauses requiring consideration of IAQ issues in the energy audit, establishing IAQ-related facility standards, and prohibiting contracted work from compromising indoor air quality.

## Regulatory Requirements for Addressing IAQ Contaminants

State policies can help ensure that school retrofit projects do not unintentionally create IAQ problems during the renovation process. Certain hazardous substances, such as asbestos, lead, and polychlorinated biphenyls (PCBs), are subject to federal regulatory requirements in the context of school renovations. Some states have adopted their own law and regulations for addressing these and other contaminants, such as radon. In addition, a number of states require best practices for controlling indoor pollutants generally while renovations are underway in occupied spaces. State ventilation and HVAC requirements, not reviewed in the report, are also vital indoor air quality measures that may apply depending on the scope and the nature of the renovation. States can consider adopting laws and regulations that build on the following strategies described in the report:

- Asbestos – require AHERA management plan review and an asbestos assessment prior to undertaking renovation; establish an indoor non-occupational air exposure standard for asbestos; restrict asbestos abatement activities when a school is occupied.
- Lead – apply the federal Renovation, Repair and Painting (RRP) rule or similar requirements to all K-12 schools; apply the RRP requirements to school renovations involving a lower threshold for interior painted surface area.
- PCBs – require or recommend replacing PCB-containing light ballasts as part of a renovation project; require evaluation prior to the renovation work to determine whether the school has PCB-containing caulk and other materials.
- Radon – require testing for and mitigating elevated radon levels in schools, and require re-testing in connection with renovation activities.
- IAQ Management During Renovations – for renovation activities that take place in occupied buildings, require schools to implement best practices for protecting occupants from pollutant exposures, such as those established in the SMACNA *IAQ Guidelines for Occupied Buildings Under Construction*.

# CHAPTER 1

## Introduction

As efforts to address climate change accelerate, government policies and programs will continue to look to energy efficiency as a powerful and cost-effective strategy for reducing greenhouse gas emissions.[1] Federal, state, and local agencies across the United States have developed a diverse array of energy efficiency programs to encourage building owners to take action.[2] Many of these initiatives focus on retrofits of residential and commercial buildings, which accounted for 41 percent of total U.S. energy consumption in 2014.[3]

These programs grew, in part, out of the U.S. experience following the oil embargos and rising fuel prices of the 1970s.The energy crises of those years offered valuable lessons not only about the need to improve energy efficiency, but also about the importance of addressing indoor air quality (IAQ) as an integral part of policies and programs that aim to increase building energy efficiency.[4] If IAQ is not addressed, energy saving measures can inadvertently diminish indoor environmental quality, with potential consequences for occupant health. This lesson was echoed in the Institute of Medicine's 2011 report on climate change, the indoor environment, and health.[5]

Over the past few decades public health research has enhanced greatly our understanding of the importance of the air quality inside buildings.[6] Research on the relationship between ventilation and

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[1] *See generally*, U.S. White House, Climate Change and President Obama's Action Plan ("Energy efficiency is one of the clearest and most cost-effective opportunities to save families money, make our businesses more competitive, and reduce greenhouse gas pollution"), https://www.whitehouse.gov/climate-change (last accessed: Jan. 15, 2016).

[2] Examples of federal building energy efficiency programs include: the U.S. Dept. of Energy's (DOE's)Better Buildings Challenge program, launched in 2011 with the goal of improving the efficiency of U.S. buildings by 20 percent or more over 10 years; DOE's Weatherization Assistance Program, which funds states to improve energy efficiency in the homes of low-income families; and the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR program, which provides benchmarking and energy management tools for schools and other buildings. For information on energy efficiency programs at the state level, see North Carolina Clean Energy Technology Center, DSIRE Database of State Incentives for Renewables & Efficiency, www.dsireusa.org.

[3] U.S. Energy Administration, Frequently Asked Questions (April 3, 2015), http://www.eia.gov/tools/faqs/faq.cfm?id=86&t=1.

[4] In 1980, the U.S. Government Accountability Office (GAO) addressed the need for stronger federal programs on indoor environmental quality, highlighting the tension between energy efficiency activities and IAQ and noting, "Paradoxically, in attempting to foster energy conservation, some Federal programs may be exacerbating the indoor air pollution problem." GAO, Indoor Air Pollution, An Emerging Health Problem at 16, http://gao.gov/products/CED-80-111.

[5] *See* Institute of Medicine, Climate Change, the Indoor Environment, and Health at 242-3 (2011) ("Beginning in the 1970s, rising heating fuel costs created economic pressures to 'tighten' buildings to limit heat loss during winters….Such weatherization measures can result in decreased building ventilation rates and…lead to increased pollutants levels indoor[s] and associated adverse exposures in some circumstances."), http://www.nap.edu/catalog/13115/climate-change-the-indoor-environment-and-health.

[6] *See generally*, Calif. Air Resources Board, Health Effects of Indoor Pollutants (Nov. 2013), http://www.arb.ca.gov/research/indoor/healtheffects1table1.htm; Lawrence Berkeley National Laboratory, IAQ Scientific

occupant health and productivity has particularly important implications for energy efficiency policies and programs. Studies have shown that lower ventilation rates are associated with diminished cognitive performance and higher absenteeism,[7] and new research has found an association between higher indoor carbon dioxide levels and diminished decision making.[8] Exposure to indoor mold and dampness is another important area of research, with studies demonstrating health risks to building occupants that include the development of asthma; the triggering of asthma attacks; and increased respiratory infections, rhinitis, wheeze, cough, and difficulty breathing.[9]

Along with developments in public health research, building science has strengthened the technical foundation for protecting and improving indoor air quality in the construction, operation, and maintenance of buildings.[10] This research has helped to identify strategic, cost-effective opportunities for considering IAQ and energy efficiency goals *together* as part of an energy efficiency retrofit, in order to both save energy and money and create healthier and more productive indoor environments.[11]

The challenge ahead is to apply public health and building science research to the practice of improving building energy efficiency. In recent years, there have been some notable policy and program initiatives to link health and energy efficiency goals. For example, following enactment of the American Recovery

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Findings Resource Bank: Human Performance, *at*: http://www.iaqscience.lbl.gov/performance-summary; U.S. EPA, Indoor Air Quality, http://www2.epa.gov/indoor-air-quality-iaq.

[7] *See, e.g.*, O.A. Seppänen, W.J. Fisk, Summary of Human Responses to Ventilation, *Indoor Air*, 14 Suppl 7, 102-118 (2004); J. Sundell, et al., Ventilation Rates and Health: Multidisciplinary Review of the Scientific Literature, *Indoor Air*, 21, 191-204 (2011); M.J. Mendell, et al., Association of Classroom Ventilation with Reduced Illness Absence: A Prospective Study in California Elementary Schools, *Indoor Air*, 23, 515-528 (2013). Regarding ventilation rates and standardized test scores, research findings are mixed. *See generally,* Lawrence Berkeley National Laboratory, IAQ Scientific Findings Resource Bank: Ventilation Rates and Student Performance, http://www.iaqscience.lbl.gov/vent-school; U. Haverinen-Shaughnessy, et al., Association Between Substandard Classroom Ventilation Rates and Students' Academic Achievement, *Indoor Air*, 21: 121–131 (2011); and M.J. Mendell, et al., Do Classroom Ventilation Rates in California Elementary Schools Influence Standardized Test Scores? Results from a Prospective Study, *Indoor Air* (2015).

[8] U. Satish, et al., Is $CO_2$ an Indoor Pollutant? Direct Effects of Low-to-Moderate $CO_2$ Concentrations on Human Decision-Making Performance, *Environmental Health Perspectives*, 120, 1671-1677 (2012), *at*: http://ehp.niehs.nih.gov/1104789/; J.G. Allen, et al., Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments (Oct. 2015), *available at*: http://bit.ly/1YaodUM.

[9] *See* Cal. Dept. of Public Health, Statement on Building Dampness, Mold, and Health (2011) (references omitted), http://www.cdph.ca.gov/programs/IAQ/Documents/statement_on_building_dampness_mold_and%20health2011.pdf. *See also* R. Quansah, et al., Indoor Dampness and Molds and the Risk of Developing Asthma: A Systematic Review and Meta-Analysis, *Am J Respir Crit Care Med*, 187, A1618 (2013); M.S. Jaakkola, et al., Association of Indoor Dampness and Molds with Rhinitis Risk: a Systematic Review and Meta-Analysis, *J Allergy Clin Immunol*, 132, 1099-1110.e1018 (2013).

[10] *See generally* National Institute of Standards and Technology, Energy and Environment Division, http://www.nist.gov/el/building_environment/; Lawrence Berkeley National Laboratory, Indoor Air Quality Scientific Findings Resource Bank, http://www.iaqscience.lbl.gov/; National Institute of Building Sciences, Whole Building Design Guide, https://www.wbdg.org/.

[11] *See, e.g.,* A.K. Persily and S.J. Emmerich, National Institute of Standards and Technology, Indoor Air Quality in Sustainable, Energy Efficiency Buildings at 10 (2010), http://www.nist.gov/manuscript-publication-search.cfm?pub_id=906045; American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), ASHRAE Position Document on Indoor Air Quality at 8 (2011, 2014), http://bit.ly/20AdbHk; W.J. Fisk, Review of Some Effects of Climate Change on Indoor Environmental Quality and Health and Associated No-Regrets Mitigation Measures, *Building and Environment* 86 (2015), http://bit.ly/1Pdl8d5.

and Reinvestment Act of 2009, which made substantial economic stimulus funding available for energy efficiency improvements, the U.S. Department of Energy developed guidance and training materials to formalize the consideration of health and safety as part of its residential Weatherization Assistance Program.[12] Some states also have taken steps to address health and indoor environmental quality as part of their home weatherization programs.[13]

Connecting energy efficiency and IAQ is also vitally important for schools. There is considerable current activity and expected demand for energy efficiency improvements in the K-12 education sector. Because school districts spend $8 billion annually on energy and operate many older facilities, schools offer "unique opportunities for deep, cost-effective energy efficiency improvements."[14] At the same time, indoor air quality improvements can yield significant benefits in terms of student and staff health and productivity.[15]

In 2014, the U.S. Environmental Protection Agency (EPA) addressed these dual needs by creating technical guidance to assist schools in improving indoor air quality as part of their energy efficiency retrofit projects. The EPA Guide, *Energy Savings Plus Health: Indoor Air Quality Guidelines for School Building Upgrades*, provides detailed information on a variety of best practices for school retrofits, including:

- Integrating IAQ protections into the design and renovation process;
- Providing adequate outdoor air ventilation;
- Controlling moisture;
- Limiting entry of contaminants from outdoor and indoor sources;
- Providing filtration and air cleaning to supplement pollutant source control and ventilation; and
- Protecting building elements, occupants, and workers during construction.[16]

[12] *See, e.g.,* U.S. DOE, Weatherization Program Notice 11-6 (Jan. 12, 2011), http://www.waptac.org/data/files/website_docs/government/guidance/2011/wpn%2011-6.pdf; U.S. DOE, Guidelines for Home Energy Professionals: Standard Work Specifications, http://energy.gov/eere/wipo/guidelines-home-energy-professionals-standard-work-specifications. The agency also created the Weatherization Plus Health initiative to "enable the comprehensive, strategic coordination of resources for energy, health, and safety in low-income homes." WAPTAC, Weatherization Plus Health, http://www.wxplushealth.org/.

[13] For example, the Washington legislature recently revised its home weatherization law to authorize grantees to propose utilizing program awards and matching funds to make healthy housing improvements to homes undergoing weatherization, noting that "there is emerging scientific evidence linking residents' health outcomes such as asthma, lead poisoning, and unintentional injuries to substandard housing." Rev. Code Wa. § 70.164.010, 040.

[14] U.S. DOE, Advanced Energy Retrofit Guide, Practical Ways to Improve Energy Performance: K-12 Schools at 1, http://apps1.eere.energy.gov/tribalenergy/pdfs/doe_eere_aerg_k12schools.pdf. *See also*, U.S. EPA, ENERGY STAR Building Manual ch. 10 (2006), http://www.energystar.gov/sites/default/files/buildings/tools/EPA_BUM_CH10_Schools.pdf.

[15] For a discussion of the relationship between IAQ, productivity, and health in schools, see Committee to Review and Assess the Health and Productivity Benefits of Green Schools, National Research Council, Green Schools: Attributes for Health and Learning (2006), http://www.nap.edu/catalog/11756/green-schools-attributes-for-health-and-learning. *See also* U.S. EPA, Energy Savings Plus Health: Indoor Air Quality Guidelines for School Building Upgrades at 17-18 (2014), http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health; Greg Kats, Greening America's Schools – Costs and Benefits" (2006), http://bit.ly/1lvL5w1.

[16] U.S. EPA, Energy Savings Plus Health: Indoor Air Quality Guidelines for School Building Upgrades at 4 (2014), http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.

Each of the 23 priority issues covered in the EPA Guide includes information on Assessment Protocols, Minimum Actions, and Expanded Actions. For example, Minimum Actions to address moisture control include items such as repairing moisture problems and preventing condensation, while Expanded Actions include consideration of new ventilation approaches that provide better moisture control. A companion tool, the *Energy Savings Plus Health Checklist Generator*, is a Microsoft Excel file that can be used by schools to develop a custom verification checklist along with specific assessment protocols and recommended actions, tailored to the school's particular energy efficiency retrofit project.[17]

While it does not establish new federal regulatory requirements, the EPA Guide provides a valuable technical framework and resource on best practices for school districts. Government policies and programs can play an important role in facilitating and institutionalizing these best practices.

**Purpose and Scope of the Report**

As the EPA Guide illustrates, many types of school energy efficiency measures have potential IAQ/health risks *and* opportunities, including: HVAC equipment upgrades to provide outdoor air and filtration; building envelope upgrades, such as roof and window replacement; and lighting retrofits. Because of the complex nature of buildings and the multiple factors that contribute to indoor air quality, there are a variety of technical and financial issues that arise when considering how to address indoor air quality issues during a particular school energy efficiency project. Thus, this report does not focus on a specific set of renovation practices, but rather on the consideration of IAQ generally in the planning and implementation of energy efficiency retrofit projects. By establishing IAQ as a complementary goal and integrating IAQ best practices, schools can help ensure that energy efficiency projects maximize opportunities for enhancing indoor air quality and avoid unintentionally creating or exacerbating IAQ problems.

State policies can advance such an approach. The purpose of this report is to further the development of state policies and programs by providing information about existing policies that encourage, facilitate, authorize, or require the consideration and integration of IAQ issues in school energy efficiency retrofit projects.

*Areas of Policy Covered.* The report focuses on three areas that address energy efficiency and IAQ directly and have been the subject of state policy development:

- State funding for school facility upgrades;
- Energy savings performance contracts; and
- Requirements for addressing specific indoor contaminants during school renovations.

Given the very broad nature of this topic, the report cannot include all areas of state policy that may be relevant. For example, the report focuses exclusively on the renovation/retrofit process and thus does not cover policies addressing new school construction (such as ventilation, mechanical, or green building

[17] U.S. EPA, Technical Resources for Energy Savings Plus Health, http://www2.epa.gov/iaq-schools/technical-resources-energy-savings-plus-health.

codes) or ongoing maintenance/operation of school facilities. Nor does the report address worker protections that may be established through state occupational safety and health regulations.

*Types of Policies Included.* The report is based primarily on a review of state laws and regulations across the U.S. The following chapters do not provide an exhaustive list of state policies, but rather they highlight examples of laws and regulations in each of the three policy areas covered. Selected examples of less formal policies, such as state technical guidance documents or program guidelines, are included as well. The report does not discuss policies and programs at the school district level, though these also play an important role in the implementation of energy efficiency retrofit projects.

The development of policies that formalize the consideration of IAQ and energy efficiency in school building upgrades is still in an early stage. The policies described here offer examples for states to consider in strengthening their laws, regulations, guidance documents, and agency programs to ensure that energy efficiency retrofit projects capture potential benefits to student and staff health and productivity, along with energy cost savings and reduced energy use.

# CHAPTER 2

## State Funding for School Facility Upgrades

For many school districts, financial incentives are critical to pursuing an energy efficiency retrofit, particularly one that incorporates capital-intensive measures.[18] States implement a range of programs that provide school districts grants, loans, and other types of funding to carry out facility upgrades. State laws establishing these programs can include provisions that promote the integration of IAQ and energy efficiency goals in funded projects. Moreover, the laws often authorize state agencies to develop program regulations or guidance that can require, encourage, or facilitate the consideration of IAQ-related measures in the selection and implementation of projects.

This chapter describes selected state laws, regulations, and guidance documents that establish funding programs for schools to undertake (1) energy efficiency and conservation measures, (2) energy audits, and (3) health and safety improvements. Some of the examples noted below explicitly link energy efficiency and IAQ/health, while others implicitly or indirectly further the integration of these dual goals.

**Policies that Require Consideration of IAQ in Retrofits of *State-Owned* Buildings**

While most laws and regulations governing school funding programs do not explicitly address the integration of IAQ and energy efficiency, at least a few state policies do so in connection with renovation projects in *state* facilities. For example, Arkansas regulations require the planning of state facility construction and operations to minimize energy consumption "while promoting a healthy indoor environment" and require that state energy plans "consider not only the energy reduction but also the impact upon the building materials, systems and upon the occupant's health and productivity." Pursuant to Missouri law, state agencies may not "sacrifice the quality of indoor air in the pursuit of increased energy efficiency" when carrying out energy efficiency projects in state buildings or making energy efficiency information available to public agencies. Oregon law requires state agencies to incorporate "all reasonable cost-effective energy conservation measures" in state construction and renovation projects and to "include consideration of indoor air quality issues and operation and maintenance costs" as well.

Sources: Ar. Admin. Code 017.00.2-2-800; Mo. Stat. § 8.851; Or. Stat.§ 276.915.

[18] *See* Calif. Energy Comm., Summary of Energy Services Companies Summary of Responses at 9 (2005) (financial incentives noted as top reason for customers to implement an energy saving project), http://bit.ly/1VN1p9Y. *See also* Climate Policy Initiative, Targeting Proposition 39 to Help California's Schools Save Energy and Money 3 (2013) (finding that budgetary pressures lead California schools to focus on short payback measures, rather than ones that cost more initially and have longer-term benefits), http://bit.ly/1OU7IXa.

## Funding for Energy Efficiency Improvements

Many states provide some type of financial assistance to schools to support energy efficiency upgrades, though the amount and type of financial assistance vary considerably.[19] While the laws and regulations governing these funding programs generally require compliance with other applicable laws, they do not typically address the consideration of IAQ issues directly. Following are examples of laws, regulations, and other policy provisions that may help to facilitate the integration of IAQ measures in state-funded school energy efficiency projects. Note that the report does not examine the extent to which these programs have in practice funded projects with significant IAQ-related components and benefits.

### IAQ and other Health/Safety Measures as Eligible Activities

State policies establishing competitive energy efficiency funding programs can promote the integration of IAQ and energy efficiency goals by prioritizing certain IAQ-related measures. For example, recently enacted legislation in the state of Washington provides funding to the Department of Commerce for competitive energy conservation grants to public agencies. The new law requires that for school district applicants "priority consideration must be given to school districts that demonstrate improved health and safety through (i) reduced exposure to polychlorinated biphenyl; or (ii) replacing outdated heating systems that use oil or propane…."[20] (Chapter 4 of this report describes the Washington Department of Ecology's plan to address PCBs in schools.)

***Washington state law prioritizes funding for school energy efficiency projects that reduce exposure to PCBs.***

Even where legislation does not prioritize IAQ measures, it can facilitate the integration of energy efficiency and IAQ goals by explicitly allowing funded projects to include related IAQ and health/safety measures. For example, the law implementing California's main state funding program for energy efficiency upgrades in schools, the Clean Energy Jobs Act (Proposition 39), describes the public school projects eligible for funding as including, "Energy efficiency retrofits and clean energy installations, along with related improvements and repairs that contribute to reduced operating costs and improved health and safety conditions."[21] While the Proposition 39 program does not require the inclusion of IAQ or other health-related measures in funded projects, the authorizing statute does require participating school districts to take into account "anticipated health and safety improvements or other nonenergy benefits for each project" as one factor in prioritizing their eligible projects.[22] In Connecticut, legislation establishing a charge for utility energy conservation and load

[19] *See generally* DSIRE (dsireusa.org), a searchable database of state policies that support energy efficiency and renewable energy, managed by the North Carolina Clean Energy Technology Center at N.C. State University.
[20] 2015 Wa. House Bill 1115 (Sec. 1035). *See also*, Wash. Dept. of Commerce, Program Guidelines for the 2015 – 2017 Energy Efficiency and Solar Grant Program (Nov. 5, 2015), http://1.usa.gov/1Pm5gEk.
[21] Ca. Pub. Res. Code § 26205. A 1996 Maine law established a loan program "to promote energy efficiency and indoor air quality in municipal and school buildings" by financing energy audits and cost-effective improvements that accomplish energy efficiency while maintaining healthful indoor air quality." 30-A Me. Rev. Stat. § 5953-C. However, according to state officials, this program is not currently in effect, and it is unclear whether it was ever fully implemented.
[22] Ca. Pub. Res. Code § 26235.

management programs provides that the funds may support, among other things, "indoor air quality programs relating to energy conservation."[23]

State laws that lack such explicit language may nonetheless be framed broadly enough to enable the implementing agencies to establish IAQ and health/safety measures as allowable activities in regulations or guidance, or otherwise to ensure that IAQ is considered as part of funded projects.

**Non-Energy Benefits and Cost-Effectiveness Requirements**

Even where energy efficiency funding programs authorize related IAQ and health/safety measures, program requirements for cost effectiveness may make it difficult for school districts to include capital-intensive measures.

One policy strategy for addressing this potential barrier is to account formally for the value of non-energy benefits when calculating project costs and benefits. Non-energy benefits may include a diverse array of outcomes, from enhanced occupant health/productivity and lower operating costs, to job creation and reduced environmental emissions.[24] In the context of utility energy efficiency programs, a number of states have established an "adder" – a flat percentage of the total project cost that may be counted as a benefit in the cost-effectiveness screening for a particular project, in order to account for non-energy benefits of the project.[25]

California takes this approach in its Proposition 39 funding program for school energy efficiency retrofits. In addition to allowing the inclusion of related health/safety measures, the Proposition 39 legislation authorizes the state to consider "non-energy benefits, such as health and safety, in addition to energy benefits" when determining the cost effectiveness of school energy efficiency projects that are proposed for funding.[26] The California Energy Commission (CEC), which is primarily responsible for the program in K-12 schools, has implemented this statutory provision by establishing an adder to account for non-energy benefits. The CEC's program guidelines require projects to demonstrate cost effectiveness by achieving a Savings-to-Investment Ratio (SIR) of 1.05, using the following formula:[27]

$$\frac{\text{Net Present Value of project cost savings}}{\text{Project Installation Costs} - \text{Rebates} - \text{Other non-repayable funds} - \text{Non-energy Benefits}}$$

[23] Ct. Gen. Stat. § 16-245m(d)(5).

[24] *See generally*, I. Malmgren and L.A. Skumatz, Lessons from the Field: Practical Applications for Incorporating Non-Energy Benefits into Cost-Effectiveness Screening (2014), http://bit.ly/1O15PIb.

[25] *See* I. Malmgren and L.A. Skumatz, Lessons from the Field: Practical Applications for Incorporating Non-Energy Benefits into Cost-Effectiveness Screening (2014) (reviewing programs in, e.g., Colorado (10 and 25% adders), Vermont (15% adder), and the District of Columbia (10% adder)), http://bit.ly/1O15PIb. *See generally*, Cal. Public Utilities Comm., Addressing Non-Energy Benefits in the Cost-Effectiveness Framework (undated), http://www.cpuc.ca.gov/NR/rdonlyres/BA1A54CF-AA89-4B80-BD90-0A4D32D11238/0/AddressingNEBsFinal.pdf.

[26] Ca. Pub. Res. Code § 26206.

[27] Calif. Energy Comm., Proposition 39: California Clean Energy Jobs Act - 2015 Program Implementation Guidelines at App. D (Dec. 2014), http://www.energy.ca.gov/2014publications/CEC-400-2014-022/CEC-400-2014-022-CMF.pdf.

Non-energy benefits are defined as: "Other associated project benefits such as enhanced comfort, better indoor air quality, and improved learning environments."[28] According to the guidance, the non-energy benefits considered by the Energy Commission are improved lighting quality, improved acoustics, improved indoor air quality, improved occupant comfort, and improved health and safety.

Rather than require applicants to quantify these indoor environmental benefits of energy measures (e.g., reduced absenteeism), the program has established a five percent adder (five percent of the Project Installation Costs) to account for these benefits. It is noteworthy that the adder aims to address primarily indoor environmental quality benefits, including IAQ.[29] In explaining the consideration of non-energy benefits, the guidance uses as an example "the health benefits of improved indoor air quality, which may improve student and teacher health and result in reduced absenteeism."[30] It remains to be seen what impact an adder of this magnitude will have on the implementation of IAQ-related measures in funded projects.

***California's school energy efficiency funding program uses a formula to account for a project's IAQ benefits.***

In addition to providing the non-energy benefits adder, the Proposition 39 program revised its definition of an "eligible energy project" in a way that may make it easier for projects incorporating capital-intensive measures, such as HVAC upgrades, to meet the minimum 1.05 SIR. Previously, a bundled group of energy measures at *one* school site constituted an eligible energy project. The program now allows local education agencies to bundle energy measures at *one or more* school sites within the district for purposes of meeting the minimum cost effectiveness standard.[31]

**Non-Energy Benefits and Project Ranking**

Competitive energy efficiency funding programs that prioritize maximum energy savings and short payback periods may create a competitive disadvantage for proposed projects that address IAQ and other related health/safety issues, in light of the potential trade-offs between IAQ and energy usage. One approach to encouraging or facilitating projects that integrate IAQ measures is to award points for non-energy benefits in the evaluation and selection of projects for funding.

For example, Colorado's rules governing the Renewable Energy and Energy Efficiency for Schools (REEES) Loan Program require loan applicants to describe non-energy benefits and to provide information about the proposed project's annual benefits, including "other environmental and health benefits."[32] In

[28] *Id*. at 15.
[29] A recent survey of the utility sector energy efficiency programs in all states found no states reporting the inclusion of health, comfort, or productivity as non-energy benefits in their utility programs. American Council for an Energy-Efficiency Economy, A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs at 32 (2012), http://aceee.org/research-report/u122.
[30] Calif. Energy Comm., Proposition 39: California Clean Energy Jobs Act - 2015 Program Implementation Guidelines at Appendix D-2 (Dec. 2014), http://www.energy.ca.gov/2014publications/CEC-400-2014-022/CEC-400-2014-022-CMF.pdf.
[31] *Id*. at 22.
[32] 1 Co. Code Regs. 301-85 (5.2.7).

addition, the rules' ranking criteria for proposals includes a "technical merit" category that considers, among other things, "benefits other than economic benefits."[33] In connection with its 2013-2015 Energy Efficiency Grants program, the state of Washington Office of Superintendent of Public Instruction added a category to the project selection criteria for "project approach and merit," which awards applicants points based on "overall quality of the project including…strategic approach and specific project goals….project benefits and expected outcomes." According to program officials, this category included, among other things, non-energy environmental benefits such as IAQ controls and monitoring devices.[34]

## Funding for Energy Audits

Energy audits are an integral part of the energy efficiency retrofit process and present an opportunity to identify IAQ issues that can be considered and addressed as part of the retrofit. An audit can describe existing IAQ problems and recommend measures to enhance IAQ at the school facility.

Third-party audit guidelines affirm the importance of indoor environmental quality issues in the energy audit. For example, the Building Performance Institute, Inc. (BPI) has developed a *home* energy auditing standard that includes a section on health and safety designed to "ensure that home performance upgrade activities do not negatively affect indoor air quality or otherwise cause or exacerbate an unsafe condition in the home."[35] Widely-referenced *commercial* energy audit procedures published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) define three levels of effort for energy audits (Levels 1, 2, and 3) and set forth best practices for auditors. The document lists six basic steps in an energy audit, including "study the building and gather data on its operational characteristics and indoor environmental quality" and "identify potential measures that will reduce the energy use and/or cost and/or will improve the occupants' indoor environmental quality."[36] In defining "energy efficiency measure," the ASHRAE guidance also incorporates the "do no harm" principle by stating that an "auditor should ensure that any proposed measures . . .will not compromise occupant comfort or safety or reduce service levels below limits set by codes and accepted building practice."[37]

States can establish energy audit requirements that draw on industry standards to help ensure that state-funded projects consider IAQ during the audit/inspection and include relevant IAQ issues in the audit report.

[33] 1 Co. Code Regs. 301-85:6.1.2.

[34] Wa. Office of Superintendent of Public Instruction (OSPI), School Facilities: 2013-2015 Energy Efficiency Grants (last accessed: Mar. 31, 2015) (on file with ELI); Nancy Johns, Wa. OSPI, personal interview (Sept. 21, 2015). This OSPI grants program is not currently funded; as noted earlier, the state legislature in 2015 provided funding to the Department of Commerce for energy efficiency grants to education institutions, local agencies, public school districts, and state agencies.

[35] BPI, ANSI/BPI-1100-T-2014 Home Energy Auditing Standard at 2 (2014), http://bpi.org/standards_approved.aspx. *See also* Residential Energy Services Network (RESNET), RESNET National Standard for Home Energy Audits, (incorporating the "procedures adopted by the Building Performance Institute for the certified Building Analyst classification" into the RESNET Comprehensive Home Energy Audit), http://bit.ly/1IrDYQb.

[36] ASHRAE, Procedures for Commercial Energy Audits (2nd ed.) at 17 (2004), https://www.ashrae.org/resources--publications/bookstore/procedures-for-commercial-building-energy-audits.

[37] *Id*. at 60.

**IAQ and Health/Safety in the Audit Inspection**

Facility inspections carried out as part of the energy audit are a key mechanism for identifying opportunities to integrate IAQ goals into an energy upgrade. EPA's *Energy Savings Plus Health* guidelines recommend including an IAQ walkthrough inspection along with the energy audit as "a concurrent, integrated process."[38] EPA has published separate guidance on conducting an IAQ walkthrough.[39]

ASHRAE audit procedures describe the site visit as a "critical part of any energy audit," covering a wide range of building systems and conditions. The ASHRAE procedures recommend that the assessment team ask about a range of issues during the on-site visit, including "indoor air quality (IAQ) problems" and "persistent comfort issues," and collect data on a number of setpoints (e.g., space temperature, space humidity, minimum outdoor airflow rates, carbon dioxide levels).[40] The BPI residential energy audit standards require specifically that the audit include identification of: sources of indoor air pollutants; combustion air requirements and ventilation needs; existing and/or potential moisture issues; areas containing known or suspected hazardous materials, including but not limited to, lead, asbestos, or mold; and whether there is an existing radon mitigation system.[41]

***EPA guidance recommends linking an IAQ walkthrough inspection with the school energy audit.***

**IAQ and Health/Safety in the Energy Audit Report**

The audit report plays an important role in informing school districts about options for improving facility conditions as part of the retrofit process.[42] In some cases, information about non-energy benefits such as improved IAQ may help convince school districts to move forward with a retrofit project.

In Oregon, legislation establishing a public purpose charge for electric utilities directs that a portion of those funds must be used to pay for school energy audits and subsequent actions to implement the audits.[43] According to guidelines developed by the Oregon Department of Energy, school districts may use the funds to conduct a Whole Building Energy Audit, which is comparable to an ASHRAE Level 2 audit.[44] Drawing on the language in the ASHRAE audit procedures, the Department directs energy

[38] U.S. EPA, Energy Savings Plus Health at 24, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.
[39] *See, e.g.*, U.S. EPA, Indoor Air Quality Tools for Schools Walk-through Inspection Checklist, http://www2.epa.gov/iaq-schools/walk-through-inspection-checklist-indoor-air-quality-tools-schools
[40] *Id*. at 34, 35, 46, 50.
[41] BPI, ANSI/BPI-1100-T-2014 Home Energy Auditing Standard 2-4 (2014), http://bpi.org/standards_approved.aspx.
[42] According to the ASHRAE procedures, the audit report should include a description of existing building systems. As an example, the document shows a building with inoperable dampers and notes that "an audit photograph documenting maintenance issues such as this might spur the client to take corrective action." ASHRAE, Procedures for Commercial Energy Audits (2nd ed.) at 86, Fig. 39 (2004), https://www.ashrae.org/resources--publications/bookstore/procedures-for-commercial-building-energy-audits.
[43] Or. Rev. Stat. 757.612 (SB 1149).
[44] Oregon Dept. of Energy, SB 1149 Schools Program: Program Guidelines at 5 (2015), http://www.oregon.gov/energy/SCHOOLS/Sb1149/documents/SB1149_Schools_Program_Guidelines.pdf.

auditors to include in their audit report, for each energy efficiency measure, a brief description of "other impacts on occupant health, comfort or safety as well as non-energy benefits, especially improvements to health, safety and environment…."[45] The Department further states, "Descriptions must include … commissioning requirements…, hazardous material disposal issues, effects on indoor air quality (IAQ), effects on classroom acoustics, [and] building code compliance issues."[46]

**Requiring Licensed Energy Auditors to Address IAQ and Health/Safety Issues**

Nevada's law governing the licensure of *home* energy auditors lists a number of IAQ-related items that the auditor must include when conducting a full home energy audit. According to state officials, the Nevada law draws on the requirements of third-party, residential energy auditor certification organizations, including the Building Performance Institute, Inc. (BPI) and the Residential Energy Services Network (RESNET). The Nevada law requires home energy audits to include, for example:

- Documentation of "anticipated remediation issues, including, without limitation, moisture or combustion appliance problems";
- "An assessment of the performance and efficiency of the building airflow and indoor air quality and ventilation, including, without limitation….Any visible sources of indoor air pollution"; and
- "An assessment of the control of moisture in the home, including, without limitation: (1) A visual identification of any moisture present from roof leaks, wall penetrations or door or window openings; and (2) An identification of any potential areas where mold may grow…."

The Nevada law also requires home energy auditors to prepare an audit report that includes, among other things, a "prioritization of health and safety hazards in the home and recommendations for improvements according to their urgency and importance, in relation to any energy efficiency measures which have been installed."

While this law is limited to home weatherization and other residential energy audit activities, comparable provisions emphasizing IAQ and health/safety matters could be incorporated into state policies and guidance governing commercial and institutional energy audits or the licensing of auditors.

*Source*: Nv. Rev. Statute § 64D.300; http://red.nv.gov/Content/Inspect_Audit/Main/.

[45] Oregon Dept. of Energy, Audit Report Template and Requirements: Energy Audits of School Buildings RFQ# 15-006 at 15, http://bit.ly/1M4FItO. The audit report must include all energy efficiency measures with a simple payback of 50 years or less. *Id*. at 14. *See also* ASHRAE, *Procedures for Commercial Energy Audits (2nd ed.)* at 11 (2004), https://www.ashrae.org/resources--publications/bookstore/procedures-for-commercial-building-energy-audits.

[46] Oregon Dept. of Energy, Audit Report Template and Requirements: Energy Audits of School Buildings RFQ# 15-006 at 15, http://bit.ly/1M4FItO.

## Funding for General School Improvements and Repairs

Most states provide funding to school districts for facility improvements, though these funding programs vary widely in terms of the amount and type of funding that is available.[47] Depending on their particular terms and requirements, such programs may offer a mechanism for schools to incorporate capital intensive measures that address IAQ in their energy retrofits and other building upgrade projects.

### Funding for IAQ Improvements Generally

In some states, programs that fund school facility renovations, repairs, and improvements establish IAQ or health/safety as priorities through laws, regulations, and guidance. For example:

- In Maine, the state education law addresses IAQ in establishing the School Revolving Renovation Fund (SRRF) to "make loans to school administrative units for school repair and renovation."[48] Projects are funded based on availability of funds in a priority order established by the regulations. The highest priority projects include

    - "improving air quality in a school building,"
    - removing or abating hazardous materials,
    - repairing or replacing a roof, and
    - "other health, safety and compliance repairs."[49]

    Criteria for rating projects within this category include the percentage of the student population affected, the extent of the problem, and whether there are code violations. Energy-related repairs and improvements, including building insulation, variable speed electric motors, energy-efficient lighting, and "other energy and water conservation projects" are also eligible under the law and are ranked third in priority.[50] According to program materials, for Fiscal Year 2016, loan applications are accepted only for emergency and Priority One projects – health, safety and compliance. A portion of each loan (from 30% to 70%) is considered a grant and is forgiven, and the balance is paid back over either five or 10 years at a zero percent interest rate.[51]

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[47] *See* 21st Century Schools Fund, State Capital Spending on PK-12 School Facilities at 6, http://bit.ly/1jRVCky.

[48] 30-A Me. Rev. Stat. § 6006-F. According to the program website, "The SRRF is funded through the Maine Municipal Bond Bank and remains a State and local partnership with each providing a portion of a project's funding. The Maine Department of Administrative and Financial Services, Bureau of General Services, provides engineering expertise, technical reviews and bidding and contract assistance for SRRF projects." Maine Dept. of Educ., School Revolving Renovation Fund, http://www.maine.gov/doe/facilities/renovation/index.html.

[49] 30-A Me. Rev. Stat. § 6006-F.

[50] Me. Admin. Code 05-071, ch. 64, §4. Criteria for rating energy projects include payback period, energy savings, energy cost reductions, and "other benefits gained."

[51] Maine Dept. of Educ., School Revolving Renovation Fund - Information for SRRF applications, http://www.maine.gov/doe/facilities/renovation/index.html. The maximum total loan for a school building is $4 million, with up to $1 million per priority area in a school building. The maximum loan term is five years for loans under $500,000, and 10 years for loans over $500,000. Me. Admin. Code 05-071, ch. 64, §4.

- A 2008 Colorado law established the public schools capital construction assistance fund (also known as the Building Excellent Schools Today, or "BEST" program) to provide an annual amount of funding for competitive matching grants for school construction and renovation. The law defines "capital construction" to include "renovation of real property …to correct …conditions hazardous to the health and safety of persons which are not covered by codes, to effect conservation of energy resources, [and] to effect cost savings for staffing, operations, or maintenance of the facility…."[52] Program regulations establish as the top priority for funding, "Projects that will address safety hazards or *health concerns* at existing Public School Facilities…."[53]

***Some state programs that fund school facility renovations and repairs establish IAQ as a priority item.***

According to a summary of BEST projects, while most of the funds were awarded to new construction and school replacement projects, a significant percentage of the funded projects addressed renovations to correct conditions in existing buildings – 10% of the BEST projects were HVAC related, 28% were roofing projects, and 3% were asbestos projects.[54] The program guidelines developed by the public school capital construction assistance board address health and safety issues and include standards for mechanical systems, roofs, and hazardous materials.[55]

- California's Modernization Program funds a variety of school facility modifications, from air conditioning to insulation and roof replacement. The state education code sets out the specific purposes for which funds may be used, which include, "abatement of hazardous asbestos," "control, management, or abatement of lead," and "designs and materials that promote the efficient use of energy … the maximum use of natural lighting and indoor air quality, the use of … materials that emit a minimum of toxic substances…and other characteristics of high-performance schools."[56] A report on financing school energy retrofits in California noted that school districts using the state's Modernization Program "often package several building upgrades – including efficiency measures – as part of large-scale modernization projects."[57]

[52] Co. Stat. §§ 22-43.7-104, 24-30-1301(2).
[53] 1 Co. Code Regs. 303-3, Sec. 6.2.1 (emphasis added).
[54] Colo. Dept. of Education, BEST Grant Program Overview, https://www.cde.state.co.us/cdefinance/capconstbest.
[55] 1 Co. Admin. Code 303(1):4.1.4.2. For example, the guidelines provide that mechanical systems must comply with ASHRAE Standards 62.1-2013, 90.1-2013, and 189.1.
[56] Ca. Educ. Code §§17074.25, .27. *See generally* Calif. Office of Public School Construction, Modernization Program, http://www.dgs.ca.gov/opsc/Programs/modernizationprogram.aspx.
[57] Climate Policy Initiative, Targeting Proposition 39 to Help California's Schools Save Energy and Money 10 (2013), http://bit.ly/1OU7IXa. For several years, major school modernization projects could receive additional money through the state's High Performance Incentive Grant program if the project met criteria that included energy efficiency and IAQ items. *See* Calif. High Performance Incentive Grant Program, http://www.dgs.ca.gov/opsc/Programs/highperformanceincentivegrantprogram.aspx.

**Funding to Address Specific Hazardous Substances and Contaminants**

Some states have laws authorizing expenditures for projects to address specific contaminants in school environments. In certain cases, these activities may be carried out in connection with energy upgrade or other renovation projects. For example, as noted above, California's Modernization Program explicitly allows funding to be used not only for energy efficiency-related measures, but also for asbestos and lead abatement.[58] Minnesota's education code authorizes total operating capital revenue to be used for certain purposes specified in the law, including asbestos removal/encapsulation, PCB cleanup and disposal, and energy audits and modifications.[59] In Washington, the criteria for prioritizing state funding for school modernization projects include the presence of asbestos in an existing building.[60]

[58] Ca. Educ. Code § 17074.25, .27.

[59] Mn. Stat. § 126C.10, subd. 14. Separate Minnesota laws governing long-term maintenance revenue for deferred maintenance and capital revenue for health/safety projects (including actions to address asbestos, PCBs, mold, radon, lead, ventilation, and IAQ inspections) provide that such revenues may *not* be used for energy-efficiency projects undertaken through an energy savings performance contract. See Minn. Stat. §§123B.57, 123B.595, as amended by 2015 Minn. Sess. Law Serv. 1st Sp. Sess. Ch. 3 (H.F. 1).

[60] Wa. Admin. Code 392-343-515. Guidance issued under the federal Energy Efficiency and Conservation Block Grant program, which provided funding to states from 2009 to 2015, also addressed remediation of hazardous substances in the context of funded energy efficiency upgrades. The guidance stated, "If the recipient determines that an EECBG activity requires additional measures for compliance with asbestos and lead paint removal requirements, DOE funds could be applied towards the cost of the energy efficiency improvement and up to 25% towards compliance efforts. Any additional costs must be borne by the recipient." U.S. DOE, EECBG Program Notice 10-021 at 2 (Jan. 2011), http://energy.gov/eere/wipo/downloads/eecbg-program-notice-10-021.

**Requiring Green Building or Energy Efficiency Certification for State Funded School Renovations**

Several states have established green building requirements for schools. These laws typically incorporate third-party standards, such as the U.S. Green Building Council's LEED rating system, or the Collaborative for High Performance Schools (CHPS) criteria, which incorporate not only energy and other conservation practices, but also certain required and optional IAQ measures. State laws may also require EPA's ENERGY STAR certification, which incorporates, e.g., compliance with ASHRAE Standards 62 and 55.

These state laws generally apply to new construction or to major school renovations or replacements and thus are not reviewed in this report. Some of the laws, however, may be framed more broadly and may apply in some fashion to state-funded energy upgrades in certain situations. For example, Oregon law provides that if the proceeds of state general obligation bonds are used for school building construction, improvement, remodeling, equipment, maintenance or repair, the building "must qualify for, at a minimum….(a) LEED Silver certification; (b) A two globes rating from the Green Globes program; or (c) An equivalent numeric rating from a nationally recognized, accepted and appropriate sustainable development rating system as determined by the State Department of Energy." Or. Stat. § 286A.810.

## Summary

States operate a variety of programs that provide grants, loans, and other financing for school energy efficiency retrofits, and these programs may be particularly important for school districts with limited resources in need of comprehensive building upgrades. Enhanced coordination among a state's diverse funding programs may help schools identify the funding needed to integrate IAQ and energy efficiency goals in their retrofit projects. In addition, states can consider revising the laws, regulations, and guidance governing their individual funding programs to build on the policy strategies highlighted in this chapter:

- Establishing energy-related IAQ improvements, as well as costs for removing hazardous materials, as allowable uses of energy efficiency funding;
- Including in energy efficiency funding programs a priority or set-aside for projects that include specific IAQ-related energy conservation measures, such as replacement of PCB-containing fluorescent light ballasts;
- Requiring applicants for energy efficiency funding to provide information on the non-energy benefits of the proposed project, including IAQ benefits specifically;

- Providing an “adder” or other allowance to help capture IAQ benefits in the cost-effectiveness calculation for a proposed energy efficiency project;
- Including IAQ and other non-energy benefits among the selection criteria for competitive energy efficiency funding programs;
- Requiring state-funded school energy audits to include information about existing IAQ conditions and options for addressing those conditions; and
- Establishing funding programs for school indoor air quality improvements, or including IAQ-related items as a priority in general school repair and renovation funding programs.

# CHAPTER 3

## Energy Savings Performance Contracts

Performance contracting is an approach to carrying out energy efficiency projects that allows a building owner to pay the installation and financing costs of the project over time, out of the energy and maintenance savings generated by the project. Building owners typically enter into energy savings performance contracts (ESPCs) with an energy service company (ESCO) to carry out the project. The ESCO also helps arrange financing and guarantees that the improvements will generate cost savings sufficient to pay for the project over the term of the contract.[61] ESPCs can be a vehicle for carrying out comprehensive energy retrofits, in which quick-payback items help support the cost of longer-payback measures that might not be feasible as stand-alone projects. Performance contracting may thus enable school districts to implement IAQ-related capital-intensive improvements as part of the energy efficiency project, with little or no up-front capital.

Public sector facilities, including schools, are among the principal users of performance contracting.[62] State law governs the types of school projects that may be carried out through an ESPC, as well as the terms of the contract. This chapter describes provisions in state ESPC statutes that authorize or facilitate the integration of IAQ measures into performance contracts. The chapter also describes relevant provisions in state ESPC guidance and model contract documents.[63] It is important to note that the work carried out under an ESPC is also subject to the substantive requirements in other applicable laws and regulations – e.g., state or local building codes that may establish ventilation standards as part of an HVAC retrofit, or state laws establishing requirements related to specific IAQ contaminants in connection with school renovation activities (see Chapter 4).

### State Performance Contracting Laws

Most states have adopted legislation governing energy savings performance contracts, and these laws include similar types of provisions. In a given state, school district contracts may be governed by an ESPC law that applies to public facilities generally and/or an ESPC law that applies specifically to schools.

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[61] For additional information on performance contracting, see ICF, Int'l. and Natl. Assoc. of Energy Services Companies, Introduction to Energy Performance Contracting (2007), http://www.energystar.gov/ia/partners/spp_res/Introduction_to_Performance_Contracting.pdf.

[62] *See, e.g.*, Lawrence Berkeley Natl. Lab. and Natl. Assoc. of Energy Service Companies, Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry at 4, 41 (Sept. 2013) (noting that ESCO market penetration is generally highest for K-12 schools at 42%), https://emp.lbl.gov/sites/all/files/lbnl-6300e_0.pdf; Calif. Energy Comm., Summary of Energy Services Companies Summary of Responses at 2, 6 (2005) (survey results showing schools represent approximately 20% of all ESCO customers in the state), http://bit.ly/1VN1p9Y. In 2012, DOE's State Energy Program awarded $5 million in competitive awards to eight states to develop models for public facility energy retrofits using ESPCs or similar project financing. U.S. DOE, Self-Funded Public Facilities Energy Retrofit Program, http://energy.gov/eere/wipo/self-funded-public-facilities-energy-retrofit-programs.

[63] For a general discussion of how schools can work with ESCOs to improve indoor air quality, see Natl. Assoc. of Energy Service Companies, School Solutions: How to Save Money and Improve Indoor Air Quality Using Energy Performance Contracts (1999), http://1.usa.gov/1W1Mw3T.

While state ESPC laws typically do not *require* that schools address IAQ issues as part of the performance contract, most of the laws have provisions that directly or indirectly allow IAQ measures to be included within the scope of the contract, provided the law's other requirements (e.g., cost-effectiveness criteria) are met. Following are examples of state ESPC statutory provisions that may facilitate inclusion of IAQ measures.

**Purpose of the ESPC**

In some states, ESPC laws affirm that improved IAQ is a core goal of performance contracting. For example, Delaware's law includes the following policy statement:

> It is the policy of this State to encourage agencies to invest in energy conservation measures that reduce energy consumption, produce a cost savings for the agency, and improve the quality of indoor air in public facilities and to operate, maintain, and when economically feasible, build or renovate existing agency facilities in such a manner as to minimize energy consumption and maximize energy savings.[64]

Florida and Virginia are examples of states with ESPC laws that contain similar language.[65]

In addition, Maine law defines "energy services companies" as those that provide "design, installation, operation, maintenance and financing of energy conservation or combined energy conservation and related air quality improvements at existing school administrative unit facilities."[66]

**Definition of Eligible Activities under the ESPC**

Virtually all state ESPC laws address which types of activities may be carried out through the mechanism of an ESPC. In many cases, the laws define "energy conservation measure" (or other comparable term) explicitly to include IAQ activities. For example, in addition to allowing lighting or HVAC system modifications, some state ESPC laws specifically include "indoor air quality improvements" in the list of examples of qualifying measures,[67] while several others include "indoor air quality improvements that conform to applicable building code requirements"[68] or similar language. Arkansas' ESPC law acknowledges the possible trade-offs between IAQ and energy usage, allowing IAQ improvements that increase air quality even in spite of an increase in energy usage.[69]

Even where IAQ is not mentioned specifically as an example of a qualifying activity, state ESPC laws may be framed broadly enough to cover certain IAQ-related measures. For example, Wisconsin's law lists as an example of a qualifying measure, "[a]ny other facility improvement measure that is designed to

[64] 29 De. Code § 6971.
[65] Fl. Stat. § 1013.23(1); Va. Code § 11-34.1.
[66] 20-A Maine Rev. Stat. § 15915.
[67] *See e.g.,* Al. Code § 41-16-141(1)(f); La. Stat. § 33:4547.1; 70 Ok. Stat. § 5-131.2; 62 Pa. Stat. § 3752(14).
[68] *See e.g.,* Co. Stat. § 29-12.5-101(9)(m); Az. Stat. § 15-213.01(R)(3)(f); Ct. Gen. Stat. § 16a-37x(1); Ga. Code § 20-2-506; Mo. Stat. § 8.231(1); Nv. Rev. Stat. § 332.330; Ut. Stat. § 11-44-102(2)(b)(xii).
[69] Ar. Code § 6-20-401(2); Ar. Admin. Code 203.00.8-3.01.06. The law also lists as an eligible activity "[a]ny additional building infrastructure improvements, cost savings, and life safety or other safety or conservation measures that provide long-term operating cost reductions and are in compliance with state and local codes."

provide long-term energy or operating cost reductions or compliance with state or local building codes."[70] Delaware includes a broad catch-all provision in its list: "[a]ny other repair, replacement or upgrade of existing equipment that produces energy and operational cost savings, improves safety, significantly reduces energy consumption or increases the operating efficiency of the facilities and which must conform to the applicable state or local building code."[71]

Michigan's school ESPC law specifically authorizes school districts to address asbestos and other hazardous substances as part of the ESPC, establishing that districts may "provide for the removal or treatment of asbestos or other material injurious to health for school facilities and may pay for the improvements from operating funds of the school district or from the proceeds of bonds or notes issued for that purpose."[72] In addition, a number of states have ESPC laws that allow "improvements not causally connected" to an energy conservation measure to be included in the contract, provided those improvements do not exceed 15% of the total value of the ESPC.[73]

***Many state laws allow schools to undertake IAQ-related improvements as part of an energy performance contract.***

**Cost-Effectiveness Standards**

State laws typically specify cost-effectiveness criteria that must be met by measures included in an ESPC. To the extent that IAQ improvements undertaken as part of energy efficiency projects involve significant capital expenditures and lengthy payback periods, the cost effectiveness criteria included in an ESPC law may facilitate or impede the inclusion of IAQ-related measures.

Most state ESPC laws specify maximum contract or payback periods, and many incorporate fairly lengthy periods.[74] State laws typically restrict the length of the ESPC or the payback period to a term of either 15 or 20 years. While some specify fewer years, a few states allow longer contract terms or payback periods. Nevada, for example, recently amended its ESPC law for local governments to increase the allowable contract term from 15 to 25 years, while Kansas and Nebraska allow for contracts up to 30 years.[75] Several states allow the lesser of a specified maximum contract term/payback period or the life of the equipment.[76]

[70] Wi. Stat. § 66.0133(11). A state ESPC law may also include provisions that potentially *restrict* inclusion of certain IAQ and other non-energy-saving measures. For example, under New Jersey's school ESPC law, "energy-related capital improvements that do not reduce energy usage" may be carried out through the ESPC, but may not be financed as a lease-purchase or through energy savings obligations. N.J. Stat. § 18A:18A-4.6 (d).
[71] 29 De. Code. § 6972(3)(m) .
[72] Mi. Comp. Laws § 380.1274a(4).
[73] *See, e.g.*, 62 Pa. Stat. § 3754(d); Ga. Stat. § 50-37-4(d); In. Stat. § 36-1-12.5-12(a).
[74] Federal regulations governing ESPCs for federal agencies allow contract terms of up to 25 years. 10 Code Fed. Regs. (C.F.R.) 436.34. Note that even where state ESPC laws allow lengthy contract and payback periods, state energy financing programs may nonetheless impose or give preference to shorter repayment periods than allowed under an ESPC.
[75] 2015 Nv. Laws Ch. 341 (A.B. 428), amending Nv. Stat. § 332.380; Ne. Stat. § 66-1065(1)(d); Ks. Stat. § 75-37,125(a)(4).
[76] *See, e.g.*, Al. Code § 41-16-143(c); Az. Stat**. §** 15-213.01; Id. Code § 67-5711D(8); N.M. Stat. § 6-23-3(C).

State ESPC laws also address which types of project costs and benefits may be considered when determining whether a project meets the law's payback period or other cost-effectiveness criteria. As noted in Chapter 2, policy provisions allowing consideration of non-energy benefits could help facilitate the integration of IAQ measures in an energy efficiency retrofit project and more fully capture the value of such projects to school districts.[77] In general, existing state ESPC laws applicable to school districts do not address consideration or calculation of non-energy benefits in detail. Some laws allow consideration of items such as operations/maintenance savings or "capital cost avoidance," which may enable school ESPC projects to capture benefits of IAQ-related improvements in some cases. For example:

- Georgia's law states that "'operational cost savings' means a measurable decrease in operation and maintenance costs that is a direct result of the implementation of one or more energy conservation measures," which are in turn defined to include "indoor air quality improvements."[78]

- Nevada's law requires performance contracts to guarantee operating cost savings, and defines "operating cost-savings measure" to include, "Operational or maintenance labor savings resulting from reduced costs for maintenance contracts as provided through reduction of required maintenance or operating tasks, including, without limitation, replacement of filters and lighting products, and equipment failures."[79]

- Kentucky's law provides that "a local public agency may enter into a guaranteed energy savings contract with a qualified provider if it finds that the amount it would spend on the energy conservation measures … would not exceed the amount to be saved in either energy or operational costs plus capital cost avoidance …."[80]

## State ESPC Programs, Guidelines, and Templates

A number of states have established *technical assistance programs* to facilitate the use of ESPCs by school districts and other public agencies. These programs, through their contracting templates, pre-qualified contractors, and direct technical support, aim to help school districts navigate the complex ESPC process generally and can also assist school districts in identifying and addressing IAQ issues as part of the ESPC. For example:

[77] For a discussion of the need to incorporate non-energy benefits into performance contracts to more accurately reflect the true value of projects, particularly in the K-12 context, see Peter Larsen, et al., Incorporating Non-Energy Benefits into Energy Savings Performance Contracts (ACEEE 2012), https://emp.lbl.gov/publications/incorporating-non-energy-benefits-energy-savings-performance-contracts. The authors argue that cost-benefit ratios as currently measured likely undervalue energy efficiency retrofit projects, because non-energy benefits are not typically or consistently quantified, and that international standards are needed to collect and then monetize information on avoided operations and maintenance and capital costs specifically related to the ESPC. *Id*. at 13-196, 201.

[78] Ga. Code § 50-37-2.

[79] Nv. Stat. § 332.330.

[80] Ky. Stat. § 45A.352. *See also,* Va. Code § 11-34.2 , 34.3 (energy cost savings must be based on life cycle costing calculations and include maintenance savings, defined as "operating expenses eliminated and future capital replacement expenditures avoided as a result of new equipment installed or services performed by the performance contractor").

- The state of Washington implements a long-standing, fee-based Energy Savings Performance Contracting Program that provides overall contracting and project management support to school districts and other agencies undertaking an ESPC with one of the program's pre-approved ESCOs. The program's project managers are engineers who participate in facility audits and can interact with the ESCO on HVAC and other technical issues.[81]

- In Colorado, the State Energy Office has implemented a Public Energy Performance Contracting program for over 20 years. The program offers contract templates, technical guidance, communications protocols, and toolkits for competitive contractor selection processes and project financing solicitations. School districts that hire a pre-qualified ESCO and agree to work with the program's standards receive free technical assistance from the program's energy engineers throughout the ESPC process, including technical review of draft and final audit reports, contracts, and measurement and verification reports.[82]

- California's Bright Schools program also offers free technical assistance to schools to help identify energy saving opportunities. The program's engineering consultants provide energy audits, help review existing proposals and designs, and assist in developing bid specifications.[83]

Some states have prepared written *guidance documents* and other educational materials to assist school districts and other government agencies in developing energy savings performance contracts. The materials serve not only to clarify existing state legal requirements for ESPCs, but also to offer best practices and lessons learned from the state's experience with performance contracting. While few, if any, states currently have ESPC guidance documents that emphasize IAQ issues comprehensively, some note strategic opportunities for addressing IAQ issues and establishing IAQ goals through the ESPC.

***States can provide school districts vital technical support for integrating IAQ goals in an energy performance contract.***

In addition to developing guidance documents, states can develop *templates* for documents used in the performance contracting process, to help ensure that IAQ issues are identified, considered, and addressed. These documents include the contract itself, as well as Requests for Proposals for the performance contracting work. EPA's *Energy Savings Plus Health* guidelines note that as part of the project planning phase, a school can advance IAQ goals by ensuring that "specific IAQ and energy efficiency requirements" are included in Requests for Proposals and other procurement documents.[84]

[81] *See* Wash. State Dept. of Enterprise Services, Energy Savings Performance Contracting, http://www.des.wa.gov/services/facilities/Energy/ESPC/Pages/default.aspx.
[82] *See* Colo. Energy Office, Public Energy Performance Contracting, https://www.colorado.gov/pacific/energyoffice/public-energy-performance-contracting.
[83] *See* Calif. Energy Commission, The Bright Schools Program, http://www.energy.ca.gov/efficiency/brightschools/.
[84] U.S. EPA, Energy Savings Plus Health at 25, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.

The remainder of this chapter describes various IAQ-related provisions that have been included in ESPC guidance and contract templates, using examples from five states – North Carolina, Maryland, Massachusetts, Louisiana, and Washington. Other states may also have ESPC materials that include similar and/or additional IAQ-related language. It is important to keep in mind that many of the provisions described below are not mandatory, and the extent to which they are utilized to advance IAQ goals in school ESPCs is not discussed here.

**State ESPC Guidance and Templates: Examples from Five States**

The examples described in this section are drawn from the following state materials.

**North Carolina** – The State Energy Office has produced the *North Carolina Guide to Energy Performance Contracting for K-12 Schools, Local Governments & Community Colleges,* to assist schools and other local entities with the performance contracting process. The guidelines provide a detailed roadmap for entering into an ESPC that complies with state laws and regulations.

**Maryland** – The Maryland Energy Administration recently published a *Guide to Energy Performance Contracting for Local Governments* to educate local government and school system decision makers on how to effectively design and manage an energy performance contracting project. The guide also discusses a range of potential benefits associated with an ESPC. Maryland adapted the guide from a report originally prepared for the State of Hawaii.

**Massachusetts** – the Massachusetts Department of Energy Resources (DOER) has created a *Model RFP for Comprehensive Project*, to assist local government agencies (including regional school districts) in developing RFPs for energy savings performance contracts. Local agencies are required to submit their RFPs to the DOER for review prior to publication and are directed to use the Model RFP as a guideline to ensure compliance with state law and regulations governing ESPCs.

**Louisiana –** the Louisiana Department of Administration has created an ESPC Model RFP. Although the document is for use by state agencies, it includes a number of IAQ-related provisions that may be relevant to school districts developing their own RFPs for energy savings performance contracts.

**Washington** – Washington's Energy Savings Performance Contracting Program, which provides technical services to many school districts, has developed a Master Agreement for contracting with the state's pre-approved ESCOs, as well as an ESPC guidance document for public agencies.

These documents can be found at:
NC: http://bit.ly/1LiR6pi
MD: http://energy.maryland.gov/Documents/FINALEPCAPLocalGovernmentEPCGuide071014.pdf
MA : http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/ems.html
LA: http://bit.ly/1jD4ET4 ("Model RFP 12.12.14")
WA: Master Agreement on file with Environmental Law Institute; Guidelines at: http://bit.ly/1LIkkeE

**Incorporating Broad IAQ Goals and Directives**

Most of the state guidance documents reviewed here affirm the importance of addressing IAQ in energy performance contracting.

*Maryland*. In making the business case for ESPCs, the Maryland guidance includes a section that underscores the importance of capturing the economic benefits of enhanced health and productivity that result from energy efficiency retrofits:

> Improving temperature control, ventilation rate, and light levels, as part of an EPC will increase building occupant comfort, resulting in fewer complaints. The economic benefits for human health and productivity from better thermal visual, and acoustic comfort, and better indoor air quality could be worth as much as the annual utility cost savings. Properly measuring these benefits could lead to larger investments in improving indoor environmental quality.[85]

When evaluating management support for a potential ESPC, the guidance notes that an important consideration is whether top financial decision makers understand "the impact of poor indoor environmental quality on employee health and productivity."[86]

The Maryland guidance also notes that the energy cost savings from an ESPC can be used to pay for an efficiency project that includes needed non-energy capital improvement projects. The guidance points out that a comprehensive ESPC project provides financial leverage to include more expensive individual measures, as the measures with quick payback periods can subsidize those with longer paybacks.[87] In discussing the measurement and verification component of an ESPC, the guidance notes that this aspect of the project can, among other things, "Quantify improvements in indoor environmental quality." Additionally, the guidance notes that "[p]erhaps the most valuable benefit from commissioning comes from better building control that improves thermal comfort and indoor air quality. These help reduce occupant temperature complaints and employee absenteeism, increase staff retention, and save the agency money. While difficulty to quantify, the annual health and productivity benefits of a comfortable building are likely to be worth more than the annual energy and operating cost savings."[88]

*North Carolina*. The North Carolina guidance states at the outset that the ESPC approach works best when certain conditions are present, including "low indoor air quality," recurring maintenance problems, and comfort complaints.[89] The guidance provides a sample RFP for performance contracting, which lists as one of the project goals, capturing "additional benefits that may directly result from energy related services and capital improvements, such as environmental protection, hazardous

[85] Md. Energy Admin., Guide to Energy Performance Contracting for Local Governments at 7 (July 2014) [hereinafter "Maryland ESPC Guide"], http://energy.maryland.gov/Documents/FINALEPCAPLocalGovernmentEPCGuide071014.pdf.
[86] *Id*. at 17.
[87] *Id*. at 6-7.
[88] *Id*. at 31, 37.
[89] N.C. State Energy Office, et al., North Carolina Guide to Energy Performance Contracting for K-12 Schools, Local Governments & Community Colleges at 4 (Oct. 2008) [hereinafter "N.C. ESPC Guide"],http://bit.ly/1LiR6pi.

materials disposal or recycling, improved occupant comfort, reduced maintenance needs, improved indoor air quality, additional buildings improvements, etc."[90]

*Louisiana.* The Louisiana Model RFP states at the outset that the ESPC achieves not only long-term cost savings, but also IAQ benefits. The Model RFP uses the same language as the North Carolina guidance in emphasizing the "additional benefits that may directly result from energy-related services and capital improvements, such as environmental protection, hazardous materials disposal or recycling, improved occupant comfort, reduced maintenance needs, improved indoor air quality, additional building improvements, etc."[91]

**Emphasizing the Importance of IAQ in an ESCO Agreement**

The Master ESCO Agreement developed by the state of Washington's energy performance contracting program includes a section focused on IAQ, which elevates the general goal of ensuring indoor air quality and requires ESCOs to incorporate measures to address existing IAQ problems. The section states:

> Installation of [energy efficiency measures] shall not sacrifice acceptable indoor air quality. The ESCO shall look for evidence of poor indoor air quality as part of the audit and design phases. Improvements shall be proposed which ensure that minimum quantities of outside air are supplied to occupied areas in accordance with the Washington State Ventilation and Indoor Air Quality Code. If there are pre-existing indoor air quality deficiencies, the ESCO shall document conditions and recommend corrective actions. The energy baseline may be adjusted to incorporate corrective actions prior to implementing Project's EEMs.

Source: Wash. Dept. of Enterprise Services, Master Energy Services Agreement at §H (2015) (on file with Env. Law Inst.).

**Including IAQ in Energy Audits and Related Facility Assessments**

The performance contracting process typically involves an energy audit that addresses a wide range of facility systems and parameters. School districts also may develop a school facility profile that becomes part of the ESPC solicitation. These facility assessments provide an opportunity to review a number of IAQ-related conditions – e.g., to identify whether a school's mechanical system is providing an adequate amount of outside air or whether the school has ongoing moisture control problems. These issues can then be addressed through the design, construction, maintenance, and operations phases of the ESPC

[90] N.C. ESPC Guide at 168.
[91] La. Dept. of Admin., State of Louisiana Request for Proposals for Energy Savings Performance Contracting Services at 1 (2009) [hereinafter "Louisiana Model RFP"], http://bit.ly/1jD4ET4.

project. EPA's *Energy Savings Plus Health* guidelines recommend performing an IAQ walkthrough inspection along with the energy audit, in order to understand current IAQ and health concerns.[92]

A few of the ESPC guidance documents reviewed here include provisions that help ensure IAQ issues are included in audits or other facility assessments undertaken at the outset of the performance contracting process.

*Washington.* As highlighted earlier, Washington's Master ESCO Agreement includes language addressing IAQ issues as part of the energy audit: "The ESCO shall look for evidence of poor indoor air quality as part of the audit and design phases …. If there are pre-existing indoor air quality deficiencies, the ESCO shall document conditions and recommend corrective actions."[93] The state's ESPC guidance similarly notes that the final Investment Grade Audit includes "identification of problem areas (i.e., indoor air quality, hazardous materials, maintenance etc.) …."[94]

*Maryland*. In discussing the technical facility profile carried out as part of the ESPC process, Maryland's guidance recommends baseline data collection that includes the following items:

- Total annual number of facility maintenance complaints;
- Average number of annual sick days per worker;
- Any specific building system that has a potentially large negative impact on employee health, productivity, or morale;
- Whether the school tracks indoor air comfort and air quality complaints; and
- Whether the school surveys building occupants annually as to IAQ, comfort, and lighting.[95]

*North Carolina*. North Carolina's ESPC guidance describes the "preliminary assessment" that school districts should undertake as part of their initial consideration of whether to pursue an ESPC. In addition to estimating energy savings, the preliminary assessment serves to "identify major building problems" and includes a walkthrough survey.[96] The sample walkthrough survey checklist includes, among other things, several items relating to the condition of the HVAC system and lighting fixtures, as well as two explicit IAQ items: (1) "Identify/Determine Facility Policies on: Indoor Air Quality awareness, ASHRAE 62;" and (2) "IAQ issues (mold, puddles, dirty filters, OA dampers shut)."[97] The guidance also recommends that schools develop a facility profile that will be incorporated into the project description for the RFP. The sample facility profile includes a discussion of HVAC and lighting, as well as several building envelope issues, such as, "Problem areas - condensation, ventilation, thermal comfort, acoustics, lighting" and "Indoor Air Quality - any problem areas -mold, ventilation at 15 cfm/person?"[98]

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[92] U.S. EPA, Energy Savings Plus Health at 24, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.

[93] Wash. Dept. of Enterprise Services, Master Energy Services Agreement at §H (2015)[hereinafter Wash. Master ESCO Agreement] (on file with the Envl. Law Inst.).

[94] Wash. Dept. of Enterprise Services, Energy Savings Performance Contracting: Guidelines for Public Agencies in Washington State at 24 (2012) [hereinafter Wash. ESPC Guidance], http://bit.ly/1LIkkeE.

[95] Maryland ESPC Guide at Appendix B, page 9.

[96] N.C. ESPC Guide at 23, 25.

[97] N.C. ESPC Guide at 26-7.

[98] N.C. ESPC Guide at 34.

**Incorporating IAQ-Related Facility Standards into the Performance Contract**

State ESPC guidance documents typically include a set of indoor environmental quality parameters (temperature, humidity, ventilation rates) that must be achieved pursuant to the ESPC.[99] The standards generally apply not only to equipment specifications and installment, but also to the operation and performance of the equipment during the term of the ESPC. All of the ESPC guidance documents reviewed here discuss including IAQ-related parameters in the performance contract.

*Louisiana.* Louisiana's Model RFP lists certain terms that are to be incorporated into the ESPC in order to "emphasize their importance." These include: (1) standards of service for HVAC, temperature, and humidity in accordance with ASHRAE standards; and (2) a provision stating that "[t]he level of quality of lighting, temperature, comfort, and humidity shall in no case be compromised" and that any equipment failing to perform at installed levels must be replaced.[100] The state's Model RFP also incorporates a Model Energy Savings Performance Contract, which includes the requirement for meeting ASHRAE standards and the prohibition on compromising lighting temperature, comfort, and humidity levels.

*Washington.* Washington's Master ESCO Agreement and ESPC Guidance describe the specific comfort standards that apply to an ESPC project, including temperature ranges for winter and summer, a relative humidity range of 40-60% if humidity control is provided, and minimum outside air per occupant in accordance with ASHRAE and the Washington State Ventilation and Indoor Air Quality Code.[101]

*North Carolina.* North Carolina's guidance document includes "standards of comfort" for heating, cooling, hot water and lighting, to guide the operation of equipment installed under an ESPC contract. These standards include relative humidity of 50%, with a humidity drift of +/- 5%. Additionally, the RFP template provided in the guidance includes as part of the "technical approach" section a request that ESCOs "describe standards of comfort and functionality that are generally used for light levels, space temperatures, ventilation rates, etc. in the intended facilities."[102]

*Maryland.* The Maryland guidance, in explaining the purpose and function of an ESPC, notes that ESPCs "contain guarantees of environmental comfort parameters such as ventilation rates, temperature, and light levels."[103]

[99] Two examples of school district RFPs that list such parameters for the ESPC are: Montgomery County (GA) Schools, Request for Proposal for Upgrades to Montgomery County Schools through a Guaranteed Energy Services Contract at 4 (2013)(requiring relative humidity (RH) between 50-55%, minimum outside air of 15 cfm, and compliance with ASHRAE 62), http://bit.ly/1DWAjlG; and Seattle(WA) School District No. 1, Energy Savings Performance Contract for Olympic View, Hay and West Woodland Elementary Schools, Exh. A (2010) (requiring RH between 40-60& RH and minimum outside air in accordance with ASHRAE and state ventilation code) (on file with Env. Law Inst.).
[100] Louisiana Model RFP at 9.
[101] Wash. Master ESCO Agreement at §K; Washington ESPC Guidance at 12-13, http://bit.ly/1LIkkeE. The guidance also requires illumination levels as recommended by the Illuminating Engineer's Society of North America (IESNA).
[102] N.C. ESPC Guide at 102, 175.
[103] Maryland ESPC Guide at 4.

*Massachusetts.* The Massachusetts Model RFP lists required contractual language for an ESPC, including the statement: "All work shall meet the minimum standards of ASHRAE and the Massachusetts Building Code." In addition, proposals must describe "standards of comfort and functionality that Respondent would propose for light levels, space temperatures, ventilation rates, etc. in the facilities," and the proposal must discuss specifically the "application of these standards in…the public school environment" and how the standards would be maintained throughout the term of the contract.[104]

**Addressing Hazardous Materials**

Chapter 4 of this paper discusses federal and state laws and regulations that may apply to the handling of certain hazardous materials and pollutants (asbestos, lead, and PCBs) in the context of a school renovation project. North Carolina, Louisiana, Massachusetts, and Washington are examples of states whose ESPC guidance addresses the role of ESCOs in handling hazardous materials encountered during work under a performance contract.

*North Carolina.* The North Carolina ESPC Guide provides a contract template that affirms the school district's responsibility for handling asbestos and other hazardous materials and requires the ESCO to "utilize due diligence in order to determine whether the Work will require the removal of PCB ballasts and whether asbestos is likely to be encountered in the performance of the Work. ESCO shall provide the ISSUER with an estimate for the cost of removal and disposition of PCB ballasts and asbestos it expects may be encountered in the performance of the Work and shall allow for an amount equal to the estimated cost of removal and disposal in the Guaranteed Savings detailed in Schedule B."[105]

*Louisiana.* In Louisiana's Model RFP, the contract template includes an "Environmental Requirements" section that discusses proper disposal of lighting ballasts that may contain PCBs. Pursuant to the model contract, the ESCO is responsible for the proper handling of "all PCB ballasts generated as a result of the installation of the Equipment," must contract with a firm that specializes in their disposal and recycling, and must ensure that an original Certificate of Disposal is delivered to the agency. The ESCO is also responsible for the proper handling of mercury-containing lamps. A separate clause in the model RFP places responsibility with the agency for addressing other hazardous materials, including asbestos, which the ESCO may encounter during the work.[106]

*Massachusetts.* The Massachusetts Model RFP designates the Contractor as responsible for the proper handling and storage of ballasts containing PCBs, and states, "All ballasts are suspected to contain PCBs unless they are specifically labeled otherwise."[107] The Contractor is also responsible for the proper handling, storage and transportation of fluorescent and HID lamps containing mercury. The Model RFP also includes a requirement for proposals to describe services that will be provided "to

[104] Mass. Model RFP at 17, 23.
[105] N.C. ESPC Guide at 203. The "lessons learned" section of the guidance notes that ballasts used in fluorescent fixtures manufactured before 1979 have PCBs that have special disposal requirements, that older buildings could have asbestos materials still in place, and that this issue should be identified in the contract. *Id*. at 146.
[106] Louisiana Model RFP at 34-35.
[107] Mass. Model RFP at 14.

identify, abate, and otherwise address hazardous materials that may be present …. Material may include but not be limited to asbestos and lead."[108]

*Washington.* Washington's Master ESCO Agreement includes a section on disposal of hazardous waste, which requires the ESCO to dispose of PCB ballasts and other hazardous wastes through an approved hazardous waste vendor and to provide the project owner with the appropriate disposal manifests.[109]

**Evaluating ESCO Qualifications**

School districts can help ensure that an energy savings performance contract will address IAQ issues by selecting ESCOs that have experience integrating IAQ considerations into the energy efficiency retrofit process. EPA's *Energy Savings Plus Health* guidelines recommend that schools districts "[m]ake sure that the design and construction teams include IAQ expertise."[110] Experience with energy rating systems such as EPA's ENERGY STAR program or other green building programs may also be helpful qualifications for school districts seeking to integrate IAQ, energy, and other resource conservation goals.

The Louisiana Model RFP addresses this issue to an extent by requesting that ESCOs describe their willingness, experience, and capability to apply for and achieve an EPA ENERGY STAR rating on retrofitted buildings.[111] In general, state ESPC laws that address the selection of energy service providers include language that is broad enough for school districts to consider IAQ issues as part of the selection process.[112]

## Summary

State ESPC guidance and model contract documents can help encourage school districts to consider and incorporate IAQ measures as part of the ESPC. State laws and regulations can also play a role in ensuring that indoor air quality is addressed through performance contracts. While some existing ESPC laws include provisions that may restrict the inclusion of capital-intensive IAQ measures, many state laws explicitly list indoor air quality measures as eligible activities, and others are framed broadly enough to allow IAQ-related measures. States can build on the examples described in this chapter by:

- Including explicit statutory and regulatory provisions that allow IAQ measures to be carried out and financed through an ESPC;
- Establishing cost-effectiveness criteria that enable ESPCs to capture non-energy benefits, including IAQ, and that allow payback periods and contract terms adequate to incorporate capital-intensive measures;

[108] *Id*. at 25.
[109] Wash. Master ESCO Agreement at §G.
[110] U.S. EPA, Energy Savings Plus Health at 25, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.
[111] Louisiana Model RFP at 17.
[112] *See, e.g.,* Ga. Code 50-37-3 (selection factors to be considered include "the experience of the provider, quality of the project approach….overall benefits to the governmental unit, and other factors determined by the governmental unit to be relevant to the implementation of the project.")

- Providing guidance documents and other ESPC educational materials that emphasize the importance of IAQ considerations in the ESPC process and reference technical materials, such as EPA's *Energy Savings Plus Health* guidelines, for integrating IAQ and energy efficiency; and
- Developing model ESPC contract documents that include clauses such as: prohibiting contracted work from compromising IAQ; directing that energy audits and other facility assessments provide information about opportunities for addressing current or potential IAQ issues; requesting information about an ESCO candidate's past IAQ experience; clarifying responsibility for addressing hazardous materials identified as part of the project; and establishing IAQ-related facility standards that must be achieved in the ESPC project.

# CHAPTER 4

## Regulatory Requirements for Addressing Indoor Contaminants during School Renovations

Energy efficiency retrofit activities may themselves produce indoor air quality problems if not managed properly. Construction activities "can disturb hazardous materials, such as asbestos, lead and polychlorinated biphenyls (PCBs); create dust; introduce new contaminants and contaminant pathways; create or aggravate moisture problems; and result in inadequate ventilation in occupied spaces."[113]

This chapter of the report describes state laws and regulations that establish requirements for managing four specific IAQ contaminants in connection with school renovation activities – asbestos, lead, PCBs, and radon. The chapter concludes by reviewing state requirements for protecting building occupants from pollutant exposures generally during construction work. The discussion that follows highlights examples from across the country, rather than describing every state law on these subjects.

There are other IAQ issues related to school renovations that may be addressed by state policy but fall outside the scope of this report. For example, state codes establishing ventilation and HVAC standards may apply to school energy efficiency retrofits depending on the nature of the project. Though not reviewed here, such codes can play an important role in ensuring adequate indoor air quality, particularly in light of recent research findings on the health and productivity benefits of higher ventilation rates.[114]

### Asbestos

Energy upgrade projects have the potential to disturb asbestos that may be present in insulation, coatings, flooring, roofing, and other building components. Asbestos exposure occurs when asbestos fibers are inhaled from the air and become trapped in the lungs. Over time, the accumulation of fibers in lung tissue may lead to breathing difficulties and asbestosis, and asbestos exposure has been linked to development of diseases such as lung cancer and mesothelioma.[115] Federal regulations establish requirements for protecting students and school employees from asbestos exposure, and many states have their own regulations to implement these and other requirements.

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[113] U.S. EPA, Energy Savings Plus Health at 3, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.

[114] See Chapter 1, notes 7-8. A recent review of research studies from 2004-2011 showed that "ventilation rates in 45-88% of U.S. public elementary school classrooms were less than specified in codes." M.J. Mendell, et al., Association of Classroom Ventilation with Reduced Illness Absence: A Prospective Study in California Elementary Schools 11-12 (2013) (references omitted), http://bit.ly/1Jcapgj.

[115] *See, e.g.,* Agency for Toxic Substances & Disease Registry (ATSDR), Toxicological Profile for Asbestos (2001), http://www.atsdr.cdc.gov/toxprofiles/tp61.pdf.

**Federal Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP)**

As required under the federal Clean Air Act, EPA has adopted regulations establishing National Emission Standards for Hazardous Air Pollutants to address air contaminants that are known or suspected to cause cancer or other serious health effects.[116] EPA's NESHAP for asbestos addresses demolition and renovation activities – defined as "altering a facility or one or more facility components in any way" – in schools and other structures.[117]

Pursuant to the NESHAP regulations, schools must undertake a thorough inspection where a demolition or renovation operation will occur and must provide notice to EPA or the delegated state agency before any demolition, or before any renovation that involves a specified amount of asbestos or asbestos-containing material.[118] The NESHAP sets forth required work practice standards that schools must follow for minimizing the release of asbestos fibers to ensure that areas in use during a renovation are not contaminated and that the area under renovation is free of contamination following completion of the project.[119] The regulations also prohibit the handling or disturbing of regulated asbestos-containing material unless at least one on-site representative who has been trained in accordance with the regulations is present.[120]

**Federal Asbestos Hazard Emergency Response Act (AHERA)**

While EPA's NESHAP regulations address asbestos during building renovations, a separate federal law, the Asbestos Hazard Emergency Response Act, establishes requirements for the ongoing management of asbestos and applies specifically to schools. The Act and accompanying EPA regulations require schools to conduct an asbestos inspection every three years and to conduct periodic surveillance, consisting of visual inspections of areas where there are asbestos-containing building materials, every six months.[121] Another central component of the law is the requirement for schools to prepare an asbestos management plan that documents the location of asbestos within the school, recommended asbestos response actions, and any actions taken to repair and remove the material.[122] The plan may provide important information for developing the scope and financing of an energy upgrade or other renovation project.

Under AHERA, those working on asbestos activities in schools must be trained and accredited in accordance with the Asbestos Model Accreditation Plan, and schools must provide asbestos awareness

[116] *See generally* U.S. EPA, Asbestos NESHAP (2015), http://www2.epa.gov/asbestos/asbestos-neshap.
[117] 40 C.F.R. 61.141. The regulations do not apply to residential buildings with four or fewer dwelling units.
[118] 40 C.F.R. 61.145(a)(1), (b).
[119] 40 C.F.R. 61.145(c).
[120] 40 C.F.R. 61.145(c).
[121] 40 C.F.R. 763.92(b). The inspection required by the federal NESHAP regulations may be more extensive than the AHERA inspection, depending on the nature of the planned renovation and demolition.
[122] 40 C.F.R. 763.93. AHERA also specifies response actions to prevent or reduce asbestos hazards (e.g., encasing or removing asbestos-containing material). 40 C.F.R. 763.85(b)(1).

training to their custodial and maintenance staff. [123] The law also requires schools to provide annual notices to building occupants and/or their guardians.[124]

**State Laws and Regulations**

States may be delegated authority to implement the federal NESHAP for asbestos and may receive a waiver from EPA to implement their own AHERA regulations. Currently, most states have been delegated authority to implement the NESHAP directly,[125] while 12 states have AHERA waivers to implement state asbestos in schools regulations.[126]

State regulations implementing the federal AHERA requirements must be at least as stringent as the federal regulations, and they may include more stringent provisions.[127] For example, Connecticut's asbestos in schools regulations add a prohibition on performing asbestos abatement while school is in session without the prior written approval of the state Department of Public Health.[128] Schools are required to submit a letter requesting the agency's approval to perform asbestos abatement while school is in session, which must be accompanied by specified information, including: an asbestos inspection report; a copy of the project design; a summary of the measures that will be taken to reduce the risk of students' exposure to asbestos to students; and written verification that the school will comply with applicable licensing, monitoring, and notification requirements.[129]

***Connecticut requires prior state approval in order to perform asbestos abatement while school is in session.***

In addition to state regulations implementing the federal AHERA requirements, states may adopt other laws and regulations that establish asbestos requirements applicable to schools that are undertaking energy upgrades and other renovations. For example:

- New York's education regulations require asbestos testing of all school areas to be disturbed during renovation or demolition and prohibit "large" and "small" asbestos abatement projects from being undertaken while the school is occupied.[130]

[123] 15 U.S.C. §2646; 40 C.F.R. 763.92(a); *id*. at Pt. 763, Subpt. E, App. C.
[124] 40 C.F.R. 763.93(g).
[125] *See* U.S. EPA Office of Air Quality Planning and Standards, *Common Questions on the Asbestos NESHAP* at 3 (1990), nepis.epa.gov.
[126] For a list of 12 states that have received waivers, *see* U.S. EPA, State Asbestos Contacts, http://www2.epa.gov/asbestos/state-asbestos-contacts.
[127] 15 U.S. Code § 2643(m); 42 U.S.C. § 7412(l).
[128] Ct. Admin. Code 19a-333-7(a).
[129] *See* Conn. Dep't of Pub. Health, *Circular Letter EHS #2006-33, Memorandum Re: Request to Perform Asbestos Abatement While School is in Session* (Aug. 18, 2006), http://www.ct.gov/dph/LIB/dph/environmental_health/asbestos/pdf/2006_33.pdf. Nebraska is another example of a state with asbestos regulations that are more stringent than the federal NESHAP and AHERA. *See* Neb. Dep't of Envtl. Quality, General Asbestos Information (2014), http://deq.ne.gov/Publica.nsf/Pages/00-072.
[130] 8 N.Y. Code Rules & Regs. 155.5(k). New York State Department of Labor industrial code rule 56 establishes licensing, certification, work practice, notification and other requirements applicable to asbestos projects. *See* 8 N.Y. Code Rules and Regs 56-1.1 et seq.

- Connecticut recently enacted legislation requiring its Department of Administrative Services to "develop a standard checklist for construction projects of school buildings," which must include testing for asbestos. As of October 1, 2015, the Department "shall conduct an assessment of any construction project of a school building receiving state funding for compliance with the standard checklist."[131]

- The West Virginia Department of Education has incorporated by rule a Handbook on Planning School Facilities, "to assist public school officials in planning and constructing new facilities, additions and major renovations."[132] The handbook requires that the facility be examined carefully before embarking on a renovation project and provides that, "An assessment of the existing facility should include an examination of at least the following areas: […] Identify all hazardous materials (e.g. lead, asbestos, PCB, etc.) and plan for their management and remediation."[133]

A few states have environmental or public health laws and regulations that address asbestos comprehensively and include general asbestos standards applicable to a variety of facilities, including schools.[134] For example, New Hampshire and Rhode Island have established indoor non-occupational air exposure standards for asbestos. New Hampshire's asbestos management statute requires the owner or manager of "any workplace, public building, facility, school, or rental dwelling" to prevent "unnecessary exposure of any person" to asbestos levels that exceed the state's standard. Similarly, the Rhode Island Asbestos Act requires building owners to prevent exposure of any person to friable asbestos in violation of the state's non-occupational exposure standard.[135]

## Lead-Based Paint

Like asbestos, lead-based paint is an important consideration for school renovation projects. The most common lead hazards in schools are lead-based paint, lead dust, and contaminated soil. During renovations, lead-based paint can be disturbed and released into the environment as lead dust. [136]

No safe blood lead level has been identified. Exposure to lead, which occurs when lead particles are ingested or inhaled, can have serious adverse health effects, especially for children. Lead exposure can damage a child's rapidly developing body and result in stunted growth, lower IQ, behavior and learning

[131] Ct. Gen. Stat. June Sp. Sess., P.A. 15-3, § 2 (2015). These newly enacted provisions have not been codified; however, the state education code's preexisting definition for "school building project" includes the "renovation or major alteration of a building to be used for public school purposes;" the code in turn defines "major alteration" as "a capital improvement of an existing building, the total project costs of which exceed ten thousand dollars … for public school purposes resulting in improved educational conditions." Ct. Gen. Stat. § 10-282(3), (6).
[132] W.V. Code R. 126-172-2.
[133] W.V. Code R. 126-172-3.
[134] Though not discussed here, states also may have asbestos laws and regulations requiring or authorizing the state asbestos agency to order an asbestos inspection and/or response action where there is an identified or suspected asbestos hazard, including hazards that arise when asbestos is disturbed during demolition or renovation operations.
[135] N.H. Rev. Stat. §§ 141-E:6-7; R.I. Gen. Laws §§ 23-24.5-5.
[136] U.S. EPA, Lead Concerns During Renovations for a Healthy School Environment (Sept. 15, 2015), http://www2.epa.gov/schools-healthy-buildings/lead-concerns-during-renovations-healthy-school-environment.

problems, anemia, and hearing problems. Early lead exposure also "significantly increases the risk of hypertension, cardiovascular disease, diabetes, schizophrenia, and neurodegenerative changes later in life."[137]

In 1978, the U.S. Consumer Product Safety Commission banned the sale of lead-based paint, with certain exceptions.[138] Following is a description of two other types of federal regulations, one governing renovations generally and one regulating specific lead-based paint activities, which establish requirements to prevent exposure to lead-based paint still present in older buildings.[139] Many states implement these federal policies through their own regulations, and states may establish additional lead-based paint requirements for schools undertaking renovations.

**Federal Renovation, Repair and Painting Rule (RRP)**

In 2008, EPA promulgated the Renovation, Repair and Painting Rule, as authorized by the Toxic Substances Control Act.[140] The RRP rule establishes requirements that apply to anyone paid to perform renovation, repair, and painting projects (including, e.g., contractors or in-house maintenance staff) that disturb lead-based paint in pre-1978 homes or other "child-occupied facilities."[141] According to the rule, such persons must be trained and certified and must adhere to specific work practice standards to minimize exposure to lead-based paint hazards created by the renovation. The RRP work practice standards require renovators to take a range of occupant protection measures, including posting signs around the work area; removing or covering all objects in the work area; containing the work area so that no dust or debris escapes; and cleaning the work area after the renovation so that no dust, debris, or residue remains.[142] The rule requires renovators to provide the facility's adult occupants, as well as parents/guardians of children, with an EPA-approved lead hazard information pamphlet and specific

[137] Centers for Disease Control and Protection, Childhood Lead Poisoning and the Environment, http://ephtracking.cdc.gov/showLeadPoisoningEnv.action; National Institute of Environmental Health Sciences, Child Development and Environmental Toxins at 3, http://www.niehs.nih.gov/health/assets/docs_a_e/child_development_and_environmental_toxins_508.pdf (citing D.A. Cory-Slechta et al., "Lifetime consequences of combined maternal lead and stress," Basic Clin. Pharmacol. Toxicol. 102(2):218-227 (2008)).

[138] *See* 16 C.F.R. Part 1303.

[139] Other federal regulations may also come into play in connection with school renovations. For example, pursuant to the federal Resource Conservation and Recovery Act (RCRA), lead-contaminated construction and demolition debris from non-residential sites that meets the toxicity characteristic for lead must be managed as hazardous waste under the law. U.S. EPA, Doc. No. EPA-530-K-04-005, RCRA in Focus: Construction, Demolition, and Renovation at 8 (Sep. 2004), http://www3.epa.gov/epawaste/inforesources/pubs/infocus/rif-cd.pdf; *see also* 40 C.F.R. 261.24.

[140] *See* 15 U.S.C. 2682, 2686.

[141] *See* 40 C.F.R. 745.82, 745.83. According to the regulations, the term "renovation" includes, but is not limited to the removal, modification or repair of painted surfaces or painted components, the removal of building components, weatherization projects, and interim controls that disturb painted surfaces. The regulations do not apply to "activities, including minor heating, ventilation or air conditioning work, electrical work, and plumbing, that disrupt 6 square feet or less of painted surface per room for interior activities or 20 square feet or less of painted surface for exterior activities," unless the activities involve window replacement, demolition of painted surface areas, or the use of certain listed construction practices. The rule does not apply to projects in buildings that have been documented to contain no lead-based paint. 40 C.F.R. 745.82-745.83.

[142] *See* 40 C.F.R. 745.85.

information about the renovation. States may establish broader notice requirements in their own laws and regulations.[143]

The RRP rule applies to schools in certain circumstances, by defining "child-occupied facilities" to include:

> [A] building, or portion of a building, constructed prior to 1978, visited regularly by the same child, under 6 years of age, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visits last at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day care centers, preschools and kindergarten classrooms.[144]

The rule goes on to address whether renovations in common areas in public buildings and exteriors of buildings are subject to the rule.

> With respect to common areas in public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only those common areas that are routinely used by children under age 6, such as restrooms and cafeterias. Common areas that children under age 6 only pass through, such as hallways, stairways, and garages are not included. In addition, with respect to exteriors of public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only the exterior sides of the building that are immediately adjacent to the child-occupied facility or the common areas routinely used by children under age 6.[145]

Thus, an energy upgrade or other renovation project taking place in a school that is regularly visited by children under six years of age must comply with the RRP rule if the work will involve kindergarten classrooms or other areas routinely used by children under six.

**Federal Lead-Based Paint Activities Regulations**

Separate federal regulations apply to those conducting lead-based paint abatement projects. Pursuant to the Residential Lead Based Paint Hazard Reduction Act of 1992 (known as "Title X"), EPA has established detailed training, certification, and work practice standards for abatement and other "lead-based paint activities," such as risk assessments and inspections, in pre-1978 "target" housing and child-occupied facilities.[146] The regulations define "child-occupied facilities" as pre-1978 buildings that are visited regularly by the same child (six years of age or under), which "may include, but are not limited to, day-care centers, preschools and kindergarten classrooms."[147] The work practice standards address inspection and lead hazard screening methodologies; prohibit certain abatement practices; establish post-abatement clearance procedures; and require development of occupant protection plans. The

[143] 40 C.F.R. 745.84.
[144] 40 C.F.R. 745.83.
[145] *Id.*
[146] *See* 42 U.S.C. 4851 et seq.; 40 C.F.R. Part 745, Subpart L.
[147] 40 C.F.R. 745.223.

regulations also establish accreditation requirements for training programs that include curriculum requirements and instructor credentials.[148]

**State Laws and Regulations**

Federal law allows states, tribes, and territories to request EPA approval to administer and enforce the federal lead-based paint requirements. To date, 15 states have received federal approval to administer their own RRP programs.[149] These state regulations must be at least as protective as the federal regulations.[150] States are not precluded from adopting provisions that are more stringent, e.g., by applying the RRP requirements to a broader range of school facilities or renovation projects or by establishing more stringent work practice requirements.[151] EPA's *Energy Savings Plus Health* "recommends RRP program rule compliance for *all* schools, regardless of the age of the students or the school."[152] The guidance also recommends lowering the threshold for interior painted surface area from 6 $ft^2$ to 2 $ft^2$ as an "expanded action" to be considered when feasible and when sufficient resources exist.[153] For the most part, however, states with their own RRP programs have adopted the same definition of "child-occupied facility" found in the federal regulations, as well as the same threshold for interior painted surface. State RRP regulations may contain provisions that differ from some of the specific work practice standards or other aspects of the federal regulations not discussed in this report.

***EPA recommends that* all *schools follow the federal Lead Renovation, Repair and Painting Rule during energy retrofits.***

States may have other laws and regulations that address lead-based paint in the context of school renovations and improvements.[154] For example, New York's education regulations establish a set of Uniform Safety Standards for School Construction and Maintenance Projects, which require that, "Any construction or maintenance operations which will disturb lead based paint will require abatement of those areas pursuant to [the U.S. Department of Housing and Urban Development's protocols]…. All areas scheduled for construction as well as areas of flaking and peeling paint shall be tested for the presence of lead and abated or encapsulated in accordance with the above noted guidelines."[155] As

[148] 40 C.F.R. 745.225.
[149] The states authorized to administer their own RRP programs in lieu of the federal program are: Alabama, Delaware, Georgia, Iowa, Kansas, Massachusetts, Mississippi, North Carolina, Oklahoma, Oregon, Rhode Island, Utah, Washington, and Wisconsin. *See* U.S. EPA, Renovation, Repair and Painting Program: Contractors (last updated April 17, 2014), http://www2.epa.gov/lead/renovation-repair-and-painting-program-contractors. In addition, 39 states have received federal approval to administer their own Lead-based Paint Activities regulations and administer their own certification and training program for lead professionals. *See* U.S. EPA, Lead-Based Paint Activities Professionals (last updated September 17, 2015), http://www2.epa.gov/lead/lead-based-paint-activities-professionals.
[150] 42 U.S.C. 2684(b)(1).
[151] *See* 40 C.F.R. Part 745, Subpart Q.
[152] U.S. EPA, Energy Savings Plus Health 36 (emphasis added), http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.
[153] *Id.*
[154] This report does not discuss the requirements of state child care licensing regulations. In some states, such regulations apply to licensed child care or preschool programs located in schools and may contain requirements related to lead-based paint.
[155] 8 N.Y. Code Rules & Regs. 155.5(l).

noted earlier, the West Virginia Department of Education has developed by rule a Handbook on Planning School Facilities that directs schools to identify lead in building materials and to "plan for their management and remediation" before beginning renovation projects.[156]

## Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls are chemicals that were used in certain building materials from the 1950s to the late 1970s. PCBs are persistent, bioaccumulative toxicants that have been identified as a probable human carcinogen, and exposure to PCBs is associated with a variety of other health problems, including reproductive and neurological effects.[157] Building occupants may be exposed through inhalation of PCBs that have off-gassed from building materials, through ingestion of PCB-containing dust and residues, and through touching PCB-contaminated materials.[158]

Although most uses of PCBs were banned in 1979, buildings constructed before then may still contain PCBs. Indeed, EPA "believes that there was potentially widespread use of PCB-containing building materials in schools and other buildings built or renovated between about 1950 and 1979."[159] Two important potential sources of PCBs in schools are:

- PCBs in Fluorescent Light Ballasts (FLBs). PCBs may be contained within fluorescent light ballast capacitors and in the FLB interior potting material of old magnetic T12 lighting fixtures. FLBs manufactured before July 1, 1979 may contain PCBs. According to EPA, exposure to PCBs may result from intact FLBs emitting small amounts of PCBs during their normal use, as well as from the rupture or leaking of FLBs. All PCB-containing FLBs currently in use have exceeded their designed life span, "increasing the risk of leaks, smoking conditions, or even fires, which would pose health and environmental hazards."[160]

- PCBs in Caulk. PCBs may be present in caulking materials "primarily used in or around windows, door frames, stairways, building joints, masonry columns, and other masonry building materials," particularly in buildings constructed in the 1950s through 1970s.[161] According to EPA, PCBs in caulk may be released into the air through off-gassing whether the caulk is intact and undisturbed or deteriorating. When PCBs in caulk are released into the air, they can be reabsorbed by other building materials to create secondary sources capable of re-emitting PCBs into the air.[162]

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[156] W.V. Code R. 126-172-3.
[157] ATSDR, ToxFAQs™ for Polychlorinated Biphenyls (PCBs) (2014), http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=140&tid=26.
[158] U.S. EPA, PCBs in Building Materials – Questions and Answers at 4 (July 28, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/pdf/pcb_bdg_mat_qa.pdf.
[159] *Id*. at 1.
[160] U.S. EPA, PCB-Containing Fluorescent Light Ballasts (FLBs) in School Buildings, http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/ballasts.htm.
[161] U.S. EPA, PCBs in Building Materials – Questions and Answers 6 (July 28, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/pdf/pcb_bdg_mat_qa.pdf.
[162] *Id.* at 6, 10. In addition, PCBs in caulk can migrate directly into adjacent building materials. *Id* .at 6.

Other sources of PCBs in schools may include paints, floor finishes, window glazing, fireproofing materials, and ceiling tiles.[163]

Federal laws and regulations establish certain requirements relating to PCBs that may impact school energy upgrade projects and other renovations, and EPA has issued guidance to help schools address PCBs in FLBs, caulk, and other building materials. States also may have laws, regulations, or other policies that address PCBs in the context of school renovation projects.

**Federal Toxic Substances Control Act (TSCA) and EPA Regulations**

The federal Toxic Substances Control Act prohibits the manufacture, processing, distribution in commerce, or use of PCBs unless authorized by rule by EPA and only if the agency finds that "such manufacture, processing, distribution in commerce, or use (or combination of such activities) will not present an unreasonable risk of injury to health or the environment."[164] TSCA requires EPA to develop regulations that govern the use, marking, storage, cleanup, reporting, and disposal of the chemicals.[165]

EPA has determined through rulemaking that PCBs and PCB-containing materials "present an unreasonable risk of injury to health" when they contain PCB concentrations of 50 parts per million ("ppm") or greater.[166] The agency's PCB regulations do not include affirmative requirements to test for PCBs in existing building materials, though the regulations prohibit use (including continued use) of building materials containing at least 50 ppm and establish requirements for disposal of such materials.[167] Federal PCB regulations also require:

- Removal of leaking PCB-containing FLBs;[168]
- Removal or cleaning of FLBs and other surfaces that have PCB stains or residues;[169]
- Proper disposal of leaking FLBs and other PCB-contaminated building materials;[170]
- Proper decontamination or disposal of PCB-contaminated remediation equipment and cleanup materials;[171] and
- Identifying and properly managing PCB waste, including the use of approved containers, approved storage facilities, and records/manifests, where appropriate.[172]

[163] *Id*. at 7.
[164] 15 USC § 2605; 40 C.F.R. 761.1 et seq. TSCA creates an exception for use of PCBs in a "totally enclosed manner."
[165] *Id*.
[166] 40 C.F.R. 761.20. ("This finding is based upon the well-documented human health and environmental hazard of PCB exposure, the high probability of human and environmental exposure to PCBs … from manufacturing, processing, or distribution activities; the potential hazard of PCB exposure posed by the transportation of PCBs … within the United States; and the evidence that contamination of the environment by PCBs is spread far beyond the areas where they are used.")
[167] *See* 40 C.F.R. 761.20; *id*. at 761.50 et seq., 761.202 et seq. Materials containing PCB at concentrations below 50 ppm are not regulated by EPA. More stringent requirements are triggered under the regulations when PCB concentrations exceed 500 ppm. According to the agency, "To identify what regulatory requirements apply to a material that contains PCBs, a person has two options: either to determine the PCB concentration and apply the regulations specified for that concentration and type of material, or to assume the concentration to be 500 parts per million (ppm) or greater. Under the second option, it is not necessary to determine the PCB concentration of the material, but the most restrictive regulatory requirements apply." Disposal of Polychlorinated Biphenyls (PCBs), 63 Fed. Reg. 35384, 35387 (Jun. 29, 1998).
[168] *See* 40 CFR 761.125(c)(1).
[169] *See* 40 C.F.R. 761.125.
[170] *See* 40 C.F.R. 761.60.
[171] *See* 40 CFR 761.60, 761.61, 761.65, 761.79.

**EPA Guidance on PCBs in Schools and Other Buildings**

In July 2015, EPA released updated guidance documents on PCBs in schools and other buildings. The guidance explains federal legal requirements and provides recommendations and best practices for addressing PCBs in building materials, including FLBs and caulk.[173]

*PCB-Containing FLBs*. EPA recommends replacing PCB-containing FLBs even if they are intact, noting that, "A FLB failure, leak, smoking condition, or fire could: (1) happen at any time, without warning; (2) add to PCB levels in the air; and (3) may pose health issues for the staff or students who are exposed. When a FLB has leaked, significant costs could be incurred…."[174] The guidance recommends use of an experienced contractor or trained staff for removal, cleanup, and disposal of PCB-containing FLBs and provides recommended procedures for preparation, inspection, removal, and cleanup of leaking and non-leaking fluorescent lights.[175] EPA's *Energy Savings Plus Health* guidelines also recommend this approach, suggesting that "non-leaking PCB-containing light ballasts … be replaced because of their increased likelihood to fail and leak and because of the increased energy efficiency of new ballasts."[176]

***Updated EPA guidance explains federal regulatory requirements and best practices for addressing PCBs in schools.***

According to EPA, one of the most likely exposure pathways for PCBs from FLBs is breathing PCB-contaminated air.[177] The agency has calculated exposure levels for evaluation of PCBs in indoor school air, which are recommended for use in determining whether or not schools have a PCB inhalation concern. In general, EPA "recommends that the concentrations of PCBs in indoor air be kept as low as is reasonably achievable" in school buildings.[178]

*PCB-Containing Caulk and Other Building Materials.* EPA recommends that all schools built between 1950 and 1979 "remove PCB-containing caulk, paint and other PCB-containing building materials during planned renovations and repairs (when replacing windows, doors, roofs, ventilation,

[172] *See* 40 C.F.R. 761.60 et seq.; *id.* at 761.202 et seq.
[173] *See* U.S. EPA, Polychlorinated Biphenyls (PCBs) in Building Materials (July 30, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/.
[174] U.S. EPA, PCB-Containing Fluorescent Light Ballasts (FLBs) in School Buildings (Aug. 10, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/ballasts.htm. The guidance also notes, "As a result of [DOE] rulemakings, the supply of T12 lamps is expected to decrease over time and the cost of those that remain is expected to increase, adding a greater incentive to perform a retrofit of PCB-containing T12 lighting." *Id*. *See also* U.S. EPA, *Practical Actions for Reducing Exposure to PCBs in Schools and Other Buildings* 2 (July 28, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/pdf/pcb_fs_v7.pdf.
[175] U.S. EPA, PCB-Containing Fluorescent Light Ballasts (FLBs) in School Buildings (Aug. 10, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/ballasts.htm.
[176] U.S. EPA, Energy Savings Plus Health at 37, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.
[177] U.S. EPA, PCB-Containing Fluorescent Light Ballasts (FLBs) in School Buildings (Aug. 10, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/ballasts.htm.
[178] *See* U.S. EPA, Exposure Levels for Evaluation of PCBs in Indoor School Air (July 30, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/exposure_levels.htm.

etc.)."[179] Prior to removal, EPA recommends testing the caulk for PCBs to determine the protections needed during removal and the proper disposal requirements. The agency has developed suggested work practices for building owners and contractors conducting renovation and repair projects in older buildings with PCB-containing caulk and other potentially-contaminated materials, including: "employing protective measures during a renovation; leaving the work area clean and safe for building occupants after completing the job; and properly disposing of waste materials."[180]

**State Laws and Regulations**

States may have regulations implementing the federal PCB requirements, as well as regulations addressing management of PCB-contaminated materials or waste that apply in addition to federal disposal requirements. In the state of Washington, for example, the Department of Ecology starts regulating demolition debris containing PCBs at concentrations of 2 ppm, compared with the federal threshold of 50 ppm.[181] States may also have laws or regulations requiring schools to identify PCB-contaminated building materials prior to renovation projects.

- Recent Connecticut legislation, noted above, requires the state Department of Administrative Services to develop a "standard checklist for construction projects of school buildings," which must include testing for polychlorinated biphenyls, as well as asbestos; after October 1, 2015, the Department is required to "conduct an assessment of any construction project of a school building receiving state funding for compliance with the standard checklist."[182]

- Minnesota's solid waste rules require specified hazardous items and materials to be removed prior to renovation or demolition of a structure. Among the listed items that must be properly characterized, tested, managed, and disposed of according to applicable standards are "items that contain polychlorinated biphenyls (PCBs), including transformers, transistors, capacitors in old appliances and electronic equipment, heat transfer equipment, and light ballasts."[183]

- The West Virginia Department of Education's Handbook on Planning School facilities, also described above, provides that facilities must identify PCB materials and "plan for their management and remediation" before beginning renovation projects.[184]

[179] U.S. EPA, Practical Actions for Reducing Exposure to PCBs in Schools and Other Buildings: Guidance for school administrators and other building owners and managers (July 28, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/pdf/pcb_fs_v7.pdf.
[180] U.S. EPA, Polychlorinated Biphenyls (PCBs) in Building Materials (July 30, 2015), http://www3.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/.
[181] *See* State of Washington Dep't of Ecology, PCBs in Demolition Debris Summary, http://www.ecy.wa.gov/programs/hwtr/demodebris/pages2/pcbsummary.html#Identification,%20Sampling%20and%20Testing ("Electrical items that were manufactured without PCBs or that were drained of federally regulated PCBs are often contaminated with lower level PCBs regulated by Ecology. A 'No PCB' label means there are less than 50 ppm PCBs but Washington starts regulation at 2 ppm. These items may be regulated by Ecology."); Wa. Admin. Code 173-303-500 et seq.; Wa. Admin. Code 173-303-9904.
[182] Ct. House Bill 7102, June Sp.Sess., P.A. 15-3, § 2.
[183] Mn. Rules 7035.0805. Other listed materials include asbestos and certain items containing lead or mercury.
[184] W.V. Code R. 126-172-3.

**State Guidance on PCBs in Schools**

In addition to regulatory requirements, some states have developed non-regulatory guidance materials or other agency policies addressing PCBs in schools. For example:

- Washington's Department of Ecology has developed a "PCB Chemical Action Plan" with recommendations for state action to reduce PCB exposures in schools. One priority identified in the plan is the use of best management practices to prevent releases of PCBs during remodeling and demolition. The plan recommends that the state identify PCB-containing lamp ballasts in schools and other public buildings and encourage their replacement with more energy efficiency fixtures; develop and promote Best Management Practices for containing PCBs in existing buildings and during remodeling or demolition; and assess schools and other public buildings for the presence of PCB-containing building materials. (As noted in chapter two, recent Washington legislation prioritizes funding for school energy projects that involve removal of PCB-containing FLBs.) Wash. Dep't of Ecology, PCB Chemical Action Plan 15-17 (Feb. 2015), *at:* https://fortress.wa.gov/ecy/publications/documents/1507002.pdf.

- In New York, the State Education Department has developed, in consultation with the State Health Department, a protocol for addressing PCBs in caulking materials in schools, which addresses the potential release of PCBs in school buildings undergoing construction or demolition. The protocol recommends that any school building undergoing renovation or demolition be evaluated prior to the renovation work to determine whether it contains caulk that is contaminated with PCBs, if the building had been originally constructed or previously renovated between 1950 and 1977. In such cases, "a plan should be developed to address potential environmental and public health concerns about potential PCB exposure." The draft manual also addresses PCBs in FLBs: "Leaking PCB containing lighting ballasts shall be removed immediately and non-leaking PCB containing ballasts should be removed as soon as possible. Removal of PCB containing ballasts shall be performed by workers with special training in hazardous waste handling." N.Y. State Educ. Dept., *Manual of Planning Standards for School Buildings 2014 (04/04/14 Draft)* at 116-117*, at*: http://www.p12.nysed.gov/facplan/documents/MPS-2014.pdf

- The Massachusetts Department of Public Health has developed a booklet on PCBs in school building materials designed to supplement EPA guidance. The booklet recommends immediate replacement of PCB-containing light ballasts that appear to be leaking or in disrepair and prompt changing of any burnt-out bulbs to "reduce overheating and stress on the ballast," which can result in release of PCBs. The booklet recommends, "to the extent feasible or in connection with repair/renovation projects, the older light ballasts should be replaced consistent with the intended lifespan." Mass. Dep't of Public Health, *An Information Booklet Addressing PCB-Containing Materials in the Indoor Environment of Schools and Other Public Buildings* 2, 5 (2009), *at*: http://www.mass.gov/eohhs/docs/dph/environmental/exposure/pcbs-guidance.pdf

## Radon

Radon is a naturally occurring, radioactive gas produced by the breakdown of uranium in soil, rock, and water. Indoor exposure to radon is the second leading cause of lung cancer in the United States and the leading cause of lung cancer among nonsmokers. According to the U.S. EPA, indoor radon exposure is responsible for about 21,000 lung cancer deaths in the country each year, with around 2,900 deaths among people who have never smoked.[185]

Radon can move from the ground into the air inside a building through cracks and other holes in the foundation. The only way to know the radon level in a particular building is to test the building for radon. EPA has established a radon "action level" of 4.0 picoCuries per liter of air (pCi/L) – the level at which a building owner should take action to reduce radon in the indoor air.[186]

EPA recommends testing schools prior to energy efficiency retrofits, so that radon mitigation systems can "be considered and installed as part of the overall building modifications."[187] EPA also recommends retesting for radon *after* completing all building upgrades and renovations that affect the building envelope and air flow, because changes to these systems can affect indoor radon levels.[188]

There are currently no federal laws or regulations that establish a general requirement for schools to test for radon. Some states have adopted radon testing and mitigation requirements for schools, and a considerable number of states require licensing or certification for those who carry out radon testing and mitigation.

**State Laws and Regulations**

Several states have laws and regulations that require radon testing in some or all schools.[189] These policies often include requirements for re-testing schools at specified intervals, such as every three, five, or ten years.[190]

Some state radon testing laws require that school buildings be evaluated or tested for radon following

[185] U.S. EPA, Radon Health Risks, http://www.epa.gov/radon/health-risk-radon.
[186] U.S. EPA, A Citizen's Guide to Radon, http://www2.epa.gov/sites/production/files/2015-05/documents/citizensguide.pdf (noting also that, "Radon levels less than 4 pCi/L still pose a risk, and in many cases may be reduced.").
[187] U.S. EPA, Energy Savings Plus Health at 39, *available at:* http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health. EPA recommends testing in accordance with state requirements or applicable standard of practice, such as the recent standard published by the American National Standards Institute (ANSI) and the American Association of Radon Scientists and Technologists, Inc. (AARST). *See id*.; ANSI/AARST, Radon Measurement for Schools and Large Buildings (2014), https://www.aarst.org/bookstore.shtml.
[188] U.S. EPA, Energy Savings Plus Health at 40, *available at:* http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health. EPA also notes that ventilation systems must operate with "no less than design minimum outdoor air ventilation rates whenever school rooms are occupied…to ensure radon levels are not adversely affected." *Id*. at 39.
[189] These states include Colorado, Connecticut, Florida, Oregon, Rhode Island, Virginia, and West Virginia. Two of these states (Rhode Island and West Virginia) also explicitly require mitigation when testing reveals elevated radon levels. *See* Envl. Law Inst., Topics in School Environmental Health: Overview of State Laws, http://www.eli.org/buildings/topics-school-environmental-health-overview-state-laws.
[190] *Id.*

renovation or remodeling. For example, Florida public health law requires radon testing of all public and private school buildings in counties designated in the Florida Radon Protection Map as Intermediate or Elevated Radon Potential, as well as follow-up testing within five years. Additional follow-up testing is required if "significant structural changes occur."[191] In Colorado, where schools must test for radon and maintain results on file at each school, regulations also require that remodeled schools be evaluated by the state to determine the need for radon testing.[192]

In addition to radon testing requirements, states may have laws and regulations that require state licensure or certification of those carrying out radon testing and mitigation in schools. More than two dozen states currently manage their own programs for licensing or certifying radon professionals, and those programs typically include testing and mitigation protocols and other specified work practices.[193] A small number of additional states require third-party certification for radon service providers.[194] Thus, in some states, schools undertaking energy efficiency retrofit projects may be required to hire state-licensed or third-party certified professionals for any radon testing or mitigation carried out in conjunction with the upgrade.

## IAQ Management During Renovation of Occupied Spaces

Construction activities in occupied school buildings can expose students and staff to a range of potentially harmful contaminants. In addition to regulatory requirements for specific substances, state policies may establish general IAQ best practices for renovation projects.

The Sheet Metal and Air Conditioning Contractors' National Association has developed industry standards on this subject, the *IAQ Guidelines for Occupied Buildings Under Construction* (hereinafter "SMACNA IAQ Guidelines"). The standards incorporate management of air pollutant sources, control measures, quality control and documentation, communication with occupants, and other practices.[195] EPA's *Energy Savings Plus Health* guidelines recommend compliance with the SMACNA IAQ Guidelines and also lists a number of best practices for conducting renovations of occupied buildings.[196]

[191] Fl. Stat. § 404.056 (4).

[192] 6 Co. Code Regs. 1010-6:6.8.1(E).

[193] These states are Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Minnesota, Nebraska, New Jersey, Ohio, Pennsylvania, Rhode Island, and West Virginia. For additional information on state radon licensing and certification programs, see Envl. Law Inst., Radon in Homes: Strengthening State Policy to Reduce Risk and Save Lives (2012), http://www.eli.org/buildings/radon-homes-strengthening-state-policy-reduce-risk-and-save-lives.

[194] *See, e.g.*, Ca. Health & Safety Code § 106750 et seq.; Ct. Gen. Stat. § 20-420—427; Md. Envt. Code § 8-305; Va. Code § 32.1-229.01.

[195] *See* SMACNA, IAQ Guidelines for Occupied Buildings Under Construction (2nd ed. 2008), https://www.smacna.org/store/indoor-environmental-air-quality.

[196] U.S. EPA, Energy Savings Plus Health at 63-64, http://www.epa.gov/iaq-schools/iaq-guidelines-school-building-upgrades-energy-savings-plus-health.

**State Laws and Regulations**

Several states have health, education, or other laws and regulations that require schools to protect occupants from pollutant exposures generally during renovation activities.[197] These policies, which often apply only to construction/renovation projects that receive state aid, vary somewhat in their scope and specificity.

A number of state policies include a general requirement for addressing exposure to contaminants. For example, Colorado's health regulations for schools require that "exposure to noise, dusts, toxic chemicals, or other hazards shall be controlled at all times including when the building or portion thereof is occupied during construction or remodeling."[198] Vermont's regulations governing building projects eligible for state aid require school boards to adopt a plan that addresses IAQ during all phases of construction or renovation.[199]

***Several states require that schools implement best practices to protect occupants from indoor air contaminants during renovations.***

Some states reference the best practices included in the SMACNA IAQ Guidelines. Arizona, Connecticut, and Massachusetts are examples of states with education and school construction regulations that require procedures consistent with the SMACNA Guidelines for school renovation projects receiving state approval and aid.[200] In Rhode Island, education regulations establish standards for the design and construction/renovation of schools where the total cost of the project exceeds $500,000. Pursuant to the regulations, projects must comply with all requirements set forth in the most recent version of the Northeast Collaborative for High Performance Schools Protocol (Northeast-CHPS), which in turn requires compliance with the SMACNA IAQ Guidelines in occupied buildings. [201]

Instead of establishing a general requirement or referencing the SMACNA IAQ Guidelines, state regulations may list specific IAQ management practices that schools must follow during renovation projects to protect occupants. For example:

- Indiana health regulations state that during school building renovations or additions, steps must be taken to ensure that pollutants from the construction area do not enter occupied spaces, and the regulation lists several steps that may be taken to meet this requirement, including: Selecting product and materials with minimal off-gassing; keeping the occupied

[197] *See generally* Env'l. Law Inst., Topics in School Environmental Health: Overview of State Laws, http://www.eli.org/buildings/topics-school-environmental-health-overview-state-laws.
[198] 6 Co. Code Regs. 110-6:6.8.1(E).
[199] Vt. Admin. Code 7-1-14:6131. This provision also requires that, "wherever practicable, the plans shall specify a minimum of one week following the completion of construction before occupancy to allow off-gassing."
[200] *See* Az. Rev. Stat. § 15-2132; Ct. Gen. Stat. § 10-291; 603 Code Ma. Regs. § 38.03.
[201] R.I. Admin. Code 21-2-41:1.01, .04 (RI ADC 08 010 015). A number of other states have policies establishing a broad set of "green building" criteria for school construction. These policies are typically limited to new construction and substantial rehabilitation of school facilities, which are not addressed in this report. *See generally,* Env'l. Law Inst., Healthy, High Performance Schools: Developments in State Policy (Nov. 2013), *at*: http://www.eli.org/buildings/healthy-high-performance-schools.

spaces under positive pressure in relation to the work areas; providing filtration; limiting certain activities to times of no occupancy; using temporary partitions; increasing housekeeping activities; and ventilating the area prior to occupancy to reduce airborne contaminants due to construction activities.[202]

- New York state education regulations include detailed provisions regarding health and safety during school construction and renovation projects. The regulations specify, among other things: separation of construction areas from occupied areas; prevention of the passage of dust and contaminants to occupied areas; maintenance of adequate ventilation to occupied spaces; and adequate exhausting of chemical fumes. According to the regulations, bid specifications must require schedules of work on construction and maintenance projects that include time for off-gassing of volatile organic compounds before re-occupancy, and final construction documents for bidding must include appropriate procedures for protecting the health of building occupants. Schools must also involve their health and safety committees during renovation projects and provide advance notification of projects to parents, staff, and the community.[203]

- New Jersey's safety and health regulations for schools and other public workplaces require that renovation work in occupied buildings be isolated; that air contaminants, dust, and debris be confined to the work area; and that work areas be aired out before re-occupancy. Schools must consider hazard information when selecting products, in order to determine whether they contain volatile organic compounds that could be emitted during regular use and to implement necessary control measures during renovation. Schools must also notify employees at least 24 hours in advance of work to be performed on the building that may introduce air contaminants into the work area.[204]

## Summary

States can ensure that school retrofit projects do not unintentionally create IAQ problems by establishing regulatory requirements for addressing indoor pollutant exposures during renovation. Certain hazardous substances, such as asbestos, lead, and PCBs, are subject to federal regulatory requirements in the context of school renovations. Some states have adopted additional regulatory measures for addressing these contaminants. In addition, the report describes how states have established requirements for addressing radon and for ensuring best practices to protect occupants from indoor exposures generally while renovations are underway. State ventilation and HVAC requirements, not reviewed here, are also vital indoor air quality measures that may apply depending on the scope and the nature of the renovation.

[202] 410 In. Admin. Code 33-4-10.
[203] 8 N.Y. Code Rules & Regs. 155.5.
[204] N.J. Admin. Code 12:100–13.5.

States can consider adopting laws and regulations that build on the examples discussed in the report:

- Asbestos – requiring AHERA management plan review and an asbestos assessment prior to undertaking renovation; establishing an indoor non-occupational air exposure standard for asbestos; and restricting asbestos abatement activities when a school is occupied.
- Lead – applying the federal Renovation, Repair and Painting rule or similar requirements to all preK-12 schools; and applying the RRP rule requirements to school renovations that involve a lower threshold for interior painted surface area.
- PCBs – requiring or recommending replacement of PCB-containing light ballasts as part of a renovation project; requiring or recommending evaluation prior to the renovation work to determine whether the school has PCB-containing caulk and other materials.
- Radon – requiring testing for and mitigation of elevated radon levels in schools, including re-testing in connection with renovation activities.
- IAQ Management During Renovations – for renovation activities that take place in occupied buildings, requiring schools to implement best practices for protecting occupants from pollutant exposures, such as those established in the SMACNA *IAQ Guidelines for Occupied Buildings Under Construction*.

# CHAPTER 5

# Conclusion

Recent years have seen increased attention to ensuring that energy efficiency projects protect and enhance indoor environmental quality. Federal agencies, including the Department of Energy and EPA, have developed new guidance and best practices for addressing indoor air quality and health in both home and school energy efficiency projects. EPA's recent *Energy Savings Plus Health* guidelines provide a broad technical foundation for K-12 schools to ensure that energy improvements do not compromise indoor air quality. States can help institutionalize these best practices through laws, regulations, and other policies that require and encourage the consideration of IAQ when planning and implementing a school energy efficiency project.

The time is ripe for action, as the coming years will likely see continued emphasis on energy efficiency as an important strategy for reducing greenhouse gas emissions. Many states have authority to enact policies in the three areas reviewed in this report – funding for school facility upgrades, energy savings performance contracting, and regulation of individual hazardous substances during renovations. The examples highlighted in the preceding chapters offer a starting point for states to consider laws, regulations, or other guidance that help schools maximize the potential health and productivity benefits of energy efficiency projects.

Many of the policies described in this report allow or encourage, but do not require, the consideration of IAQ goals as part of the energy efficiency retrofit process. The practical effect of such policies may turn on whether a school district already infuses IAQ priorities and practices into its ongoing operations and maintenance activities and integrates IAQ goals into its energy management and construction programs. Thus, another way for states to promote consideration of IAQ in energy efficiency upgrades is to promote IAQ management practices in school operations more broadly.[205] State laws can require or encourage schools to implement an IAQ management program, such as EPA's *Indoor Air Quality Tools for Schools* Action Kit.[206] States can also develop programs for providing direct education, technical support, and financial assistance to help schools implement IAQ management programs and to identify best practices for integrating IAQ and energy efficiency in their facility upgrade projects.

[205] EPA has created a widely-used model IAQ management program and accompanying resources. *See* U.S. EPA, *Indoor Air Quality Tools for Schools* Action Kit, http://www2.epa.gov/iaq-schools/indoor-air-quality-tools-schools-action-kit/.
[206] *See* Env'l. Law Inst., Topics in School Environmental Health: Overview of State Laws (IAQ Management Plans), http://www.eli.org/sites/default/files/docs/iaq_mgmt_plans_draft_final_draft_minor_revision_feb_2015.pdf.

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