

Making Affordable Multifamily Housing More Energy Efficient

A Guide to Healthier Upgrade Materials



Executive Summary



There is no question that investing in energy-efficiency upgrades has the potential to deliver substantial financial, environmental, and health benefits to building owners and residents. Robust evidence demonstrates that interventions such as weatherization and other energy-efficiency upgrades, particularly in poor quality housing, can significantly improve residents' health by reducing thermal stress, asthma symptoms, and energy costs.¹ What is far less understood and addressed, however, are the adverse health impacts produced by chemical emissions from some of the materials commonly used for these upgrades.^a These materials often contain persistent, bioaccumulative, or toxic chemicals^b and either show evidence or are suspected of being asthmagens, reproductive or developmental toxicants, endocrine disruptors, or carcinogens.^c Not only are a building's residents endangered, but these chemicals of concern^d can also pose threats over the materials' life cycles to the workers who manufacture, install, and dispose of these products, to the communities adjacent to these facilities, and to the broader environment. Many of these populations are some of our most vulnerable and have limited access to health care.

Defining Our Audience

This guide is designed for those who decide what products to use in the energy-efficiency upgrade process — specifiers, contractors, building owners, developers, architects and engineers, program managers, and scientific advisors. Our focus is the affordable multifamily rental stock, a significant source of housing for low-income households that



can be substandard and poorly maintained, with relatively high utility bills and increased exposure to biological, chemical, and physical hazards. However, the research and recommendations presented in this guide will be useful to practitioners across the entire building industry.

Defining the Health Issues

Because insulating and air sealing provide the most significant long-term savings from upgrade projects but can also introduce many chemicals of concern, this guide focuses on the materials used for these purposes — on their chemical composition and potential health impacts,^e as well as on their general performance and relative cost. Some common types of chemicals found in insulation and air-sealing products that are of the greatest concern are halogenated flame retardants, formaldehyde-based binders, isocyanates, and phthalate plasticizers. The health effects of these chemicals include reproductive and developmental impacts, carcinogenicity, and the ability to cause or exacerbate asthma. Moreover, some of these chemicals persist and accumulate in the environment and in people and thus can have broad-reaching, long-term impacts.

Ranking Healthier Materials

Through our research into the common content of insulation and air-sealing products, we have developed a ranking of materials from a health standpoint and provide practical recommendations for moving up the ladder of healthier materials. Recommendations are based on chemical hazard avoidance per the Hierarchy of Controls framework, used in occupational safety by organizations such as the National Institute for Occupational Safety and Health (NIOSH). Some of the best insulation materials from a health perspective are commonly used fiber glass and cellulose insulation and we recommend their use whenever possible. We also recommend avoiding foam insulation, particularly those products that are mixed and reacted on site, such as spray foam, because they contain several chemicals that are the most important to avoid.

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For some air-sealing applications, prefoamed materials like foam sealant tapes offer a healthier option. Acrylic-based sealants with low volatile organic compound (VOC) content also rank well from a health perspective. We recommend avoiding, whenever possible, modified polymer and polyurethane sealants that commonly contain phthalates and other chemicals that raise the greatest concerns.

Broadening Interventions for Healthier Materials

Looking at the broader practice and policy context, this guide makes the case for the following interventions:

- Improving the transparency of the chemical content of upgrade materials
- Investing in product innovation, demonstrations, and early adopters to mainstream and scale the use of healthier products
- Using state and local policy tools like the Low-Income Housing Tax Credit's allocation priorities to drive healthier upgrade materials usage
- Ensuring that the upgrade workforce is appropriately trained to use these healthier materials
- Engaging, above all, in wider and strategic industry dialogue to begin the complex process of forging consensus about the need to use healthier materials to achieve energy efficiency.

Looking Forward

While there is reason for concern about some of the materials used to construct the buildings in which we live, work, and learn, there is also reason to be optimistic. Transparency about chemicals in building products is growing as chemical contents are disclosed through transparency platforms like the Health Product Declaration and Declare. Innovative new products and improved versions of well-known products are regularly coming on the market. These developments often improve performance or decrease cost and may also improve the health profile of the product. We still have a long way to go, however, toward mainstream adoption of healthier products.

The focus of this guide may introduce new ground for those energy-efficiency advocates, practitioners, and funders who have historically emphasized the energy performance and cost of upgrade materials, but not their health impacts. We envision a future when upgrades not only make buildings energy efficient, but also create environments that promote the health and well-being of their residents, installation workers, and the broader communities affected by materials' manufacture, production, and disposal.

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- ^a Throughout this guide, we will use the term "upgrade" to refer to a holistic set of interventions to make a building more energy efficient.
- ^b Commonly referred to as properties of concern, persistent chemicals do not break down readily in the environment; bioaccumulative chemicals build up in people and other animals and become more concentrated as they move up the food chain; and toxic chemicals are harmful to living organisms.
- ^c This report focuses on a subset of toxicity endpoints, outlined in the methodology section.
- ^d Chemicals of concern are those that may adversely affect human health. Different organizations may define different subsets of chemicals as chemicals of concern. For this report, health hazard information from the Pharos Chemical & Material Library was used to screen chemicals. Those rated as having high or very high hazard levels for the health endpoints shown in Table 1 of this report were considered to be chemicals of concern. In some cases in which research is still emerging, additional sources beyond the Pharos Library were consulted for associated health hazards, and in these cases, the additional sources are cited within the text.
- ^e This analysis is based on health hazards to a person exposed to the contents of the insulation or air-sealing products, though this analysis does not assess the level of exposure to these chemicals. There is potential exposure to these substances throughout their life cycles. Manufacturing can expose workers and fenceline community residents; installation can expose workers and nearby occupants; occupancy can expose building occupants when chemicals migrate out of the products during use; and demolition and disposal can again expose workers and nearby occupants. Chemicals that persist in the environment can also travel long distances and have global impacts.