

## Safe School Design Task Force OBJECTIVE, RESEARCH, & TRENDS FRAMEWORK

### Healthy Schools: Hygienic Materials

#### A. Objective Statement

Our AIA NJ Safe School Design Task Force is focusing attention on the timely and important topic of “**Hygienic Materials**” and how it relates to the overall framework of designing safe and secure schools in New Jersey. Our Task Force objective is to share national best practices in K-12 school designs and to show how to apply these practices to local New Jersey communities to help meet our schools’ health, safety, welfare, and wellness needs. The strategies used by NJ Architects to design and renovate schools shall not only protect building occupants but also create highly successful learning environments by applying innovative design solutions to integrate facility management and physical security with spaces supporting mental health and wellness practices.

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#### **GOAL: Providing Healthy Environments by choosing better and more Hygienic Materials.**

What is meant by Hygienic Materials? Words like safe, protective, or unharmed may come to mind at the human scale. At the same time, when we look at the technical level, things like antimicrobial, low or no volatile organic compounds (VOCs), or low embodied energy (the energy needed to create, transport, and install) in materials come to mind.

When we think of hygienic materials, we often think of that object's effectiveness in preventing the transfer of bacteria or how easy it is to clean, such as a cutting board or a smaller object. However, when it comes to a building, we need to expand that thinking to all the material’s impacts on its occupants. In the case of schools, this is very important as the occupants, students, teachers, and staff spend most of their days surrounded and interacting with these materials.

Depending on the selection of building materials, such as the flooring, wall coverings, ceiling systems, distribution systems (such as air and water), or even the furniture, could contain harmful chemicals that could leach into the water, off-gas into the air, or harm the occupants with prolonged exposure. The selection of materials can seemingly be at odds with the requirements of durability, fire requirements, or costs that school buildings are under. This complexity of needs

can lead to the materials, including chemicals to retardant fire, wood stains containing formaldehyde, paint with VOCs, or insulation that can mold.

A better approach is to analyze the material selection with the occupant's health as just as important of a factor as durability or cost to select the best material for the project. Other times, it is the detailing of where materials are installed to reduce or eliminate their interaction with occupants.

Some concerns when selecting materials can include the following:

*Antimicrobials* - Toxic chemicals that may be used to kill microbes. Overuse and misuse may lead to microbes that are resistant to antimicrobials. Health impacts include asthmagen, eye and skin irritation, among many others. Antimicrobials may be found in stains, sealants, adhesives, textiles, wallpaper, and other products.

*Isocyanates* - A potential human carcinogen, which can lead to irritation or difficulty breathing. Isocyanates can be found in resins, paints, sealants, adhesives, and other flexible substances.

*Volatile Organic Compounds (VOCs)* - can have health impacts with symptoms such as irritation, dizziness, visual disorders, memory impairment, etc. VOCs can be found in some paints, cleaners, furniture, adhesives, and other building materials.

*Bisphenols* - such as BPA (commonly found in certain plastics), accumulate in the body and can lead to adverse health impacts. Bisphenols are included in some paints, countertops, floorings, and coatings.

*Mold* - health impacts can range from sore throat to allergic reactions. Mold will grow on certain materials when exposed to moisture with a lack of air movement.

## **B. Design Innovations & Creative Solutions**

Selecting materials that balance the demands of durability, life cycle cost, and that are safe for humans is not easy, and there are few quick and easy solutions at hand. The best advice is to work with architects, consultants, and product experts for selections on the actual products and installation methods.

That said, we can provide some helpful guidance:

- Select natural finishes or ones with less synthetics, such as Linoleum or bamboo.
- Review the product declarations for harmful properties.
- Selecting materials without VOCs.
- Avoiding sealers, stains, or coating that contain isocyanates or bisphenols.
- Selecting insulation that does not mold, such as mineral wool.
- For materials that contain harmful chemicals, install them with enough time to allow for off-gassing before the building is occupied.

There are design and technical considerations to plan for outside of material selections: moisture and air.

### **Moisture**

Water will get into buildings through the exterior wall assemblies, windows, user error, and by other means. The tactic is planning how water will get out once it enters so it will not be trapped. Proper detailing of weeps, rainscreens, flashing, and drainage is paramount.

### **Air**

Air is discussed in another topic in the Health series on *Indoor Air Quality*, but to be brief, bringing in fresh air throughout the school is essential. Avoid using too much recycled air, plenum returns, or duct-liner insulation if possible. Additionally, air filtration and proper practices should be reviewed with maintenance staff, specifying MER13 or 16 filters.

## **C. Resource Reference Links**

**Resource Information on Daylight and Lighting and excerpts taken from:**

**2022 Research White Paper “[Healthy Schools by Design - Materials](#)”** - A study on materials for schools by Perkins&Will

- *90% of school occupants are rapidly developing children and women of reproductive age, who are highly sensitive to an increasing number of chemicals that bioaccumulate in our bodies.*
- *Certain phthalates, seen in plastics in building materials, can impair brain development in childhood and have adverse effects on the reproductive system, especially in boys (Engel et al., 2021).*
- *Careful material selection can also dampen background noise that distracts learners and causes teachers’ vocal strain.*
- *Material selections should prioritize maintenance and operations because the long-term impact of adverse exposure can significantly affect teachers, students, and staff.*
- *The poorest communities often have older buildings, and may be exposed to*

*cheaper, unhealthy material alternatives that compound existing health burdens.*

**[The 9 Foundations of a Healthy Building, Healthy Buildings for Health](#)**, 2017

Harvard T.H. Chan School of Public Health by Joseph G. Allen, Ari Bernstein, Xiadong Cao, Erika Sita Eitland, Sky Flanigan, Maia Gokhale, Julie M. Goodman, Skylar Klager, Lacey Klingensmith, Jose Guillermo Cedeno Laurent, Steven W. Lockley, Piers Macnaughton, Sepideh Pakpour, Jack D. Spengler, Jose Vallarino, Augusta Williams, Anna Young, and Jie Yin.

*“The 9 Foundations of a Healthy Building” was created by a multidisciplinary team of experts from the Healthy Buildings Program at the Harvard T.H. Chan School of Public Health. You can learn more about the team and our research at [www.ForHealth.org](http://www.ForHealth.org). The 9 Foundations curated summaries are designed to be a clear and actionable distillation of the core elements of healthy indoor environments. For each, we created a 2-page summary of the underlying science, fully cited back to the primary literature. These summaries are included in the following pages, along with a short guide for how to achieve each foundation. The 9 Foundations apply universally to all building types, including homes, but the supporting text focuses mainly on commercial office environments.*

**[Foundation For Student Success How School Buildings Influence Student Health, Thinking and Performance](#)**

Harvard T.H. Chan School for Public Health by Erika Eitland, Lacey Klignesmith, Piers MacNaughton, Jose Cedeno Laurent, Jack Spengler, Ari Bernstein, and Joseph G. Allen

*Schools for Health: Foundations for Student Success was researched and produced by the Healthy Buildings program at the Harvard T.H. Chan School of Public Health under the direction of Dr. Joseph Allen. Our goal is to improve the lives of all people, in all buildings, everywhere, every day. The Schools for Health program is a platform to discuss, research, and disseminate information on how school buildings affect the health and productivity of students, teachers, and staff every day. Our team works to answer critical questions related to the environmental and contextual factors that influence chronic absenteeism, academic performance, and short- and long-term health performance indicators. Schools for Health: Foundations for Student Success is intended to serve as an evidence-based decision-making tool for key school stakeholders.*