Material Transparency and Healthier Choices:

Building Local Advocacy with Global Impact
03 NOVEMBER 2018
A4LE LEARNINGSCAPES

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When you change the way you look at things, the things you look at change.

-Max Planck
HOW SUBSTANCES MOVE FROM BUILDING MATERIALS INTO HUMAN BODIES

Once substances have migrated out of building materials, people can come in contact with them through inhalation, ingestion, or dermal absorption (Figure 2-3). This contact is referred to as exposure.
Acknowledge

Demand Transparency
To understand our choice and make good decisions.
Could we build a school that does not contain lead, asbestos, volatile organic compounds (VOC’s)?
Could we build a school that **does not contain** lead, asbestos, volatile organic compounds (VOC’s)? 
**carcinogens, asthmagens?**
Could we build a school that does not contain lead, asbestos, volatile organic compounds (VOC’s)? carcinogens, asthmagens? bisphenols, phthalates, halogenated flame retardants, formaldehyde? highly fluorinated chemicals (PFAS)? antimicrobials, polyvinyl chloride (PVC)?
Although children are only 24 percent of the population, they are 100 percent of our future.

- Ed Markey
Future-Proof

Can we protect human health by selecting materials that are inherently safer?
BPA (bisphenol A)

**Study median**

**Your result:** 0.56 ng/mL
BPS (bisphenol S)

![Chemical structure of BPS]

**US median and US 95th percentile**

- Study median

**Your result:** 4.9 ng/mL
Competitive gymnasts can be exposed to high levels of flame retardants through the foam-containing equipment (pit cubes, landing mats, etc) used in gyms. In a study of 11 collegiate gymnasts, levels in blood were 4-6 times higher compared to the general population, and similar to an occupationally exposed population of foam cutters and carpet installers.

SGA found a new foam supplier and became the first gym in the United States to replace all of their loose foam with flame retardant-free foam.
15,000
15,000 hours typically spent in a classroom upon graduating high school
https://schools.forhealth.org
Industry Impact

In the year 2016, we designed or built more than 2 million ft$^2$.

900 billion ft$^2$ of new and re-built buildings will be constructed in cities worldwide over the next twenty years. This equates to an entire New York City every 47 days.

UN Habitat, State of the World’s Cities 2010/2011;
McKinsey Global Institute, Urban World; Cities and the rise of the consuming class, 2012

Develop speedometers
To better understand your impact
Embodied Impacts

Looking beyond energy efficiency
84,000 chemicals in the United States are registered under the EPA Toxic Substances Control Act.

700 additional chemicals are introduced annually.

777 chemicals are on the LBC Red List, extrapolated from 22 materials and chemical families.

600 chemicals are actively monitored under the EPA Toxic Release Inventory.

200 chemicals have been tested by the EPA for threats to human health and safety.

5 chemicals have been partially banned as a result of testing (Asbestos, CFCs, PCBs, Dioxins & Hex Chromium).

How is chemical safety regulated?

Precautionary Principle: Even in the face of scientific uncertainty, action should be taken to prevent harm.
Chemical Regulation

- DDT: Risk Identified 1962 - 1972 Regulation (10 years)
- Asbestos: Risk Identified 1970 - 1989 Regulation (19 years)
- Bisphenol A (BPA): Risk Identified 1997 - 2012 Regulation (15 years)
- Phthalates: Risk Identified 2003

Regulations are minimums
A building built to code is the worst building allowed by law
Architects have a greater ability to improve public health than medical professionals

-Dr. Claudia Miller
USG Eclipse - acoustic ceiling tiles
  HPD2.0 label
titanium dioxide
  occupational carcinogen

Benjamin Moore UltraSpec 500 - paint
  C2C3.1 Silver label

Soltis 99 fabric - window shades
  no ingredient label, UL Greenguard
  PVC, PET, phthalates
  reproductive & developmental toxicants

Abet Laminati - plastic laminate
  no ingredient label
  40% proprietary resins including phenol
  & melamine formaldehyde
  nervous system impacts

Mannington Infinity - carpet
  HPD2.0 label
  PVC backing, phthalates
  reproductive & developmental toxicants

Mannington MGuard 718 - carpet adhesive
  no ingredient label
  VOCs
  nervous system impacts, cancer

Noraplan Sentica - rubber flooring
  no ingredient label

Joy Carpeting – FF&E area rugs
  no ingredient label & fails California Prop-65
  halogenated flame retardants
  perfluorochemical stain repellents
  anti-microbial additives
  thyroid disruption, reproductive problems

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Understanding Labels

HPD = Health Product Declaration

Understand what is inside to make informed decisions

Section 2: Content in Descending Order of Quantity

This section lists materials in a product and the substances in each material based on the Inventory Threshold for each material. If residuals or impurities from the manufacturing or extraction processes are considered for a material, these are inventoried and characterized to the extent described in the Material and General Notes. Chemical substances are screened against the HPD Priority Hazard Lists for human and environmental health impacts. Screening is based on best available information. "Not Found" does not necessarily mean there is no potential hazard associated with the product or its contents. More information about Priority Hazard Lists and the GreenScreen can be found online: www.hpd collaborative.org and www.greenscreenchemicals.org.
Healthy Building Network study identifies 44 hazardous substances in carpet

Health impacts:
- Developmental Disorders
- Endocrine Disruptor
- Hypersensitivity
- Asthma
- Reproductive Disorders
- Carcinogen
- Neurological Disorders

*This graphic outlines some of the most hazardous substances and some of their highest priority hazards, but does not reflect all hazardous chemicals that can be found in carpets, or all associated hazards for the chemicals and chemical groups listed. See the report text and appendices for additional information on specific chemical hazard associations.*
Celebrating successes

Reward manufacturers that disclose - write specs requiring their competitors to
Understanding Labels

Quality is defined by five criteria categories:

**MATERIAL HEALTH**
Product ingredients are inventoried throughout the supply chain and evaluated for impact on human and environmental health. The criteria at each level build towards the expectation of eliminating all toxic and unidentified chemicals and becoming nutrients for a safe, continuous cycle.

**MATERIAL REUTILIZATION**
Products are designed either to biodegrade safely as a biological nutrient or to be recycled into new products as a technical nutrient. At each level continued progress must be made towards increasing the recovery of materials and keeping them in continuous cycles.

**RENEWABLE ENERGY AND CARBON MANAGEMENT**
The criteria at each level build towards the expectation of carbon neutrality and powering all operations with 100% renewable energy.

**WATER STEWARDSHIP**
Processes are designed to regard water as a precious resource for all living things. At each level, progress is made towards cleaning up effluent to drinking water standards.

**SOCIAL FAIRNESS AND Biodiversity**
Company operations are designed to celebrate all people and natural systems and progress is made towards having a wholly beneficial impact on the people and the planet.

Celebrate successes

Reward manufacturers that disclose - write specs requiring their competitors to
### Understanding Labels

The below table contains the full assessment report for the product disclosed at 1000 ppm.

<table>
<thead>
<tr>
<th>Material</th>
<th>CAS Number</th>
<th>Role</th>
<th>%</th>
<th>Result</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>Vehicle</td>
<td>0-20%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td>4472-04-9</td>
<td>Binder</td>
<td>&gt;20%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>13463-67-7</td>
<td>Pigment</td>
<td>7%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Resin (Epoxy)</td>
<td>9003-05-8</td>
<td>Pigment</td>
<td>7%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Other Colorants (Pigments)</td>
<td>Proprietary</td>
<td>Pigment</td>
<td>7%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Additives (Proprietary)</td>
<td>Proprietary</td>
<td>Additives</td>
<td>3%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Phosphate Acrylate Polymer</td>
<td>Proprietary</td>
<td>Opposite Polymer</td>
<td>5%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Epoxy Acrylate Polymer</td>
<td>Proprietary</td>
<td>Epoxy Acrylate Polymer</td>
<td>7%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Transparent</td>
<td>Proprietary</td>
<td>Transparent</td>
<td>7%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
<tr>
<td>Preservative</td>
<td>Proprietary</td>
<td>Preservative</td>
<td>0.2%</td>
<td>MFU</td>
<td>Use with care, see label.</td>
</tr>
</tbody>
</table>

### COMPANY AND PRODUCT INFO

**Issued to:** Sherwin-Williams

**For the Products:** Pintar® 200 Zero VOC - B20, B21, B24, B25, B30, B31

**B1** Series

**Description:** Professional painters have it all with Pintar® 200 Zero VOC Interior Latex Paint. A complete professional line that not only has zero VOCs, but is also available in six sheens and every color. All while delivering maximum productivity with exceptional economy and touch-up.

**Certification Period:** June 2016 – June 2020

**Assessor:** MBDC basis methodology v2.0

### Qualifications

- LEED SPCG Credit: Material Ingredients Option 1: Qualifies for an 1 product
- LEED SPCG Credit: Material Ingredients Option 2: Qualifies for 100% of coat

### MATERIALS / INGREDIENTS INFORMATION

The following table summarizes the top 5% of the material ingredient disclosure and ratings. For full ingredient disclosure information, please see the table at the online site.

<table>
<thead>
<tr>
<th>Material</th>
<th>Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>MFU</td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td>MFU</td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td>MFU</td>
</tr>
<tr>
<td>Other Colorants (Pigments)</td>
<td>MFU</td>
</tr>
<tr>
<td>Additives (Proprietary)</td>
<td>MFU</td>
</tr>
</tbody>
</table>

### Exposure Indicator
1 - Inhalation, air
2 - Oral, mouth

*No indicator means no potential exposure criteria identified.*

### Color Ratings
- Low or mild hazard identified and/or potential exposure
- Moderate hazard identified and/or potential exposure
- High risk hazard identified and/or potential exposure
- Data insufficient to evaluate the hazard and potential exposure levels

*Hazardous materials are those with potential to cause injury, and are subject to federal and state regulations.*

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**UL Product Lens**

Look at hazards from cradle to grave.
When it comes to our collective ecological goals, the swarm rules might boil down to: **know your impacts**, favor **improvements** and **share what you learn**.

-Daniel Goleman, Ecological Intelligence
Making The Right Choice

Your decisions matter.

Focus on products that are fully disclosed.

Optimize your selections to deliver the most impact.

Balance decisions against project goals and client needs.
DISCLOSURE TRANSPARENCY INVENTORY
A full Public Inventory of all contents to a specified level in an industry adopted format

SCREENING RESTRICTED SUBSTANCE LIST (RSL)
Ingredients are Screened against list of known chemicals of concern; regrettable substitutions

ASSESSMENT
Impacts to human and environmental health are Assessed

OPTIMIZATION
Material is Optimized by design to eliminate hazards throughout lifecycle
<table>
<thead>
<tr>
<th>Scheme</th>
<th>Cradle to Cradle v3</th>
<th>GreenScreen full assessment</th>
<th>UL Product Lens</th>
<th>HPD v2</th>
<th>Declare</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intent</strong></td>
<td>Multi-attribute assessment, of which material health is part, based on C2C design principles.</td>
<td>Hazard benchmark derived from hazard evaluation for 18 healthy/ environmental endpoints.</td>
<td>Hazard disclosure and exposure indicators across four phases of the product lifecycle.</td>
<td>Ingredient disclosure and hazard screening. Open standard shaped by an inclusive group.</td>
<td>Ingredient disclosure, hazard screening against LBC red list, material sourcing info., end-of-life fate.</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>Product level</td>
<td>Chemical level</td>
<td>Product level</td>
<td>Product level</td>
<td>Product level</td>
</tr>
<tr>
<td><strong>Chemical Inventory</strong></td>
<td>Product level</td>
<td>Chemical level</td>
<td>Product level</td>
<td>Product level</td>
<td>Product level</td>
</tr>
<tr>
<td><strong>List-Based Screening</strong></td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>Optimization</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>Exposure Prediction</strong></td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>Adoption</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>LEED</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>WELL</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>LBC</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
<tr>
<td><strong>Lifecycle Phases</strong></td>
<td></td>
<td></td>
<td></td>
<td>LBC Red List only</td>
<td></td>
</tr>
</tbody>
</table>

**Inputs + Outputs**
- **Disclosure Level**
  - 100 ppm
  - 100 ppm
  - 100 to 1,000 ppm
  - 100 to 10,000 ppm
  - 100 ppm
- **Public Data Availability**
  - Intellectual property protected by C2C.
  - When used for LEED, parallel to HPD.
  - Intellectual property protected by UL.
  - Role, amt, and hazard must be disclosed.
  - Two exception paths for intellectual property.

**Reporting Format**
- Third-party verified
- Third-party verified
- Third-party verified
- Third-party optional
- Self-declared

**Verification**
- Third-party verified
- Third-party verified
- Third-party verified
- Third-party optional
- Self-declared

**AIA / ARUP**
Prescription For Healthier Building Materials: A Design & Implementation Protocol - 2018

**Inventory** of all chemicals within a material
**Ingredients screened** against list of known chemicals of concern
**Impacts to human and environmental health are assessed**
**Material is optimized by design to eliminate hazards**
Material Impacts

Database tools
- Mindful Materials
- Sustainable Minds Transparency Catalog
- Red2Green
- Manufacturer websites!

Building certification programs
- Washington State Sustainable Schools Program (WSSP)
- Collaborative for High Performance Schools (CHPS)
- LEED v4
- WELL
- ILFI Living Building Challenge (LBC)
Public Policy & Position Statement – The Practice

The AIA advocates for programs, policies, and practices that inform an holistic approach to selecting and using building materials. Materials significantly affect human and ecosystem health, well-being, climate, and social equity. Architects’ ability to understand life-cycle impacts is fundamental to the art, craft, and science of architecture and to making positive material choices that support a healthy, prosperous world.

The AIA supports transparent, clear information on the content of building materials and furthermore urges manufacturers to develop materials that are free of toxic substances, minimize greenhouse gas emissions, and are environmentally and socially responsible.

- AIA –2017

Code of Ethics – Canon VI / Obligations to the Environment

Members should recognize and acknowledge the professional responsibilities they have to promote sustainable design and development in the natural and built environments and to implement energy and resource conscious design.

Ethical Standard 6.3 Building Materials:

Members should select and use building materials to minimize exposure to toxins and pollutants in the environment to promote environmental and human health and to reduce waste and pollution.

- AIA 2018

Transparency is the new normal

Everyone involved in the building project could have access to information on health impacts
AIA Materials Industry Forum Summary Report

November 8, 2017

Attendees

2017 Greenbuild, Boston

On a Wednesday afternoon during Greenbuild, about 40 professionals representing different roles within the building industry gathered with the following purpose:

To identify barriers to increased transparency and purchasing based on the health and environmental impact of building products and to identify opportunities for cross-disciplinary collaboration to overcome those barriers.

In a way that is: Collaborative, engaging, fun, empowering, and increases trust among the participants.

So that: People and ecosystems, including those within the built environment and those affected by its supply chain, can thrive.

The planning team had also identified several desired outcomes:

- Prioritized list of barriers to transparency in building products
- Clearly defined strategies for collaborating to overcome these barriers.
- An assessment as to the value of and interest in continued collaboration to address the barriers.

We came away with a short list of high priority barriers to product transparency and optimization, along with a handful of strategies for addressing each one. The barriers are:

- **Education**: across the industry, people are not well informed about these issues.
- **Quality & reliability of information**: disclosure varies widely in their accuracy and comprehensiveness.
- **Lack of technical standardization**: various disclosure formats and programs have inconsistent requirements.
- **Lack of products with transparency documentation**: designers, contractors, and owners struggle to find products that meet their goals, such as LEED v4, WELL, and Living Building Challenge.

We also identified a handful of actions or initiatives that could help remove those barriers. Some of them will require a long-term engagement, while others might be achievable in the short term.

The hard stuff:

- Develop policies at the municipal, state, or federal level that provide incentives for purchasing optimized products and those with disclosure documentation. California’s new Building Energy Efficiency Standards is an example of such a policy.
- Consolidate information on products with disclosure documentation and optimization into one mega transparency database or establish the standards that would allow this type of information to flow easily among existing databases and tools.

The easy stuff:

- Promote independently verified data and recognize it as higher quality. This could be an important way to counter the plethora of poor quality data that is now in the market. There is also an unfortunate tendency for less comprehensive disclosure documents to be given fewer “good” ratings, thereby rewarding less conscientious manufacturers.
- Document the soft ROIs: develop a clear way for manufacturers to find out when their products have been specified (or, better yet, purchased) due to their transparency and/or environmental credentials.
- Tell the “why” story through multiple channels. If we don’t talk about why this is important, people won’t get behind it.
- Distribute AIA’s existing resources supporting this effort, including the Materials Transparency and Legal Risk white paper and the HazAIA Materials Protocol.
- Reward high-quality education programs through programs such as AIA’s CE Quality Education.
Prescription for Healthier Building Materials:
A Design and Implementation Protocol

Frances Yang, SE, LEED AP BD+C, WELL AP
Sara Teplar, MArch, AIA, LEED AP

Engaging Our Peers

Embrace open-source platforms to share resources and successes
The big ask

Is anyone listening?
CLOSING THE LOOP ON PRODUCT TRANSPARENCY

Dear Design Community Member,

We, as members of the building product manufacturing community, truly appreciate and applaud the many letters and requests for product transparency that we have received from concerned members of the Architecture and Design Community these past five years. Around 35 signatories from some of the world’s biggest and most influential firms encouraged us each to continue on our sustainability journey with product transparency, accelerating a transformation in the manufacturing industry. The industry would not be where it is today without such advocacy and encouragement.

As responsible members of a community, you asked us each to tell you what was in our products and what impacts our products have in terms of human and environmental health and sustainability.

WE RESPONDED, IN A BIG WAY

The manufacturers represented in this letter hold a total of:

- 500 Material Ingredient Reports (e.g. Declare labels, C2C, MHC, HPDs)
- 1200 Environmental Impact Reports (e.g. LCAs, EPDs)
- 6 Certified Living Products
- Covering more than 25 product categories and 3400 product lines

We are united in a common goal to ensure that high performing, healthy, sustainable and affordable building materials are the rule, not the exception.

This is where your help is crucial.

A letter was important to open a dialogue and increase the sharing of information. Transparency has created a platform upon which to have productive conversations with the Architecture and Design community and consumers at large. Now that we have each responded, it is important to evolve and deepen the conversation. Information about where and why our products are being selected now needs to flow back to the manufacturing community.

Significant costs are incurred to develop new materials and implement new, more sustainable products. Manufacturers must invest in data management, employee, supplier and stakeholder engagement, R+D, and capital investment. Each manufacturer, like every business, must demonstrate return on these investments by reducing risk.

This important message bears repeating: we need to hear that it matters to you, and that it has an impact on your choices and purchasing decisions.

We need your feedback to justify continued reinvestment and expansion in sustainability efforts. It is time to close this transparency loop, together.

Yes!

And we want to hear back from you!

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EACH OF US COMMIT TO

- Continue building sustainability practices into manufacturing and material selection.
- Continue to invest in product transparency measures and programs.
- Use common platforms for product information to make it easier to specify products with preferable environmental attributes.
- Prioritize suppliers that support our transparency and environmental impact reduction efforts.
- Educate internally at our companies, and externally in our supply chains, about the importance of transparency and sustainable products.
- Walk the talk through encouraging the specification of transparent products in our own buildings, factories, and purchasing programs.

WE EACH ASK YOU TO

- Specify products that are transparently disclosed and have reduced human and environmental health impacts whenever possible.
- Advocate to customers for programs like Living Building Challenge, LEED and WELL, that value transparency, material health and reduced environmental impacts, and create market demand.
- Tell us which tools and databases you want to use to find our products, and reach out separately to let us know when and why you specified our products.
- Continue to send us letters as well (they go a long way).
- Consider all product categories, including those that go beyond what you can see, touch and feel in a building; they also have significant impact.
- Distribute this letter at your own firms and continue internal education to ensure that this message reaches the individuals who specify products on a daily basis.

This work and the conversation surrounding it will continue to evolve, and we are merely scratching the surface on this first step. We each thank you again for your bold pursuit of sustainability in the built environment, and look forward to being fierce advocates for creating healthy, sustainable buildings.

Sincerely,

The Living Product 50

A group of leading manufacturers collaborating to transform the materials economy through transparency, green chemistry, supply chain innovation, and industry awareness.

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[Logos of various companies]
PFASs / PFCs / PFOA / PFOS / C8 = “forever chemicals”

More than 3,000 individual PFASs may have entered the market. Use sparingly.
Scientists have long known that when it comes to harm from environmental exposures, the youngest children often face the greatest risk.

-Gluckman PD, Hanson MA, Spencer HG, Bateson P
Spec Hackathon

Specs

Drawings

Something In-between!
Crowd sourcing

Establishing best practices, removing bad actors
What is Thermal Insulation?

1. While stopping heat flow is the goal for the wall of a refrigerator...a building faces a different task: to provide a comfortable interior environment as the exterior environment goes through large changes in temperature and solar radiation.
2. We don't really care about making buildings comfortable. We care about making people comfortable.
3. The paradox of insulation materials is that the very best insulation we can imagine would be literally, nothing.

-Z Smith (Eskew+Dumez+Ripple)

**Board Insulation**
Cavity Wall Cl, Stem wall, Foundation, Under-slab Fiber, Foam

**Batt / Blanket Insulation**
Cavity Wall, Soffit, Roof Fiber (Glass or Mineral)

**Acoustic Insulation**
Specialty function

**Spray / Blown Insulation**
Cellulose, Foam

**Accessories**
Vapor Retarder
How do we specify Thermal Insulation?

01 81 13 – Sustainable Design Requirements
Product and building certification system performance goals, checklists, scorecards and forms

07 21 00 – Thermal Insulation

07 5X 00 – Roofing
Board and tapered insulation systems part of a single-ply or built-up roofing system

09 21 16 – Gypsum Board Assemblies
Interior partition insulation

See also:
Division 22 & 23 piping, ductwork & equipment, Metal decking acoustical systems, Structural topping slab/radiant systems, Firestopping systems, EIFS, SIPS, ICFs, Sheathing, ACM/MCM Panels, Dampproofing & Waterproofing protection systems
Chemical Regulation

Hierarchy of Controls

- Elimination: Physically remove the hazard
- Substitution: Replace the hazard
- Engineering Controls: Isolate people from the hazard
- Administrative Controls: Change the way people work
- PPE: Protect the worker with Personal Protective Equipment

Hazard x Exposure = RISK

Protecting resources
Designing for optimized solutions versus remediation
Material Impacts

**General tools** for ingredient disclosure and chemicals of concern

Healthy Building Network (HBN) HomeFree insulation product site
Quartz Project site
Perkins+Will Transparency site
Parsons Healthy Materials Lab insulation guide
BuildingGreen Guide to Insulation

More?!
BuildingGreen Designer Pages, LEEDUser
Healthy Building Network (HBN), Data Commons, Pharos Project
Green Science Policy Institute, Six Classes

<table>
<thead>
<tr>
<th>Insulation Type</th>
<th>R-value Per Inch*</th>
<th>Estimated Installed Cost Per ft² for R-19**</th>
<th>Vapor Permeability†</th>
<th>Air Barrier‡</th>
<th>Environmental Notes (see below for legend)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low end</td>
<td>High end</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIBER, CELLULOSIC, AND GRANULAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral wool</td>
<td>3.3</td>
<td>3.3</td>
<td>Class III: Semi-Permeable</td>
<td>Not an air barrier</td>
<td>Choose low-emitting products</td>
</tr>
<tr>
<td></td>
<td>$1.44</td>
<td>$2.10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| RIGID BOARDSTOCK |                   |                                            |                     |              |                                          |
| Polyisocyanurate | 6-6.5             | $3.20                                      | Class II: Semi-Permeable | Air barrier material | High global warming potential for urethane-core SIPs | Chlorinated flame retardant (otherwise fairly inert) | Toxic manufacturing process | $3.65 |
Avoid formaldehyde-based binders
Formaldehyde is a potent carcinogen and respiratory hazard, even at low levels. Fiberglass and mineral wool insulations have traditionally used these binders, but there now are often formaldehyde-free options.

Check the type and source of recycled content
Fiberglass insulation often includes a high amount of recycled content (known as glass cullet), which comes mainly from recycled bottles. However, some glass cullet comes from recycled cathode ray tubes (CRTs), which release large amounts of lead into the environment during recycling. Look for fiberglass insulation products containing 60% or more post-consumer recycled content.

Avoid foam insulation
Foamed products like polystyrene and spray polyurethane foam use blowing agents that are greenhouse gases. These gases contribute to global warming, and detract from these insulations’ positive effects on climate change by saving energy. Foam insulation can also contains highly toxic flame retardants.

Insulation Hazard Spectrum

<table>
<thead>
<tr>
<th>Insulation Type</th>
<th>Hazard Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cork</td>
<td>Low</td>
</tr>
<tr>
<td>Blown-In Fiber Glass (Loose Fill, Dense Pack, and Spray-Applied)</td>
<td>Low</td>
</tr>
<tr>
<td>Kraft-Faced and Unfaced Fiber Glass Batts</td>
<td>Low</td>
</tr>
<tr>
<td>Unfaced Cellulose/Cotton Batts</td>
<td>Low</td>
</tr>
<tr>
<td>Blown-In Cellulose (Loose Fill, Dense Pack, and Wet-Blown)</td>
<td>Low</td>
</tr>
<tr>
<td>PSK or FSK-Faced Fiber Glass Batts or Blankets</td>
<td>Low</td>
</tr>
<tr>
<td>Mineral Fiber Batts and Boards</td>
<td>Low</td>
</tr>
<tr>
<td>Fiber Glass Board (Duct Insulation)</td>
<td>Low</td>
</tr>
<tr>
<td>Polysicyanurate</td>
<td>High</td>
</tr>
<tr>
<td>Expanded Polystyrene (EPS)</td>
<td>High</td>
</tr>
<tr>
<td>Extruded Polystyrene (XPS)</td>
<td>High</td>
</tr>
<tr>
<td>Spray Foam Insulation (SPF)</td>
<td>High</td>
</tr>
</tbody>
</table>
Perkins+Will – Transparency site

**Precautionary List**
Browse substances of concern by project type, product type, CSI specifications, and hazards

**Flame Retardants**
CASRN: Multiple

**Overview + Health**
There are three general categories of flame retardant substances: halogenated, organophosphate, and mineral/other. Of highest concern are the halogenated type, because they are well documented as toxic, persistent, and/or bioaccumulative. The organophosphate group is somewhat less persistent and somewhat less bioaccumulative, and is sometimes touted as “safer” than the halogenated class; however, this type also has far less health data available. The third group, mineral/other, is the broadest grouping, and many in this group are of lowest concern—but some still are Benchmark 1 (for example, antimony trioxide), so for now best practice is to check each flame retardant chemical for its individual hazards.

**GreenScreen Score**
- List Translator GT-4 Likely Benchmark 1

**GSPI Six Classes of Chemicals of Concern**
- Flame Retardants

**Pathways of Exposure**
- Biomonitoring studies have found flame retardants in the blood and body tissues of nearly all Americans tested, with the highest levels in young children. Diet is thought to be a secondary source of exposure in most cases. The flame retardants emitted from factories, washed down drains, or leached from landfills can accumulate in plants and animals that ultimately become our food.
- Flame retardant chemicals are being found in all environmental matrices examined including air, water, soil, sediment, and sewage sludge.
Urea phenol-formaldehyde can release formaldehyde over time (a carcinogen and asthmagen).
Thermafiber® UltraBatt® FF
Formaldehyde-Free
Mineral Wool Insulation

Product Data Sheet

Description
Thermafiber® UltraBatt® Formaldehyde-Free insulation batts are designed to provide excellent thermal insulation, fire resistance and mold control in residential and light commercial construction. UltraBatt® FF is more dense than traditional batts or rolls and is quick and easy to install. The new formaldehyde-free Thermafiber® light density products are especially appropriate for applications committed to indoor air quality. Thermafiber® UltraBatt® insulation FF is non-combustible, non-corrosive, non-telecorroding, and mold resistant.

Standards, Codes Compliance

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASHRAE 110</td>
<td>Class F Rated Insulation</td>
</tr>
<tr>
<td>ASTM E665</td>
<td>Non-Corrosive</td>
</tr>
<tr>
<td>ASTM E116</td>
<td>Non-combustible as defined per NFPA Standard 214</td>
</tr>
<tr>
<td>ASTM 138</td>
<td>Pass Special’s Smoke Developed</td>
</tr>
<tr>
<td>UL/Standard 600</td>
<td>Smoke Developed</td>
</tr>
<tr>
<td>M1/100</td>
<td>M1 Listed</td>
</tr>
<tr>
<td>E8/100</td>
<td>E8 Listed</td>
</tr>
</tbody>
</table>

Product Options
- Available in standard widths for both wood and steel stud framing

Technical Data

<table>
<thead>
<tr>
<th>R-Value</th>
<th>Size</th>
<th>Pieces/Bag</th>
<th>Qty/Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-10</td>
<td>8&quot; x 12&quot; x 48&quot;</td>
<td>3</td>
<td>22.8</td>
</tr>
<tr>
<td>R-15</td>
<td>8&quot; x 12&quot; x 60&quot;</td>
<td>4</td>
<td>29.9</td>
</tr>
<tr>
<td>R-20</td>
<td>8&quot; x 12&quot; x 84&quot;</td>
<td>4</td>
<td>39.0</td>
</tr>
<tr>
<td>R-25</td>
<td>8&quot; x 12&quot; x 120&quot;</td>
<td>3</td>
<td>48.0</td>
</tr>
</tbody>
</table>

Installation
1. Measure & cut
   UltraBatt® insulation is easy to cut with a standard knife for custom fit or ground electrical boxes, pipes, ductwork, wiring, or between non-load-bearing studs and joists.
2. Squeeze & insert
   UltraBatt® insulation is flexible and pliable; simply squeeze the sides to compress the insulation and insert into the desired wall.
3. Release & expand
   Once in place, UltraBatt® insulation naturally expands to fill in the space, creating a snug, custom fit.

Availability

- **R-Value**: R-10, R-15, R-20, R-25, R-30
- **Watt/hour**: 6.2 W/hour
- **EPA Standard**: 50%+ Total

**Note**: The value given is the insulation rating. The higher the value, the better the insulation.
ENGAGE

We are conducting a massive clinical toxicological trial, and our children and our children’s children are the experimental subjects.

-Herbert Needleman & Philip Landrigan
Sustainability is a big word.

The District is designing a new middle school. Join the project team in prioritizing sustainable strategies!

A Net Zero Energy building is highly-efficient and optimized to use only as much energy as it can produce on-site over a given year, producing extra power to share with the grid in the summer, and drawing power from the grid during winter months, where the net annual energy use equals zero.

Resilient Design is about building that are highly resistant, healthy, adaptable and regenerative. It means creating a plan that is adaptable for the future. How we design a building today could have consequences far into the future.

Eco Workshop

Tuesday April 19, 4:30 PM
Lake Ridge Junior High School

Nature refers to the natural qualities of an area, including natural flora and the specific living species that are found in the area. The Northern Lights are a specific example of a natural phenomenon. Many studies have shown that people of all ages and backgrounds benefit from outdoor experiences.

Water is our source of life and vital for our environment. It makes our environment better for everyone. How do we use water responsibly? How do we use water in a way that is healthy and sustainable?

Materials are what the buildings are made of. How do we learn about the structural forms and systems we use? What are the benefits of using particular materials? How do we make sure our materials are healthy?

The District is designing a new middle school. Join the project team in prioritizing sustainable strategies!
Activity 1

What does sustainability mean for you personally?
... architecture doesn’t get the benefit of an extensive period of trial and error, a custom designed building needs to function from day one.

-AIA Committee on the Environment (COTE) Top Ten Toolkit
Waiting for a unicorn?
Materials Transparency

What is our metric for success?
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 21 16</td>
<td>GYPSUM BOARD ASSEMBLIES</td>
</tr>
<tr>
<td>06 21 16</td>
<td>FRAMING, STUD, RUNNER, DEFLECTION TRACK, FIRESTOP TRACK, FLAT STRAP BACKING, CHASE, HAT CHANNELS, SUSPENDED CEILING FRAMING, GRID SUSPENSION, GYP, IMPACT-RATED, MOLD-RESISTANT, WATER-RESISTANT, CEILING BOARD, SHAFTWALL, METAL EDGE BEAD, J-REED, &quot;L&quot;-REED, CONTROL JOINT, TRIM, CEMENTITIOUS BACKING BOARD, JOINT COMPOUND, JOINT TAPE, ADHESIVE, ACOUSTIC SEALANT, CH-STUD, CH-STUD RUNNER, ALUMINUM REVEAL, BASE MOLDING</td>
</tr>
<tr>
<td>HIGH IMPACT GYP BELOW WALL PROTECTION</td>
<td></td>
</tr>
<tr>
<td>FRY REGLET BASE</td>
<td></td>
</tr>
<tr>
<td>METAL FRAMING = EPD</td>
<td></td>
</tr>
<tr>
<td>GYPSUM BOARD = EPD + HPD</td>
<td></td>
</tr>
<tr>
<td>00 30 00</td>
<td>TILING</td>
</tr>
<tr>
<td>00 30 00</td>
<td>TILE, TILING, EPOXY, GROUT, MORTAR BED, THICKSET, THINSET, ADHESIVE, SEALER, SEALANT, TRIM, QUARRY TILE</td>
</tr>
<tr>
<td>QUARRY TILE</td>
<td></td>
</tr>
</tbody>
</table>
| QT-1: DAL TILES, PAVER TILE, COLOR STORM GRAY WITH SMOOTH FACE, 6"X6"
| QT-1B: DAL TILES, PAVER TILE COVE BASE, COLOR STORM GRAY WITH SMOOTH FACE, 6"X6" COVE – COVE CORNER – INSIDE COVE CORNER |
| CERAMIC TILE |
| CT-1: WHITE (MAHOGANY INTERNAL DEFINITION) |
| MIRROCOLOR: PENTAL SURFACES, BITECH WALL TILE, SOFT 6"X6", COLOR WHITE (VERTICAL STACKED BOND INSTALL) (NO BASE AT TILE WALL, RUBBER AT ADJACENT WALL) |
| CT-2 (WALL AND FLOOR): OLIVE |
| MIRROCOLOR: DALE TILE, KEYSTONE COLLECTION, 2"X2" WALL – FLOOR – COVED BASE, COLOR CYPRESS (COORDINATE COVE BASE AT ALTERNATE) |
| CT-3 (WALL AND FLOOR): YELLOW |
| MIRROCOLOR: DALE TILE, KEYSTONE COLLECTION, 2"X2" WALL – FLOOR – COVED BASE, COLOR MOON BEAM (COORDINATE COVE BASE AT ALTERNATE) |
| CT-4 (WALL AND FLOOR): TEAL |
| MIRROCOLOR: DALE TILE, KEYSTONE COLLECTION, 2"X2" WALL – FLOOR – COVED BASE, COLOR CORNSILK (COORDINATE COVE BASE AT ALTERNATE) |
| PORCELAIN TILE, MORTAR, GROUT = EPD + HPD |
| 00 51 00 | ACOUSTICAL CEILINGS |
| ACOUSTICAL CEILING PANEL, SUSPENSION SYSTEM |
| MATERIAL: MINERAL FIBER |
| NRC: CAC RATING |
| 01 ACT-1: 2x4x8 ARMSTRONG OPTIMA PLANT BASED #3153P (NRC 95) OR USG HALCYON CLIMAPLUS (NRC 95) FIBERGLASS, SQUARE EDGE PROFILE (89241) ARMSTRONG PRELUDE 25% EXPOSED TEE GRID SYSTEM |
| ACT-2 (KITCHEN): 2x4x8 ARMSTRONG OPTIMA HEALTH ZONE PLANT BASED XXX CERTAINTIED ECOPHON HYGIENE ADVANCE A (NRC 95) BEST) WITH ARMSTRONG PRELUDE 15/16" EXPOSED TEE GRID SYSTEM |
| GRID TYPE: SEE ABOVE |
| ACCESSORIES: DRYWALL TO ACOUSTICAL CEILING TRANSITION MOLDINGS |
| TRIMS AND TRANSITIONS |
| PROVIDE STEPPED AXIOM TRANSITIONS WHERE ACT CEILING TRANSITIONS TO GYPSBOARD CEILING AND THERE IS A VARIATION IN HEIGHT, REFER TO RCP FOR HEIGHTS. EXAMPLE: TYPICAL Transition OF 7" WOULD UTILIZE MODEL AXTR700STR |
| PROVIDE FLUSH, SHADOW AXIOM TRANSITIONS WHERE ACT CEILING TRANSITIONS TO GYPSBOARD CEILING AND THERE IS NO CHANGE IN HEIGHT. MODEL AXTR7507STR |
| HOLD DOWN CLIPS |
| ACT TILES, GRID = EPD + HPD |
Building Product Disclosure Data
Environmental Product Declaration (EPD) & Material Ingredient Disclosures
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Suspended metal grid ceiling system.
B. Acoustical units (ACT-1, ACT-2).

1.5 SUBMITTALS
A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate grid layout and related dimensioning and mechanical and electrical items installed in the ceiling.
C. Product Data: Provide data on suspension system components and acoustical units.

D. Building Product Disclosure Data: For each product listed, submit all current, applicable (but not less than one) declaration and disclosure types.
   1. Product:
      a. Acoustical Tile
      b. Suspension System
   2. Environmental Product Declaration (EPD) Type:
      a. Product specific Life Cycle Analysis (LCA) conforming to ISO 14044 with at least a cradle to gate scope.
      b. Industry-wide (generic) EPD with third-party certification (Type III), manufacturer is a recognized participant
      c. Product Specific Type III EPD
      d. Other USGBC approved programs
   3. Material Ingredient Disclosure Type:
      b. ILFI Declare Label: www.living-future.org/declare
      c. Cradle to Cradle (C2C) Certified: www.c2ccertified.org
      f. Other USGBC approved programs
Putty pads and insulation substitution request form added to front of package

Building Product Disclosure Data

The response
Batt Insulation EPD

UL Environment
ISO 14025
PCR Building Envelope Insulation
Functional unit = 1 m2 (R-5.68)
Cradle to Grave
60 year LCA
Scaling factor to other R-values

<table>
<thead>
<tr>
<th>Type III product specific EPD</th>
<th>Units</th>
<th>TR/SM</th>
<th>R-13 scale (x 3.05)</th>
<th>UL</th>
<th>R-13 scale (x 3.07)</th>
<th>Delta</th>
<th>Scale</th>
<th>Env Delta</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Potential</td>
<td>kg CO2 eq</td>
<td>6.65E-01</td>
<td>2.03E+00</td>
<td>6.18E-01</td>
<td>1.90E+00</td>
<td>-7.61</td>
<td>-6.90</td>
<td>-3.68330</td>
<td>kg CO2 eq</td>
</tr>
<tr>
<td>Acidification</td>
<td>kg mol H+ eq</td>
<td>1.66E-01</td>
<td>5.06E-01</td>
<td>2.37E-01</td>
<td>7.28E-01</td>
<td>29.96</td>
<td>30.41</td>
<td>-6.22244</td>
<td>kg mol H+ eq</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>kg N eq</td>
<td>2.16E-04</td>
<td>6.59E-04</td>
<td>3.82E-04</td>
<td>1.17E-03</td>
<td>43.46</td>
<td>45.82</td>
<td>-14.45</td>
<td>kg N eq</td>
</tr>
<tr>
<td>Smog Creation</td>
<td>kg O3 eq</td>
<td>2.50E-02</td>
<td>7.63E-02</td>
<td>3.81E-02</td>
<td>1.17E-01</td>
<td>34.38</td>
<td>34.81</td>
<td>-1.14492</td>
<td>kg O3 eq</td>
</tr>
<tr>
<td>Ozone Depletion</td>
<td>kg CFC-11 eq</td>
<td>1.37E-10</td>
<td>4.18E-10</td>
<td>1.70E-08</td>
<td>5.22E-08</td>
<td>99.19</td>
<td>99.20</td>
<td>0.00</td>
<td>kg CFC-11 eq</td>
</tr>
<tr>
<td>Respiratory Effects</td>
<td>kg PM2.5 eq</td>
<td>3.59E-01</td>
<td>1.09E+00</td>
<td>3.95E-01</td>
<td>1.22E+00</td>
<td>9.80</td>
<td>10.39</td>
<td>-3.56858</td>
<td>kg</td>
</tr>
<tr>
<td>Waste to Landfill</td>
<td>kg</td>
<td>1.23E+00</td>
<td>3.75E+00</td>
<td>4.76E+00</td>
<td>1.46E+01</td>
<td>74.16</td>
<td>74.33</td>
<td>-305,419.61</td>
<td>L</td>
</tr>
<tr>
<td>Metered Water</td>
<td>L</td>
<td>1.16E+01</td>
<td>3.54E+01</td>
<td>9.92E+00</td>
<td>3.05E+01</td>
<td>-16.94</td>
<td>-16.17</td>
<td>-138,502.71</td>
<td>M eq</td>
</tr>
</tbody>
</table>

Best in category count: 6
Worst in category count: 2

ELC exterior opaque wall area SF: 302.670
Convert to sq meters: 28,119

https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
https://www.translatorscale.com/unit-converter/en/energy/3-1/

Equivalency Results

The sum of the greenhouse gas emissions you entered above is of Carbon Dioxide Equivalent. This is equivalent to:

- 3,683.30 kg CO2 eq

More Questions
Defining Metrics for Success
I am only one, **but I am one**.
I cannot do everything, but I can do something.
And I will not let what I cannot do interfere with what I can do.

-Edward Everett Hale
Build a school that does not contain lead, asbestos, volatile organic compounds (VOC’s), carcinogens, asthmagens, bisphenols, phthalates, halogenated flame retardants, formaldehyde, highly fluorinated chemicals (PFAS), antimicrobials, polyvinyl chloride (PVC).
Kaiser Permanente Environmentally Preferable Purchasing (EPP) Standard

Summary: Products must meet all eleven (11) of the EPP Chemicals of Concern criteria

#2 #5 #7 #3 #9 #11

- Bisphenols
- Phthalates
- Halogenated flame retardants
- Highly fluorinated chemicals (PFAS)
- Antimicrobials
- Polyvinyl chloride (PVC)

Moving the market
Purchasing Standards & Chemical Policies
Athletic Wall Pads
halogenated flame retardants
perfluorochemical stain repellents (PFAS)
anti-microbial additives
vinyl
polyurethane / isocyanates
phenol & urea formaldehyde
FF&E Area Rugs
- halogenated flame retardants
- perfluorochemical stain repellents (PFAS)
- anti-microbial additives
- polyvinyl chloride (PVC)
- polyurethane / isocyanates
- coal fly ash / heavy metals
- styrene butadiene latex / rubber
Takeaways

1. We have the **tools** available now, for an honest discussion about material health and embodied impacts.

2. It’s **hard!** But it’s getting better.

3. Start small. Or start big. **Start.**

4. Find friends.

5. Leverage the hard work of the innovators and early adopters.

6. **Bake in** the material research into your design / construction process.

7. Cultivate your **why story.** Share it freely.
Takeaways

1. We have the tools available now, for an honest discussion about material health and embodied impacts.

2. It’s hard! But it’s getting better.


4. Find friends.

5. Leverage the hard work of the innovators and early adopters.

6. Bake in the material research into your design / construction process.


8. Go find your unicorn, they do exist!