Sustainable Exhibition Design & Construction

Toolkit

v6 Sep 2024

About the Museum Exhibition Materials Pledge

In our exhibit design work, we are committed to using the latest sustainable design practices and to assisting the Museum community improve their sustainability goals. The Museum Exhibition Materials Pledge is an invitation to museums and museum exhibition designers to continue their thoughtful conversations about the definition of sustainability for your institutions, using the latest research in building science in selecting exhibition materials. Much of the language from the letter comes from 2019 Materials Pledge supported by the American Institute of Architects (AIA). We hope that defining "sustainability" for you and for your institution can lead to more specific actions. Signing the pledge is your opportunity to make a public statement that you are committed to preferring sustainable products and to engaging in an ongoing dialogue with manufacturers to help them improve the transparency and the sustainability of their products.

You can sign the pledge at the mindful MATERIALS website:
https://www.mindfulmaterials.com/museum-materials-pledge

MxMP
Museum Exhibition Materials Pledge

About the Sustainable Exhibition & Design Toolkit

Once you have signed the pledge, what are the next steps? The toolkit that follows the pledge will help you to transform your pledge into specific actions that will reduce negative impacts to our climate and to our society. The list of actions in the toolkit may seem overwhelming at first, but it is meant to be an aspirational guide. Select the parts of it that will help your institution progress.

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Don't Worry about "Perfect." Work towards "Better."

Few museums have the resources to follow all of these guidelines. Don't get discouraged or overwhelmed. Start with low-hanging fruit. Learn more with each project and make each project better than the last. These resources are designed to help you define and improve the sustainability of your exhibitions in the ways that are most important to your community and your institution.

The Museum Exhibition Materials Pledge authors thank the American Institute of Architects, the U.S. Green Building Council, and the International Living Future Institute for their leadership on these issues.

AIA

U.S. GREEN BUILDING COUNCIL USGBC

INTERNATIONAL LIVING FUTURE INSTITUTE

Museum Exhibition Materials Pledge

MxMP
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To interior finish and graphic substrate manufacturers:

As members of the museum exhibition community, and inspired by the AIA (American Institute of Architects) Materials Pledge of 2019 and the Lighting Advocacy Letter of 2021, we unite as museum exhibition designers, fabricators, and installers to ask manufactures to continue to raise their standards of transparency while providing long-lasting, high-quality materials that positively impact all people.

As museum exhibit designers, fabricators, and installers, we join with our colleagues who have signed the 2019 AIA Materials Pledge, and we also pledge to:

- support **human health** by preferring products that support and foster life throughout their life-cycles and seek to eliminate the use of hazardous substances.
- support **social health & equity** by preferring products from manufacturers that secure human rights in their own operations and in their supply chains, positively impacting their workers and the communities where they operate.
- support **ecosystem health** by preferring products that support and regenerate the natural air, water, and biological cycles of life through thoughtful supply chain management and restorative company practices.
- support **climate health** by preferring products that reduce carbon emissions and ultimately sequester more carbon than emitted.
- support a **circular economy** by reusing and improving buildings and by designing for resiliency, adaptability, disassembly, and reuse, aspiring to a zero-waste goal for global construction activities.

To address these concerns and to meet our goals of transforming the industry, we commit to continuously updating our design libraries and specifications. We commit to sharing best practices, educational resources, and preferred products with our museum exhibition community. We further commit to giving priority to products and manufacturers with a commitment to:

- Provide publicly available material ingredient disclosure information.
- Provide publicly available environmental impact disclosure information.
- Provide publicly available Design for Freedom supplier questionnaires or similar supply chain disclosure information.
- Do not stop at material transparency but strive for optimization.

To achieve this goal, we must work together as museum leadership, museum boards, exhibit directors, curators, exhibit designers, graphic designers, lighting designers, audiovisual designers, audiovisual specifiers and installers, building product manufacturers, graphic print houses, exhibit fabricators and exhibit installers to build awareness, share knowledge, drive demand, and deliver solutions. We ask you, as responsible product manufacturers, for your commitment to work towards market transformation in the museum exhibition world. To accelerate this mission and to leverage cross-industry insight and expertise, we seek your partnership in advancing this conversation at upcoming industry annual meetings, conferences and trade shows.

We value our relationship with each of you and we understand that the change we seek will not be accomplished overnight. Please join us in continued dialogue and collaboration as we learn from each other and improve the best practices of museum exhibitions.

Sincerely,

MUSEUM EXHIBITION MATERIALS PLEDGE SIGNATORIES
(see *museumMATERIALS website* for up-to-date signatories)

Project Timeline

Project Kickoff

- Start building design team awareness of different sustainable priorities.
- Hold a team kickoff meeting where sustainability goals are shared and established.
- Involve community partners.

Photo by Braden Collum on Unsplash

Concept/Schematic Design

- Remind design team of sustainability goals and priorities.
- Research salvage and reuse opportunities. Can salvaged materials be sourced?
- Begin transparency research for large-volume finish and millwork materials.
- Have budget conversations. Where can sustainability save money?
- Design documents should include narrative language outlining requirements.

Design Development

- Start conversations with product representatives.
- Focus on design for deconstruction using clips and screws, not nails and glues.
- How can salvaged materials help tell the story of the exhibit?
- Design documents should include specific requirements for transparency, absence of specific toxic materials, sustainably sourced material ingredients, and low carbon footprint materials according to sustainability goals.
- Ensure materials meet any archival and collections requirements.
- Meet with community partners to check environmental justice assumptions.

Contract/Bid Documents

- Ensure specification language and in the contract documents or bid documents, outline all sustainability goals with specific requirements.

Bid/Construction Administration

- Hold pre-bid and kickoff meeting to review and clarify expectations with the client and the construction team.
- Review submitted transparency documentation and third-party verification documentation as requested in bid/contract documents.
- Review any suggested substitutions to confirm that they comply with sustainability goals and archival requirements.

Design for Human Health

Design for human health by avoiding toxic chemicals in exhibit flooring, wallpaper, graphic substrates, woods, fabrics, adhesives, paints and carpeting. Prioritize materials touched by visitors, especially by children.

Photo by Sigmund on Unsplash

Low Emissions

- Develop a plan to use materials that have been tested according to regulations from *CPHD (California's Department of Public Health)'s emissions testing v1.2*. Look for Greenguard Gold, GRI Green Label Plus, Declare label, or Cradle to Cradle Certification.
- Prioritize materials and coatings that have zero VOC content.
- Install onsite air-quality monitoring to automate increased outdoor air ventilation, or install an inexpensive device from a company such as Awair, PurpleAir, or Attune and open a window when interior air quality is bad.

No PVC (Polyvinyl chloride)

- Choose flooring materials with no PVC.
- Choose wall murals with no PVC.
- Choose graphic substrates with no PVC.

Avoid Red List Ingredients

- Avoid materials from the *International Living Future Institute (ILFI) Red List*. These "worst in class" materials, chemicals and elements are known to pose serious risks to human health.

Material Transparency

- Choose materials with *Health Product Declarations (HPDs)* or other methods to demonstrate the chemical inventory of the product to at least 1000 ppm (0.1%).
- Select materials with *Declare Labels*.

RoHS Compliant Lighting and Audiovisual Equipment

- *Restriction of Certain Hazardous Substances (RoHS)* is used for electrical and electronic equipment. It limits the use of materials such as lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE).

Design for Social Health and Equity

Ensure that the entire project team truly embraces *Diversity, Equity, Accessibility and Inclusion (DEAI) goals* by setting them early in the planning process. A design team lacking in racial and ethnic diversity will be less able to see blind spots in exhibit content and exhibit sustainability goals. Reach out to community partners and DEAI specialists to review the design at key milestones. This will make the exhibition richer and more inclusive of all communities.

Ethnic Diversity

- Document goals to increase ethnic and racial diversity among the exhibit project team. Set goals to reflect regional communities.
- Set goals to match regional ethnic and racial diversity on the museum board and in leadership.
- Hire minority-owned businesses and design/ fabrication partners.

Photo by Yasin Yusuf on Unsplash

Gender Diversity

- Document goals of the project to increase gender and sexual identity diversity on the design team and with outside consultants, artists and fabricators.
- US national statistics for 2022 show 51% women and 49% men[1] with 7% self-identifying as part of the LGBTQ+ community[2] (Lesbian, Gay, Transgender, Bisexual, plus other gender and sexual identities). How does your team compare?

Community Outreach

- Identify and engage traditionally underrepresented community partners in the exhibit development and design process. When possible, hire these members as part of the design team.
- Establish regular community review points and workshops. Ensure that community members drive decision-making by planning for a realistic project timeline and staffing resources that fully engage traditionally underrepresented groups.

1 *Total Population in the United States by Gender from 2010 to 2025*, statista.com, (collected 12 May 2022)

2 Jones, Jeffery M., *LGBT Identification in U.S. Ticks Up to 7.1%*, news.gallup.com, 17 February 2022, (collected 12 May 2022)

Living Wage

- Use the *MIT (Massachusetts Institute of Technology) Living Wage Calculator* for your location in the US or other regional living wage calculators such as in *Ontario* or *British Columbia*. Talk with HR and museum boards and commit to paying entry-level employees, on salary and on limited contracts, at minimum, a living wage for a two-working-adult and two-child family unit.

Design for Freedom

- Research high-risk product types to ensure exhibit construction is 100% free from forced or child labor.
- Develop a plan to ask suppliers and manufacturers about and avoid products with forced or child labor in the supply chain. Ensure all workers in the supply chain receive a fair wage. These materials are especially high-risk: Glass, Gypsum, Polysilicone (used in solar panels), Rubber, Silica, Stone, Textiles, and Timber.
- Ask suppliers of high-risk products to fill out Design for Freedom Supplier Questionnaires[3] to further examine their supply chains.

Design for Neurological Diversity

- Consult with an autism spectrum specialist to discuss how exhibit elements can better accommodate neurologically diverse visitors.
- Design exhibits with clearly marked places of refuge throughout the visitor experience path.
- Create methods for visitors to plan full itineraries in advance of their visit by using icons and landmarks. These are most helpful if visitors can see the icons and landmarks visually on their personalized itineraries.

Universal Design

- Ensure that the exhibit complies with all federal ADA (Americans with Disabilities Act) guidelines.
- Consult with a universal design specialist about how the exhibit could go beyond ADA guidelines to improve universal access.

Photo courtesy CambridgeSeven

3 designforfreedom.org

Design for Ecosystem Health

Consider the full life cycle of products and prefer those that mimic or use natural regeneration processes. Which products break down easily and will end their useful lives in the compost bin rather than the landfill? Are there ways that the exhibit can extend outdoors to regenerate natural habitat for local wildlife? Do your corporate sponsors support healthy ecosystems?

Corporate Sustainability Reports and Take-Back Programs

- Look for companies that have Corporate Sustainability Reports (CSRs) and/or Environmental Social Governance (ESG) reporting. The *Global Reporting Initiative (GRI)* is an independent, international organization that sets standards for these reports to ensure that they are more than just green-washing.
- *Extended Producer Responsibility (EPR)* programs, better known as "Take-Back" programs means that the company has established a method to reclaim and recycle their products. This goes beyond the dubious claim of "recyclable." Look for documentation that products are actually being recycled at a high rate. Many commercial carpet and ceiling tile companies have established EPR programs.

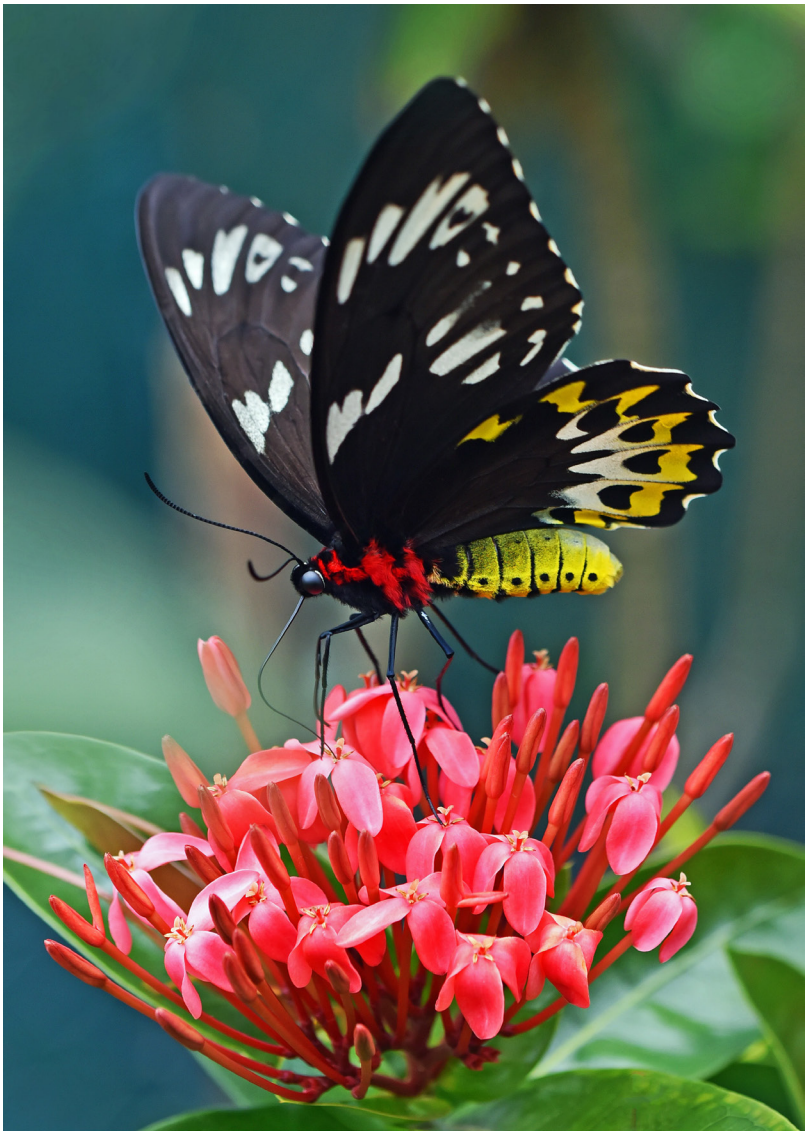

Photo by David Clode on Unsplash

Third Party Certification

- *B Corp* companies are certified by the B Lab to preserve ecosystems and support local communities.
- Benefit Corporations need to show that they put social and environmental values on an equal footing with profits.
- *Just* certification by the International Living Future Institute is a voluntary disclosure tool focusing on transparency surrounding equity,

diversity and employee welfare. It also looks at animal welfare and examines the company's supply chains.

Biobased Materials and Biophilia

- Look for products made with a high degree of natural materials that will eventually breakdown naturally and not end up in landfills.
- Design exhibits using the principles of Terrapin Bright Green's 14 *Patterns of Biophilic Design* to increase the human connection to nature.

[1]

Forest Stewardship Council (FSC) Wood

- Although not perfect, *FSC* wood remains the best standard for ecosystem friendly wood harvesting. Cost premiums are much less than they used to be and FSC certified wood is more available than ever.

Bird Friendly Windows

- If you have large windows in your exhibit hall, consider methods of minimizing reflection of trees, bushes and sky in your windows to reduce bird strikes. Netting, insect screens, blinds, wires, vines, paint, stickers or glass frit are all methods that help indicate to birds that there is a physical barrier present. A 2x4-inch grid will keep most birds safe. Window manufacturers are now making transparent coatings that are nearly invisible to humans, but not to birds.

Photo and Design by Derek Tan, Beaty Biodiversity Research Centre, The University of British Columbia

Traditional Ways of Thinking and Being

- Consult with Native American or First Nation tribal communities to find ways to bring traditional ways of thinking about respecting place, and our natural world into the exhibition. Find ways to make this a reciprocal relationship where the museum can find ways to provide services and bring value to the tribal communities.

1 *https://www.terrapinbrightgreen.com/reports/14-patterns/*

Design for Climate Health

Just as many museums are examining their operational energy use, many building product suppliers are examining the embodied carbon of their materials. Embodied carbon is the total carbon released into the atmosphere as a result of the extraction, manufacture, transportation, sale, installation, use, deconstruction and disposal or reuse of a product. Plan early to design for overall climate health by using Environmental Product Declarations (EPDs) to determine the Global Warming Potential (GWP) of materials as well as setting a cap on the exhibit's total carbon footprint.

Global Warming Potential Transparency with Environmental Product Declarations (EPDs)

- Choose materials with *EPDs* (a carbon "life story" of the product) which conform to ISO 14025 and EN 15804 or ISO 21930.

Low Global Warming Potential (GWP) Materials

- Use tools like Sustainable Mind's transparency catalog[1] or Carbon Cure's Embodied Carbon in Construction Calculator[2] to find products that are low in embodied carbon compared to their competitors.

Photo by Dan Meyers on Unsplash

Reduce Transportation Carbon Footprint

- Use virtual tools for workshops and reviews in order to limit air travel during the exhibit planning process, especially for outside consultants.
- Use local artists, illustrators and craftspeople to fabricate exhibits.
- If travel is necessary, offset with purchased carbon credits.

1 *transparencycatalog.com*
2 *buildingtransparency.org*

Energy Use Reduction

- Early in the exhibit design process, set a shared media & lighting Energy Use Intensity (EUI) not-to-exceed target toward overall power use. Estimate the energy that will be used by exhibit lighting and media and develop a plan to reduce power in both areas. High tech EUI studies could involve computer models and computerized building management systems. A low-tech way of studying EUI is to create a spreadsheet, inventory fixtures and AV hardware, calculate how much wattage each uses and how many hours/per day it will be used.[3]

Lighting

- Choose LED lighting as well as light or motion sensors to shut off or dim lights when not in use.
- Track lighting with Energy Use Intensity (EUI, annual kBtu/square feet), through a spreadsheet or with real-time monitoring.
- Offset exhibit lighting use with renewable energy generation toward a goal of Net Zero.

Photo courtesy CambridgeSeven

Audiovisual (AV)

- Choose motion sensors, or similar technology, to move AV to low power mode when not in use.
- Track AV with Energy Use Intensity (EUI, annual kBtu/square feet), and plan to reduce from business as usual design.
- Offset exhibit AV use with renewable energy generation toward a goal of Net Zero.

Tailor Temperature and Humidity Requirements to Each Object

- Instead of using the strictest temperature humidity requirements on all collection objects, tailor these requirements to each object or exhibit display case. The proper care of objects is essential. Given this, many museums are now adopting the *Bizot Green Protocol* to reduce a museum's overall carbon footprint whenever possible.
- Consider localized, passive methods of controlling humidity and temperature instead of relying on expensive and carbon-intensive whole building solutions.

3 Calculate the annual energy usage per square foot. EnergyStar publishes *average EUI baselines*. As of 2023, the baseline EUI for museums is 56.2 kBtu/ft^2.

Design for the Circular Economy

Through a combination of salvage and recycling, develop a design plan for reducing, reusing, and recycling exhibit materials including furniture, hardware and substrates.

Design for Deconstruction

- Choose clips and screws instead of nails and glue to attach exhibit materials.
- Plan to document which exhibit features and systems are designed for reuse, and how to easily disassemble them.
- Select some exhibit furniture or graphic panel sizes that make sense for your institution and standardize their sizes. Some degree of standardization will make it easier to reuse exhibit furniture and graphic panel substrates in new exhibitions.

Photo courtesy of CambridgeSeven

Salvaged Material Use

- Establish resources with theaters or film boards in your community to harvest plywood and other gently used construction materials.
- As a start, use All for Reuse's opensource map of salvage opportunities[1].
- Look to current exhibits to find ways to reuse exhibit elements in-house.
- Are there stories that would be made richer and more connected to place by gathering salvaged objects or materials from the community to help tell the story?

Recycled Material Use

- Choose recycled materials for exhibit furniture and features. Recycled material documentation is largely unregulated and based on manufacturer claims.
- Post-consumer recycling is more challenging for producers than pre-consumer, or post-industrial recycling, as it requires work to eliminate contaminates. Preferring post-consumer recycling creates a market for used materials and diverts materials from the landfill. Post-industrial materials are still considered "virgin" materials.

1 allforreuse.org

End-of-Life Plan

- Plan for "Deconstruction" and reuse instead of "Demolition" and sending materials to landfills.
- Determine a goal for a maximum percentage of materials and finishes to be sent to landfill. Work on finding ways to divert materials from the landfill by seeking recycling or reuse homes for most materials.

Places to Buy or Sell/Donate Used Exhibits

- **BARDER.art**[2] — Mostly for art museums. Includes display furniture, cases, vitrines, crates, etc. for free or for sale, with a filter for location.
- **craigslist** — Don't count this out yet. Craigslist's online classified posting is still very popular and could be a way for museums to find local connections to acquire or offload assets.
- **culturenut**[3] — A place for cultural institutions to buy, sell, and exchange idle assets.
- **facebook** — Try facebook groups for Historic House and Small Museums Affinity Groups (SEMC) or for local or state museum associations.
- **The Freecycle Network**[4] — Free online network dedicated to keeping good stuff out of landfills. It will connect you with people who are gifting and lending items in your own town.

2 barder.art
3 https://culturenut.com/
4 https://www.freecycle.org/

Product Specific Guidelines

Here is a list of third-party standards that you can trust when looking to select specific healthy and socially just interior finish products.

Low Emitting, High Performance Paints

- *California Department of Public Health (CDPH) Standard Method Emissions Evaluation*
- Less than 50 g/l of (Volatile Organic Compound) VOC content measured after tinting
- *MPI X-Green Performance Standard Certification* for high performance and low VOC paints.
- Green Seal Certified
- Interior lime and mineral-based paints are becoming more mainstream. They are considered more sustainable and more durable than paints containing high amounts of petroleum based plastics and chemicals. Look at brands like Alkemis, Graphenstone, Keim, or Romabio.

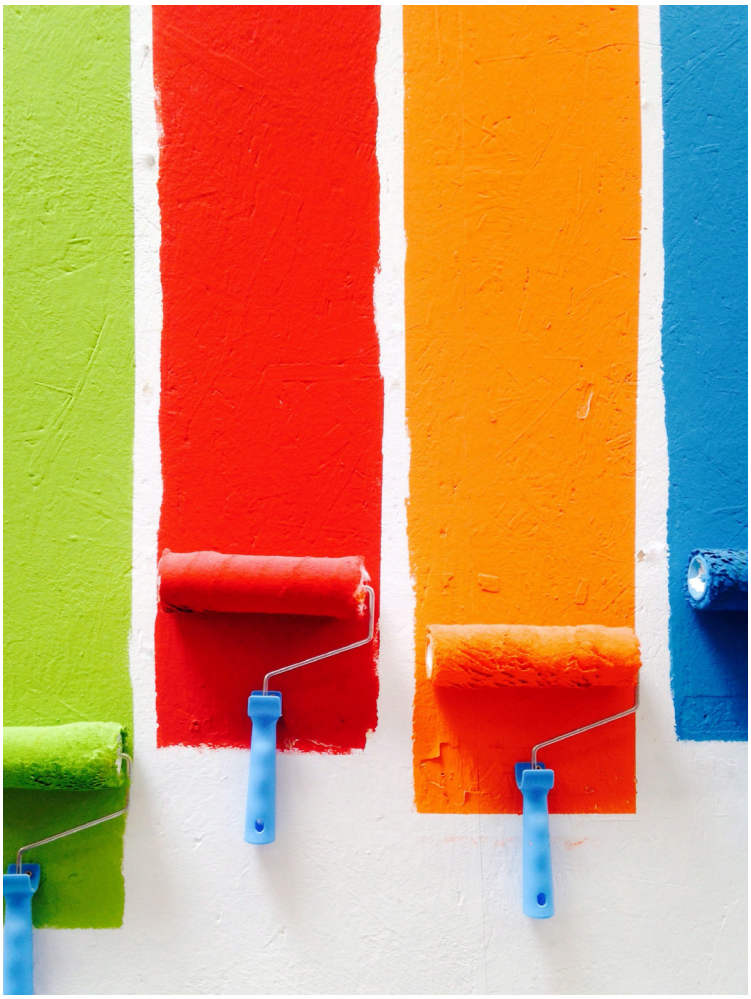

Photo by David Pisnoy on UnSplash

Interior Stains and Finishes

- CDPH Standard Method Emissions Evaluation
- Below California's South Coast Air Quality management District (SCAQMD) limits for VOC Content
- Greenguard Gold

Metal Finish

- High Performance Latex, use the same CDPH Standard Method Emissions Evaluation and VOC content standards as above.
- Powder coating can be made from polyester, acrylic, polyurethane, or hybrids. Powder coating is much more durable than latex paint, but more difficult to touch up. It can use less energy to apply than liquid coatings and minimizes waste. Avoid epoxies and fluoropolymers.

Medium Density Fiberboard (MDF), Plywood, and Particleboard

- Meet *California Air Resources Board (CARB)* ultra-low-emitting formaldehyde (ULEF) or no-added-formaldehyde (NAF) emissions requirements[1]
- *Forest Stewardship Council (FSC)* certified or recovered waste fiber

Photo courtesy of CambridgeSeven

Countertops

- Natural Stone
  - ANSI/NSC 373 and/or C2C Silver or higher
  - Avoid sealers
- Engineered Stone/ Quartz
  - C2C Silver or higher
  - Declare Red List Free
  - Low Emissions
- Natural Wood
  - Local species[2]

Photo courtesy of CambridgeSeven

Low Emitting and Low Life Cycle Impact Modular Carpet

- Certified to CRI Green Label Plus
- Certified to *C2C v3.1 Silver* or higher, NSF 140 Platinum or Living Product Challenge

Resilient Flooring

- Linoleum or Natural Rubber Flooring[3]
- *Greenguard Gold* Certification
- C2C Silver or Higher

1 Wood products are not appropriate for collection storage spaces. See *NARA 1571S, Architectural and Design Standards for Presidential Libraries*, July 2018 and *NARA 1571, Archival Storage Standards,* updated January 17, 2023

2 Wood products are not appropriate for collection storage spaces. Wood should not be used in exhibit display cases unless mitigation steps are taken. Ibid.

3 Natural rubber flooring products may not be appropriate for archival spaces because they often contains sulfur. Ibid.

Polished Concrete Flooring

- Often cheaper and lower maintenance than any other flooring choice
- Densifying the surface increases durability
- Polished floors can be dyed many colors
- Pay attention to acoustics
- Reduce material use by polishing new or existing concrete slabs

Wood Flooring

- Pre-finished, bamboo or FSC solid wood floors, or salvaged wood that can be installed without an adhesive are ideal.
- Wood should not be used in areas with sensitive collections.
- Look for *CPHD Emissions Testing* and low VOC content coatings.

Tile Flooring

- Ceramic and porcelain tiles made in North America likely have eliminated toxic glazes and are inherently non-emitting. Tiles made abroad may contain lead in glazes.
- Avoid epoxies in grout.
- Avoid Cathode Ray Tube filler material.
- Prefer products with a Health Product Declarations (HPD).

Photo courtesy of CambridgeSeven

Textiles

- *facts* certified - Gold or Platinum, *C2C Gold*, *SCS Indoor Advantage Gold*
- Natural Fibers – *GOTS* or *Oeko Tex 100*
- Avoid antimicrobials
- Avoid Per- and Polyfluoroalkyl Substances (PFAS)
- Avoid stain treatments, flame retardants
- Avoid PVC
- Avoid mixed natural and synthetic fibers. Purely natural or purely synthetic fibers are easier to recycle.
- Recent studies show that washing synthetic fabrics is a major contributor to microplastics in the ocean.

PVC Free Alternatives to Vinyl Wall Murals

- Monadnock Envi Commercial Wallpaper
- Moss SustainaWallcovering
- Acrovyn By Design wall protection panels (durable, PVC-free, seams every 4ft.)
- 3M Envision Print Wrap Films – PVC free
- Moss SustainaPSA
- Digitally printed fabric such as Moss SustainaTex Ocean
- High Pressure Laminate or phenolic (FSC available through Wilsonart)

Alternatives to PVC Substrates for Graphic Panels

- BioBoard
- Eco-fi Fabric
- Moss SustainaPaper Board
- Moss SustainaPlexi
- PVC-free options by Cooley Group in Rhode Island
- Plyboo or ApplePly panels

Alternatives to Vinyl Lettering

- Direct-to-substrate prints on plywood panels, mounted to the wall
- Hand-painted letters
- Cardboard or chipboard stencils
- *Wheatpaste* paper letters or posters
- Dry transfer lettering

Sustainable Material Resources

BuildingGreen.com (subscription) excellent product guides
Homefree.healthybuilding.net
Products.ecomedes.com
origin.build/#/materials
Transparencycatalog.com
mindfulMATERIALS.com
Declare.living-future.org
Healthymaterialslab.org
Sixclasses.org
EC3 website for baseline embodied carbon for interior finishes
STiCH.culturalheritage.org - Sustainability Tools in Cultural Heritage - Carbon Calculator

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