



Sustainable Materials

Case Studies

Refer to the end of this section of the manual for case studies on the [Regional Waste Management District Office Building](#) and [the EPA's Regional Headquarters in Philadelphia](#).

Misperceptions

There are a few key misperceptions that may hinder the use of sustainable products. These include:

1. The perception that sustainable products are lesser in quality than standard products. Sustainable products should be required to meet the same performance requirements as any other product. It is true that some products may have had problems associated with them, such as difficulty with installation, or durability, but this rarely is due to the sustainable characteristics of a product.
2. The perception that sustainable products “look different” than standard materials. Certainly some products may look like they are environmentally friendly (such as some agricultural products, for example). However, many sustainable products would not be noticeable to a building owner or building occupant. These include such products as refurbished furniture partitions, low VOC paints, or recycled content ceiling tiles.
3. The perception that sustainable products always cost more. Some sustainable products do cost more than ‘typical’ products. However, this additional first cost is often offset by increased durability of product, reduced maintenance costs, or other benefits to building occupants such as

enhanced indoor air quality. There are a large number of sustainable products available that do not cost any more than the standard product.

4. The perception that sustainable products are not readily available. Some sustainable products are not available in all locations. A good example is products made from industrial waste or certified wood. However, it is rare that there would be a delay on the delivery of a sustainable product due to delays in the manufacturing process.
5. The perception that a number of sustainable products are proprietary or do not have competitive manufacturers. There are some products that are proprietary, but this is the exception rather than the rule.

Evaluating Materials

Product Life-cycle

Evaluating a material, or comparing two materials to determine if the product(s) is a sound environmental product depends on the evaluation of a material's life cycle, often called the cradle-to-cradle analysis of a material.

This process typically addresses the environmental impacts of:

Resource acquisition. This includes addressing the environmental impacts of extracting the resources necessary to manufacture the product.

Manufacturing. This includes evaluating the environmental impacts of the manufacturing process.



Notes:

Transporting. This includes considering the impacts of transporting the material to the manufacturing or assembly location, as well as transporting the material to the site.

Installation. This includes considering the impact the installation of the product will have on the installer as well as any building occupants.

Impact to Building Occupants. This includes evaluating what impact the product will have on occupants during its use.

Performance. This includes considering how durable the product is, as well as what kind of maintenance requirements the product has.

End of use options. This includes considering if the product can be disassembled, recycled, or reused.

Methods of Product Evaluation

There is not one 'standard' for evaluating the sustainable characteristics of all building materials. There are some tools that can be used, however, when selecting materials, at least in part, due to their sustainable characteristics. They include:

- [Institute of Standards and Technology Building for Economic and Environmental Sustainability \(BEES\).](#) BEES measures the environmental performance of building products by using the environmental life-cycle assessment approach specified in ISO 14000 standards
- [Environmental Resource Guide.](#) This guide presents detailed life-cycle



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information about a number of building products.

- **LEED Material Credits.** The material credit requirements in the LEED Green Building Rating System address some of the key criteria for product selection.
- Environmental Building News simplified criteria, outlined in the article, Building Materials: What Makes a Product Green?

Environmental Building News Criteria

The criteria highlighted in the Environmental Building News called [Materials: What Makes a Product Green?](#) Represent a simplified methodology that can be utilized by anyone attempting to consider the sustainable qualities of building products. This article is reproduced at the end of this section. Note that **information on materials presented in the training** is also included at the end of this section.

The general idea presented in the article is that certain key product criteria can be evaluated to determine how sustainable a product might, or might not, be.

The criteria are as follows:

Products made from Environmentally-Attractive Materials

Specifically:

- Products that reduce material use
- Salvaged products
- Products with post-consumer recycled content
- Products with post-industrial recycled content
- Certified wood products
- Products made from agricultural waste material
- Natural or minimally processed products

California, in fact, has a State Agency Buy Recycled Campaign, requiring that state agencies purchase products that contain recycled materials whenever the following are comparable

- Price
- Quality
- Availability

State agencies must spend a specified minimum on products that have recycled content. The required minimum procurement goal is 50 percent of all the funds the agencies spends in 11 product categories. Construction products include glass products, paint, tire derived products, steel products

Products that are Green Because of What Isn't There

Specifically:

- Alternatives to ozone-depleting substances
- Alternatives to products made from PVC and polycarbonate
- Alternatives to conventional preservative-treated wood that contains toxins
- Alternatives to other components considered hazardous

Products that Reduce Environmental Impacts during Construction, Renovation, or Demolition

Specifically:

- Products that reduce the impacts of new construction
- Tackable carpet
- Products that reduce the impacts of renovation
- Raised flooring
- Products that reduce the impacts of demolition
- Low mercury fluorescent lamps

Products that Reduce Environmental Impacts of Building Operation

Specifically:

- Building components that reduce heating and cooling loads
- Equipment that conserves energy
- Renewable energy and fuel cell equipment
- Fixtures and equipment that conserve water
- Products with exceptional durability or low maintenance requirements
- Products that prevent pollution or reduce waste
- Products that reduce or eliminate pesticide treatments

Notes:

For example, consider the following comparison of the use of a 27 watt compact fluorescent vs. a 100 watt incandescent lamp.

	Fluorescent	Incandescent
Cost of Lamps	\$14.00	\$0.50
Lamp Life	4.5 years	0.5 years
Annual Energy \$	\$5.91	\$21.90
# Lamps Replaced		
in 4.5 years	0	10
Total Cost	\$40.60	\$103.55
Savings Over		
Lamp Life	\$62.95	0

Products that Contribute to a Safe, Healthy Indoor Environment

Specifically:

- Products that don't release significant pollutants into the building
- Products that block development and spread of indoor contaminants
- Products that remove indoor pollutants
- Products that warn occupants of health hazards in the building
- Products that improve light quality

Other Methods of Evaluation

There are also some resources for evaluating specific products. They include:



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Carpet. The [Carpet and Rug Institute's Green Label Indoor Air Quality Test Program](#) indicates that a carpet manufacturer is committed to developing ways to minimize any adverse effects on indoor air quality. A representative sample of the product type is tested by an independent laboratory and meets the established requirements for each program.

Certified Wood. There are certification programs for wood products that come from well-managed forests. They include: and [Forest Stewardship Council](#).

[Seal](#). Green Seal is the independent, nonprofit organization dedicated to protecting the environment by promoting the manufacture and sale of environmentally responsible consumer products. It sets environmental standards and awards a "Green Seal of Approval" to products that cause less harm to the environment than other similar products.

Benefits of Green Materials

There are many benefits to selecting sustainable products, such as

1. Reduced maintenance costs; for example
 - By specifying easy-to-maintain materials
 - By leasing equipment or materials
2. Reduced operational costs; for example
 - By selecting products that result in energy savings
3. Reduced replacement of materials
 - By selecting durable materials
4. Reduced environmental impact; for example

- By reducing unnecessary resource extraction
- By minimizing waste generation

5. Reduced impacts to air quality; for example

- By selecting low-emitting materials
- By using indoor air quality monitors

No Cost Material Solutions

There are many products that may be considered sustainable that would not add anything to a project's cost. They include, for example

- Low VOC sealants, adhesives and paints
- Recycled content ceiling tiles
- Recycled content ceramic tile – Ecocycle by Crossville Ceramics
- Reclaimed nylon in carpet
- Reprocessed or consolidated latex paint

Cost Competitive Sustainable Materials

There are a number of products that are cost competitive with standard products.

Agriboard in lieu of particleboard

Agriboard is a term used for agricultural based products such as wheatboard or strawboard. These products do not contain formaldehyde like most particleboard does, and they are as durable.

Recycled content rubber flooring in lieu of vinyl composition tile

Using recycled content rubber flooring assists in closing the recycling loop as



opposed to using a product with little or no recycled content.

Notes:

Linoleum in lieu of sheet vinyl flooring.

Linoleum is made primarily from renewable resources, such as linseed oil, pine resins, jute, cork, and wood wastes. Specifying linoleum also eliminates specifying a product that uses chlorine in the manufacturing process.

Polyolefin wall coverings in lieu of vinyl wall coverings

Polyolefin wall covering, in contrast with vinyl wall covering, allows the wall to “breathe”; it does not require the use of chlorine in the manufacturing process; and it may be recycled.

TPO Energy Star roofing in lieu of EPDM

Energy Star roofs have high reflectances and can assist in reducing a building’s operating costs by reflecting heat.

“ChipSeal” treatment for improving solar reflectance asphalt paving

Chip seals are applied in a three-part process. The asphalt emulsion binder is first sprayed onto the pavement. This is followed immediately by an application of rock chips. Finally, the rocks are pressed into the asphalt binder using a heavy roller.

Comparing Materials

Following are two examples of how two products might be compared for both environmental and economic criteria.

Polyisocyanurate roofing insulation as alternate to extruded polystyrene insulation.

Pros:



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- No ODS used as blowing agent.
- Reclaimed resins per CPG.
- Available in boardstock, tapered and nailbase.
- Meets UL, FM, ICBO criteria for roofing applications.

Cons:

- Proprietary
- Cannot be used in vertical waterproofing applications.
- Cannot be used in building interiors because of toxicity when burning.

Cost is same as other polyisocyanurates and, depending on market, less than extruded polystyrenes.

i This manual is being developed as part of a ten-point plan to implement the Governor's sustainable building goal as outlined in Executive Order D-16-00 and the report Building Better Buildings: A Blueprint for Sustainable State Facilities (Blueprint). Task 7 of the Blueprint calls for developing sustainable building technical assistance and outreach tools, including a training program for state departments, as well as local government and private sector partners. This manual was developed by DGS, the Sustainable building task force, and CIWMB as one component of the sustainable building training program for state departments. This document will be undergoing constant revision as other deliverables outlined in the Blueprint are completed and technological and process breakthroughs advance the rapidly emerging field of sustainable design.