

ENVIRONMENT: MATERIAL RESOURCES AND WASTE

Material selections can begin at the start of a project. The selections can include site paving and landscape vegetation; structural systems; wall framing; building foundations; mechanical, electrical and plumbing equipment; case work; and room finishes.

Case work and room finishes in particular can affect indoor air quality. They must be chosen to minimize off-gassing properties such as Volatile Organic Compounds (VOCs) that can affect occupant health negatively.

Material choices affect long-term operating costs as well as initial construction costs.

Material selections can be constrained by market forces: the availability of raw material, the time required for material processing and component assembly, and the level of demand in the local market.

Therefore: It is important to consider specific guidelines early in the design as key components in the process.

- 1** *Locally Sourced Materials*
- 2** *Locally Manufactured Component Systems*
- 3** *Rapidly Renewable Materials*
- 4** *Sustainably-Harvested Forest Products*
- 5** *Recycled Content Materials*
- 6** *Recyclable Materials*
- 7** *Glazing Type to Match Façade Orientation*
- 8** *Recycling of Construction Waste*
- 9** *Commissioning of Materials*
- 10** *Material Properties*



An example of recycled materials in a small open air community building in rural Alabama.

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Resources:

Recycle materials to be discarded from existing structure

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=73>

Consider exposing structural materials as finished surfaces

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=81>

Require a waste management plan from the contractor

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=74>

Use wood treated with less-toxic preservatives than CCA or ACZA

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=69>

Use engineered wood products in place of large-dimension timbers

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=85>

Use plastic toilet partitions made from recycled plastic

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=78>

Prefer roofing materials with high levels of recycled content

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=79>

Use salvaged wood for finish carpentry

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=80>

Prefer materials that are sourced and manufactured within the local area

<http://www.buildinggreen.com/menus/entries.cfm?HeadingID=72>

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1 Locally Sourced Materials

What:

Construction materials harvested within a 500-mile radius are conventionally defined as locally sourced.

Why:

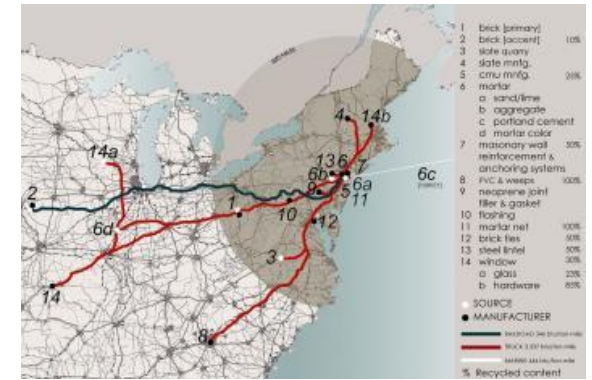
By identifying the available construction materials within the 500-mile radius, it is possible to reduce the embedded transportation costs associated with their extraction and delivery, localize the positive impact on the economy — especially the in-state economy — and guarantee more immediate access to suppliers should a difficulty arise during construction.

Guidelines: NEED

- 1.1 Use *Indiana Hardwoods*
- 1.2 Use *Indiana Limestone*
- 1.3 Use *Indiana Brick*

Guidelines: RETURN ON INVESTMENT

- 1.4 Use *Other Identifiable Indiana Source Materials*



Grey zone indicating the 500-mile radius of material and product sourcing for the Phillip Merrill Center of the Chesapeake Bay Foundation (courtesy of the Smith Group)

ENVIRONMENT: MATERIALS: RESOURCES AND WASTE**2 *Locally Manufactured Systems*****What:**

Building components and systems of any size that are assembled within a 500-mile radius of the project site are considered to be locally manufactured. Whether the source materials or sub-components of the systems come from a great distance, as long as the physical attachment and final assembly occurs within the 500-mile radius, the deliverable components (windows, mechanical air handlers, lighting luminaire) are considered to be locally manufactured.

Why:

The advantage of identifying building components available within the 500-mile radius is to reduce the embedded cost of transportation and resulting environmental impact. Purchasing construction components from within the local economy assures a turnover of those dollars and a resulting local economic leveraging.

Guidelines: NEED

2.1 *Use Indiana-Manufactured Metal Products.*

2.2 *Use Indiana-Manufactured Casework*

2.3 *Use Indiana-Manufactured Door and Window Systems*

Guidelines: RETURN ON INVESTMENT

2.4 *Use Indiana-Manufactured Mechanical, Electrical, and Plumbing Equipment*

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3 *Rapidly Renewable Materials*

What:

Any naturally grown material that has a short life cycle for reaching maturity falls into this category. The most common example cited is bamboo, which can grow significant lengths, yielding multiple harvests within a single calendar year. Selected softwood trees and even grasses or straws that can be used as feedstock for particle board or other cellulose-based product manufacturing also fit this description.

Why:

Rapidly renewable materials offer quick— if not multiple— cycles of harvest during a calendar year and require fewer units of soil amendment, irrigation, or intervening attention to yield a useful crop. The net effect of such crops is to lessen environmental impact for the given product benefit.

Guidelines: NEED

3.1 *Use Indiana Poplar*

Use of locally grown materials supports the statewide economy.

Guidelines: RETURN ON INVESTMENT

3.2 *Use Regionally Grown Bamboo*

Use of regionally grown materials supports the statewide economy.

3.3 *Use Regionally Grown Wheat Board*

Use of regionally grown materials supports the statewide economy.

3.4 *Use Regionally-Grown Straw Board*

Use of regionally grown materials supports the statewide economy.



Example Bamboo flooring.



Example stands of quick-growing Bamboo .



Examples of Sustainable harvested wood strips laminated to create structural members and/or wood veneers.



Example assembly of Micro-Lam Timber Framing.

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4 *Sustainably-Harvested Forest Products*

What:

Any hardwood or softwood forest product that is selectively harvested so as not to damage the remaining stands of timber that have not yet reached maturity is regarded as a sustainably harvested forest product. Moreover, such harvesting techniques assure no damage to the retention of surface water and forest litter and therefore minimize any runoff into established stream beds.

Why:

Supporting this form of economic development has two results:

1. It assures the sustainability of continuing harvest from the stands of trees under the care of the forest steward.
2. It obviates the pollution and soil erosion impact on the environment from the more traditional practice of wholesale clear-cutting of a forested area.

Guidelines: NEED

4.1 *Use Forest Stewardship Council (FSC) Lumber*

FSC lumber is produced through sustainable harvesting techniques.

Guidelines: RETURN ON INVESTMENT

4.2 *Use Micro-lam Framing Products*

These products comprise salvaged waste fiber and offer dimensional consistency and structurally rated performance.

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5 *Recycled Content Materials*

What:

Any building construction product that contains recycled material falls into this category. Distinction is made between pre-consumer and post-consumer recycled content. The significance of the later is that the material stock has been through the commercial supply chain and brought back for reuse whereas pre-consumer recycling generally refers to the in-house plant manufacturing capture of waste for reuse.

Why:

Any materials that can be continually reused so as to close the so-called technical nutrient loop comprise materials that otherwise would have gone to the landfill. This eliminates the need for manufacturers to find places for solid waste disposal and reduces the stress on the environment. In point of fact, recycled content materials markets are supported by careful on-site harvesting of the construction waste stream itself.

Guidelines: NEED

5.1 *Use Recycled-Paper-Covered Gyp Board*

Guidelines: RETURN ON INVESTMENT

5.2 *Use Fly-Ash Concrete*

5.3 *Use Recycled Content Metals*

5.4 *Use Recycled Content Carpeting*



Recyclable Construction Debris

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6 *Recyclable Materials*



Interface Flooring™ Carpet Tiles are made from recycled carpeting materials; Interface markets the carpet as a ‘product of service’ rather than as a ‘consumable product’.

What:

Any material or building component that can be disassembled and reused comprise this category of environmentally responsible material usage. Virtually any construction component that is not destroyed when removed from a building can meet these criteria: windows, doors, lighting fixtures.

Why:

This also is a pathway for closing the technical nutrient loop and eliminating the volume of waste that would otherwise flow to the landfill.

Guidelines: NEED

6.1 *Use Recyclable Carpet Square Floor Covering*

Many manufacturers now offer this under products of service rather than products of consumption.

Guidelines: RETURN ON INVESTMENT

6.2 *Use Prefabricated Bolt–Together Framing Components*

Many options exist now for acquiring recyclable structural steel framing systems

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7 Glazing Type to Match Façade Orientation

What:

Glazing qualities are defined by several factors including visible light transmittance (VLT), solar heat gain coefficient (SHGC) and thermal conductive properties (U-value). Window assemblies that use air gaps, inert gases, suspended thin films, or low-e surface coatings can be used to control these three characteristics independently.

Why:

The significance of selectively specifying these three distinct components in glazing offers the opportunity of tuning the glazing to fit the nature of exposure on the north, east, west, and south façades of a building. The south façade sees the most direct solar radiation every day of the year; the east and west windows see substantial early morning and late afternoon (near horizontal) sun penetration that can lead to some overheating conditions, and the north windows would see very little sun during the course of the year but are exposed to the ambient air and thus represent a significant conductive gain or loss through the building shell.

Guidelines: NEED

7.1 Tune U-Value to N, S, E, W (Cardinal) Exposure

7.2 Tune SHGC to N, S, E, W (Cardinal) Exposure

7.3 Tune VLT Tuned to N, S, E, W (Cardinal) Exposure

Guidelines: RETURN ON INVESTMENT

7.4 Use Operable Shading Devices

7.5 Use Operable Insulated Window Coverings

Amount of glazing (percent of building skin area)	North South East West	60% 60% 60% 60%	40% 40% 20% 20%
Glazing characteristics (U-factor solar heat gain coefficient visible light transmittance)	North South East West	.42 / .60 / .71 .42 / .60 / .71 .42 / .60 / .71 .42 / .60 / .71	.29 / .43 / .70 .29 / .43 / .70 .31 / .40 / .47 .31 / .40 / .47
Thermal properties (overall system R-value)	Wall R-value Roof R-value Floor R-value Mass	R-8 R-20 R-19 No	R-33 R-40 R-27 Yes / high mass

U-Value, SHGC, and VLT for Differing Glazing Exposures

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8 *Recycling of Construction Waste*



Recyclable Yard Waste

What:

Source separation on the project site of all materials that can be fed back into the respective technical nutrient loops — such as metals, woods, glass, papers — can be most easily managed during the construction process. As waste is generated, it can readily be placed in the appropriate recycling bin.

Why:

Closing the technical nutrient loops reduces the amount of solid waste needing to go to a landfill and offers opportunities for the contractor to gain financial compensation for materials that otherwise would represent a cost for disposal.

Guidelines: NEED

8.1 *Provide On-Site Source Separation*

This can be shared by all sub contractors on the job site.

Guidelines: RETURN ON INVESTMENT

8.2 *Provide In-Building Source Separation for Use by Occupants*

This can be coordinated with the local waste hauling service in the area.

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9 *Include Materials in the Commissioning Process*

What:

Commissioning is the verification of performance in the field, and in the case of materials mostly means checking to make sure specified materials have been installed as directed in the construction documents.

Why:

Material commissioning obviates the latent discovery of poor performance from materials that did not meet specifications.

Guidelines: NEED

9.1 *Commission Room Finishes*

Guidelines: RETURN ON INVESTMENT

9.2 *Commission All Substrate Materials*



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10 *Material Properties*

What:

American Society of Testing Materials (ASTM) is the source of scientifically accepted protocols for evaluating performance of various materials and associated building products. Adhering to the nationally adopted standards for specification and evaluation are critical to success of any school project.

Why:

The best way to cross-compare material performance is to use established third-party testing data.

Guidelines: NEED

10.1 *Use ASTM Certification for all Materials*

Guidelines: RETURN ON INVESTMENT

10.2 *Use GreenTM Spec Listing for Materials Selection*