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PROJECT: Sample Project
LOCATION: Philadelphia, PA 19104

This report discusses the sustainable issues of various building materials and their relationships to credits available under the USGBC LEED Green Building Rating System®. Please take into consideration these issues when determining the most appropriate materials for your project. In addition to these discussions, we have included the attached Appendix A, which lists various product manufacturers, contact information, sustainable characteristics related to those products, and manufacture and extraction locations relevant to MR credits 4, 5, 6 and 7; EQ credits 4 and 5; and ID credit 1 that may be useful when specifying building products for the above-referenced project.

1. Concrete

Concrete mixes consist of portland cement, aggregates and water. Most suppliers will replace some of the portland cement with flyash and ground granulated blast furnace slag. These practices save virgin resources and help reduce the carbon dioxide (CO_2) emitted into the atmosphere during portland cement production. Therefore, consider a ready-mix supplier that uses the above-mentioned practices to achieve 6% minimum pre-consumer recycled content by weight. The LEED Reference Guide allows this recycled content to be calculated in a unique manner. We can help with these calculations. In order to achieve the proposed innovation in design credit, 40% of the project's portland cement must be replaced with a substitute pozzolanic material. The ready-mix suppliers included in Appendix A use these strategies to reduce environmental impacts of the industry. An additional strategy is to find a ready-mix supplier that utilizes light weight aggregates such as slag aggregates, which are 100% pre-consumer recycled content.

2. Concrete Products

Pre-cast concrete products have environmental benefits that can be realized through LEED credits as well as indirect benefits for the environment. Consider local manufacturers that incorporate recycled content into their products which would directly relate to MRc4 and MRc5. Item 1 above describes in detail the possible sources of recycled content in concrete. Pre-cast concrete use can also reduce the general amount of waste generated on-site versus cast-in-place which requires extensive wood formwork and other materials. Thus, MRc2 is more easily attainable. Additionally, the purchase of less wood can be helpful if the project pursues MRc7.

3. Concrete Masonry Units (CMUs)

CMUs are manufactured using a concrete mix containing mostly portland cement and aggregates. Manufacturers may create more sustainable CMUs by utilizing flyash and ground granulated blast furnace slag to replace some of the portland cement. An additional strategy to increase recycled content is to use slag aggregates. These practices save virgin resources and, in the case of cement replacement, help reduce the carbon dioxide (CO_2) emitted into the atmosphere during portland cement production. Consider using CMUs manufactured by a company that utilizes the practices mentioned above to achieve a minimum pre-consumer recycled content by weight of 30%. Alternatively, consider using CMU seconds, which meet ASTM requirements but lack uniform qualities (e.g. more chipped corners, may be taller or shorter than standard CMUs). By utilizing seconds, the blocks are used for their intended purpose and no additional energy will be consumed to recycle them. Seconds may also contain recycled content.

4. Steel Products

Steel can be produced using either a Basic Oxygen Furnace (BOF) or an Electric Arc Furnace (EAF). Both of these processes require scrap steel to manufacture new steel. However, a BOF uses only 25 to 35% old steel while an EAF uses almost 100% recycled steel to produce new steel. Therefore, the project team should utilize steel products manufactured in an EAF. Additionally, consider steel manufacturers that are in close proximity to the recycling facility from which their scrap metals are obtained.

5. Windows

Window selection will primarily affect the energy use of the building. The energy efficiency of a window is measured in the U-value and R-value. The U-value measures heat loss, so the lower the number, the more efficient the window. The R-value measures resistance to heat flow, the higher the value, the higher the insulation value. Project teams should consider using windows with multiple panes, low e-coatings and gas-fills to conserve energy. Glazing products with high visible light transmittance will increase daylighting and occupant health. Fritting glass can be used as a light control measure, as well as a guard against avian impacts. An insulated fiberglass sash may be the best option to control heat gain and loss. Additionally, consider using building integrated photovoltaics in curtainwall systems.

6. Wood Products

Considering the recent changes involving the manufacture of agrifiber boards, it appears that the availability of agrifiber panel products has diminished. However, anecdotal information suggests that certain suppliers may still have remaining stocks of agrifiber products. If the project team can specify enough need for a truck load of agrifiber product then the cost becomes competitive through Environ Biocomposites in Mankato, Minnesota.

Project teams should consider Forest Stewardship Council (FSC) certified wood products. Such wood products originate from forests that are managed in an environmental and socially responsible manner. FSC-certified wood products contribute to MRc7. If pursuing EQc4.4, LEED requires that all composite wood and agrifiber products used within the interior of the project building, such as particleboard, medium density fiberboard, plywood, wheatboard, panel substrates and door cores, contain no added urea-formaldehyde.

7. Plastic Laminate (P-lam) Products

Plastic laminate products are sheets composed of melamine-impregnated paper combined with resin-saturated kraft paper bonded to a wood substrate such as medium density fiberboard (MDF). The resulting plastic surface is fairly durable and versatile.

In regards to sustainability, specify p-lam products whose underlying wood substrate uses no added urea-formaldehyde as a binder and make certain that installation adhesives and sealants are low in volatile organic compounds (VOC) content. Consider manufacturers that utilize FSC-certified wood products and whose manufacturing and harvesting or extraction of materials originate within 500 miles of the project site. Also consider p-lam furniture products that are Greenguard Indoor Air Quality Certified. As an alternative to p-lam products consider natural stone such as honed black slate that can often be comparable in price.

8. Rigid Insulation

There are several types of rigid foam insulation: polyisocyanurate, extruded polystyrene and expanded polystyrene (EPS). However, a common environmental concern with the first two types of rigid insulation is the use of Chloroflurocarbons (CFCs) and Hydrofluorocarbons (HCFCs) as blowing agents to create the closed cell structures which provide the actual insulation characteristics of the foam insulation. CFCs are ozone depleting agents and HCFCs have global warming potential. In contrast, EPS insulation does not contain either CFCs or HCFCs. Although typically slightly lower in R-value rating than the first two, high quality EPS insulation has similar performance characteristics as extruded polystyrene.

As an alternative to rigid foam insulation, the project team should consider blown-in cellulose insulation which blocks air leakage effectively and provides good R-value ratings. In addition, because blown-in insulation completely fills in wall and ceiling cavities, thermal breaks created by thermal conduction through metal studs is reduced. Cellulose insulation can contain a high amount of recycled content in the form of recycled newspaper (nontoxic flame retardants are also added) which contributes to MRc4.

9. Gypsum Wallboard Products

Gypsum wallboard, otherwise known as drywall, is an interior-utilized wall panel with a gypsum core sandwiched between two heavy sheets of paper. Most wallboard is composed of virgin gypsum – mixed with small amounts of either in-plant scrap gypsum and/or clean construction waste gypsum – and contains relatively low amounts of recycled content. However, synthetic (flue-gas) gypsum, a waste product from stack scrubbers that remove sulfur from coal-fired power plant emissions, and recycled gypsum are becoming more prevalent in gypsum wallboard manufacturing. Therefore, consider using synthetic gypsum wallboard that contains a high level of pre-consumer recycled content. Additionally, consider manufacturers whose manufacturing plants and harvesting or extraction of component materials originate within 500 miles of the project site.

10. Acoustical Ceiling Tile Systems

Acoustical ceiling panels are generally composed of a mixture of mineral fiber and waste paper bound together with cornstarch. Various other mineral-based components can be added as well as pigmented clay paints for color. The performance characteristics of acoustical tiles can vary widely depending on what is desired. Consider products that have high recycled content in order to contribute to MRc4. Additionally, highly reflective (white) ceiling panels may help reduce lighting energy consumption and contribute to EAc1.

11. Polished Concrete Flooring

Polished concrete floors can be used as an alternative to almost all flooring types including epoxy flooring. Epoxy flooring generally does not comply with the VOC content limits of Green Seal Standard GS-11. Polished concrete flooring is typically half the price of terrazzo, however, when applied to large areas, the cost decreases significantly.

12. Linoleum Floor Covering

Linoleum is made from natural materials consisting of solidified linseed oil and wood flour or cork dust along with resins and ground limestone. The backing is usually a burlap or canvas material. Linoleum is available as tile or sheets and can have a life span of 40 years or more. Extremely durable, it is difficult to gouge or chip and the color runs throughout the material depth.

13. Carpet

The pursuit of EQc4.3 necessitates that all carpet installed in the building interior meet the requirements of the Carpet and Rug Institute Green Label Plus program, that all carpet cushions installed in the building interior meet the requirements of the Carpet and Rug Institute Green Label program and that all carpet adhesives must not exceed a VOC limit of 50g/L. Additionally, project teams may wish to consider modular carpet tiles instead of sheet carpeting. Carpet tiles have an advantage in that damaged or stained tile can be individually replaced and a number of manufacturers will take back old tiles for recycling.

14. Paints and Coating

Advances in paints and coatings technology has produced products that have reduced or zero volatile organic chemical offgassing yet maintain a high level of performance. For architectural paints, coatings and primers, specify products which comply with the VOC content limits of Green Seal Standard GS-11 (flats: 50 g/L and non-flats: 150 g/L). Anti-corrosives and anti-rust paints should not exceed 250 g/L as established by Green Seal Standard GC-03. Specify clear wood finishes, floor coatings, stains, sealers and shellacs to comply with the VOC content limit of the South Coast Air Quality Management District (SCAQMD) Rule 1113 (clear wood finishes: varnish 350 g/L and lacquer 550 g/L; floor coatings: 100 g/L; sealers: waterproofing sealers 250 g/L, sanding sealers 275 g/L, and all other sealers 200 g/L; and stains: 250 g/L).