Materials and Resources

Building materials choices are important in sustainable design because of the extensive network of extraction, processing and transportation steps required to process them. Activities to create building materials may pollute the air and water, destroy natural habitats and deplete natural resources. Construction and demolition wastes constitute about 40% of the total solid waste stream in the United States.

Maintaining occupancy rates in existing buildings reduces redundant development and the associated environmental impact of producing and delivering all new materials. Reuse of existing buildings, versus building new structures, is one of the most effective strategies for minimizing environmental impacts. When rehabilitation of existing buildings components is included in the strategy, waste volumes can be reduced or diverted from landfills. Reuse results in less habitat disturbance and typically less infrastructure. An effective way to use salvaged interior components is to specify them in the construction documents. The actions of an increasing number of public and private waste management operations have reduced construction debris volumes by recycling these materials. Recovery activities typically begin with job-site separation into multiple bins or disposal areas. In some areas, regional recycling facilities are being constructed to accept comingled waste and separate the recyclable materials from those that must go to the landfill. These facilities are achieving waste diversion rates of 80% or greater in many areas.

When materials are selected for a project, it is important to evaluate new and different sources. Salvaged materials can be substituted for new materials, save costs and add character. Recycled-content materials reuse waste products that would otherwise be deposited in landfills. Use of local materials supports the local economy and reduces transportation. Use of rapidly renewable materials minimizes natural resource consumption and has the potential to better match the harvest cycle of the resource with the life of the material in buildings. Use of third-party certified wood improves the stewardship of forests and the related ecosystems.

Materials Cost

While projects are encouraged to determine the actual total materials cost (excluding labor and equipment) for calculation purposes, LEED for New Construction allows project teams to apply a 45% factor to total costs (including labor and equipment) to establish a default total materials cost for the project.

Materials & Resources Credit Characteristics

Table 1 shows which credits were substantially revised for Version 2.2, which credits are eligible to be submitted in the Design Phase Submittal, and which project team members are likely to carry decision-making responsibility for each credit. The decision-making responsibility matrix is not intended to exclude any party, rather to emphasize those credits that are most likely to require strong participation by a particular team member.

The Materials and Resources credits are organized around several key parameters and categories. **Table 2** shows the metrics used to determine compliance with each credit, such as area, weight and cost. The table also shows which materials are included and excluded in the calculations. Materials that are blacked out in the table below are excluded from the corresponding credit calculations.

Overview of LEED® Prerequisites and Credits

MR Prerequisite 1
Storage & Collection of Recyclables

MR Credit 1.1
Building Reuse—Maintain 75% of Existing Walls, Floors & Roof

MR Credit 1.2
Building Reuse—Maintain 95% of Existing Walls, Floors & Roof

MR Credit 1.3
Building Reuse—Maintain 50% of Interior Non-Structural Elements

MR Credit 2.1
Construction Waste Management—Divert 50% from Disposal

MR Credit 2.2
Construction Waste Management—Divert 75% from Disposal

MR Credit 3.1
Materials Reuse—5%

MR Credit 3.2
Materials Reuse—10%

MR Credit 4.1
Recycled Content—10% (post-consumer + 1/2 pre-consumer)

MR Credit 4.2
Recycled Content—20% (post-consumer + 1/2 pre-consumer)

MR Credit 5.1
Regional Materials—10% Extracted, Processed & Manufactured Regionally

MR Credit 5.2
Regional Materials—20% Extracted, Processed & Manufactured Regionally

MR Credit 6
Rapidly Renewable Materials

MR Credit 7
Certified Wood

Table 1: MR Credit Characteristics

Credit	Significant Change from Version 2.1	Design Submittal	Construction Submittal	Owner Decision-Making	Design Team Decision-Making	Contractor Decision-Making
MRp1: Storage & Collection of Recyclables		*		*	*	
MRc1.1: Building Reuse, 75% of Walls, Floors, Roof			*	*	*	
MRc1.2: Building Reuse, 95% of Walls, Floors, Roof			*	*	*	
MRc1.3: Building Reuse, Maintain 50% of Interior Non-Structural Elements	*		*	*	*	
MRc2: Construction Waste Management			*			*
MRc3: Resource Reuse			*		*	*
MRc4: Recycled Content	*		*		*	*
MRc5: Regional Materials	*		*		*	*
MRc6: Rapidly Renewable Materials			*		*	*
MRc7: Certified Wood			*		*	*

Special notes:

- Materials qualifying as reused for MR Credit 3.1 and 3.2 cannot be applied to MR Credits 1, 2, 4, 6 or 7.
- Projects that are incorporating existing buildings but do not meet the requirements for MR Credit 1 may apply the reused portions of the existing buildings towards the achievement of MR Credit 2, Construction Waste Management.

Table 2: MR Credit Metrics

Material	MRc1: Building Reuse	MRc2: Construction Waste Management	MRc3: Materials Reuse	MRc4: Recycled Content	MRc5: Regional Materials	MRc6: Rapidly Renewable Materials	MRc7: Certified Wood
CSI Divisions 2 thru 10	Based on area	Based on weight or volume. Include demolition and construction waste	Based on replacement value ($)	Based on cost of qualifying materials as a percent of overall materials cost for Divisions 2–10 ($)			Based on cost of FSC wood as a percentage of all new wood ($)
Mechanical							
Electrical							
Plumbing							
Furniture & Furnishings (CSI Division 12)			May be included with Divisions 2–10, if done consistently for credits 3–7				

Storage & Collection of Recyclables

SS	WE	EA	MR	EQ	ID
Prerequisite 1					

Required

Intent

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

Requirements

Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals.

Potential Technologies & Strategies

Coordinate the size and functionality of the recycling areas with the anticipated collection services for glass, plastic, office paper, newspaper, cardboard and organic wastes to maximize the effectiveness of the dedicated areas. Consider employing cardboard balers, aluminum can crushers, recycling chutes and collection bins at individual workstations to further enhance the recycling program.

Summary of Referenced Standard

There is no standard referenced for this credit.

Approach and Implementation

Dense urban areas typically have a recycling infrastructure in place while some less populated areas may still be developing this type of service. Building owners and designers must determine the most appropriate method for creating a dedicated recycling collection area that meets the project occupant's needs and also those of the collection infrastructure. It is possible that recyclable collection and storage space could increase the project footprint in some instances. It is important to address possible indoor environmental quality (IEQ) impacts on occupants due to recycling activities. Those activities that create odors, noise and air contaminants should be isolated or performed during non-occupant hours to maintain optimal IEQ. **Table 1** provides guidelines for the recycling storage area based on overall building square footage. The requirements of this prerequisite do not regulate the size of the recycling area. The intent is for the design team to size the facilities appropriate to the specific building operations, and the information provided below is intended as a resource for that exercise.

Designate well marked collection and storage areas for recyclables including office paper, cardboard, glass, plastic and metals. Locate a central collection and storage area in the basement or at the ground level that provides easy access for maintenance staff as well as collection vehicles. For projects with larger site areas, it may be possible to create a separate central collection area that is not located within the building footprint.

Design considerations for recycling areas should include signage to prevent contamination, protection from the elements, and security for high value materials. Security of recyclable collection areas should also be designed to discourage illegal disposal. Allocate recycling space in common areas as well as a centralized collection point. Common areas may be more easily maintained if recycling containers are no larger than 20–25 gallons. It may be beneficial to specify recycling bins that have wheeled carts to transport the recyclables from the common area to a centralized collection area. At the centralized collection point, it is useful to design enough space for a front-loader bin as well as a ramp up to the recycling area.

It may be helpful to research local recycling programs to find the best method of diverting recyclable materials from the waste stream for your particular building location. When allocating space for the centralized collection point of recyclables, it is beneficial to involve the local hauler who will be providing waste management services to the site. Space allocation needs can vary depending upon collection strategies used by the hauler such as comingled or source separated recyclables. For example, if the local hauler accepts comingled recyclables, then it may be possible to reduce the area that would be required if separate collection bins for each material were required. There is no requirement for projects to provide proof of contract for hauling services to achieve this prerequisite.

Table 1: Recycling Area Guidelines

Commercial Building Square Footage [sf]	Minimum Recycling Area [sf]
0 to 5,000	82
5,001 to 15,000	125
15,001 to 50,000	175
50,001 to 100,000	225
100,001 to 200,000	275
200,001 or greater	500

Where possible, provide instruction to occupants and maintenance personnel on recycling procedures. Encourage activities to reduce and reuse materials before recycling in order to reduce the amount of recyclable volumes handled. For instance, building occupants can reduce the solid waste stream by using reusable bottles, bags and other containers. Consider employing cardboard balers, aluminum can crushers, recycling chutes and other waste management technologies to further enhance the recycling program.

Calculations

There are no calculations required to demonstrate compliance with this prerequisite. **Table 1** is provided as a guideline for sizing recycling areas. The values in this table were developed by the city of Seattle in support of an ordinance requiring minimum areas for recycling and storage of recyclables in commercial buildings. The ordinance is based on the total square footage of the building. Minimum areas for residential buildings were also specified in that reference document.

Another potential source of guidelines for sizing recycling areas is the California Integrated Waste Management Board's (CIWMB) 1999 Statewide Waste Characterization Study, in which the waste disposal rates of 1,200 businesses were measured. See the References section of this prerequisite for details.

Submittal Documentation

This prerequisite is submitted as part of the **Design Submittal**.

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

- ❑ Confirm that recycling collection areas have been provided, per requirements, to meet the needs of the project.
- ❑ Confirm the types of materials that are being collected for recycling.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's prerequisite approach.

Considerations

Environmental Issues

By creating convenient recycling opportunities for building occupants, a significant portion of the solid waste stream can be diverted from landfills. Recycling of paper, metals, cardboard and plastics reduces the need to extract virgin natural resources. For example, recycling one ton of paper prevents the processing of 17 trees and saves three cubic yards of landfill space. Recycled aluminum requires only 5% of the energy required to produce virgin aluminum from bauxite, its raw material. Recycling also reduces environmental impacts of waste in landfills. Land, water and air pollution impacts can all be reduced by minimizing the volume of waste sent to landfills.

Economic Issues

Recycling requires minimal initial cost and offers significant savings in reduced landfill disposal costs or tipping fees. However, recycling activities use floor space that could be used otherwise. In larger projects, processing equipment such as can crushers and cardboard balers are effective at minimizing the space required for recycling activities. Some recyclables can generate revenue which can help to offset the cost of their collection and processing.

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Web Sites

California Integrated Waste Management Board

www.ciwmb.ca.gov/WasteChar/

Solid Waste Characterization Database, Estimated Solid Waste Generation Rates

California Statewide Solid Waste Characterization Study

www.ciwmb.ca.gov/Publications/default.asp?pubid=1097

Alternative Waste Calculations

California Integrated Waste Management Board's (CIWMB) Statewide Waste Characterization Study in which the waste disposal rates of businesses are measured.

Earth 911

www.earth911.org/master.asp

(480) 889-2650 or 877-EARTH911

Information and education programs on recycling as well as regional links to recyclers.

Recycling at Work

U.S. Conference of Mayors

www.usmayors.org/USCM/recycle

(202) 293-7330

A program of the U.S. Conference of Mayors that provides information on workplace recycling efforts.

Waste at Work

Inform: Strategies for a Better Environment

www.informinc.org/wasteatwork.php

(212) 361-2400

An online document from Inform, Inc., and the Council on the Environment of New York City on strategies and case studies to reduce workplace waste generation.

Print Media

Composting and Recycling Municipal Solid Waste by Luis Diaz et al., CRC Press, 1993.

McGraw-Hill Recycling Handbook by Herbert F. Lund, McGraw-Hill, 2000.

Definitions

Recycling is the collection, reprocessing, marketing and use of materials that were diverted or recovered from the solid waste stream.

A **Landfill** is a waste disposal site for the deposit of solid waste from human activities.

Building Reuse

Maintain 75% of Existing Walls, Floors & Roof

SS	WE	EA	MR	EQ	ID
Credit 1.1					

1 point

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Maintain at least 75% (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project scope shall be excluded from the calculation of the percentage maintained. If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.

Potential Technologies & Strategies

Consider reuse of existing, previously occupied buildings, including structure, envelope and elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency such as windows, mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

1 Point
in addition to
MR Credit 1.1

Building Reuse

Maintain 95% of Existing Walls, Floors & Roof

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Maintain an additional 20% (95% total, based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are re-mediated as a part of the project scope shall be excluded from the calculation of the percentage maintained. If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.

Potential Technologies & Strategies

Consider reuse of existing, previously occupied buildings, including structure, envelope and elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency such as windows, mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

SS	WE	EA	MR	EQ	ID
Credit 1.3					

1 point

Building Reuse

Maintain 50% of Interior Non-Structural Elements

Intent

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements

Use existing interior non-structural elements (interior walls, doors, floor coverings and ceiling systems) in at least 50% (by area) of the completed building (including additions). If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.

Potential Technologies & Strategies

Consider reuse of existing, previously occupied buildings, including structure, envelope and interior non-structural elements. Remove elements that pose contamination risk to building occupants and upgrade components that would improve energy and water efficiency, such as mechanical systems and plumbing fixtures. Quantify the extent of building reuse.

Summary of Referenced Standard

There is no standard referenced for this credit.

Approach and Implementation

For any project that is reusing portions of an existing building, it is recommended that the project team inventory the existing conditions. Develop a floor plan showing the location of existing structural components, finished ceilings, finished flooring, interior wall partitions, doors within the interior walls, exterior and party walls, and exterior windows and doors. If there are existing built-in case goods that will be reused, they should be documented as well. The drawings should provide the detail needed to determine the surface area of all these pre-existing elements.

Confirm that the items designated for reuse can be reused. Take the needed steps to retain them in the finished work. Fixed items, such as walls and doors that are found on-site are included in this credit and count toward the percentage of reuse when they perform the same function (i.e., doors reused as doors). If they are used for another purpose (i.e., doors made into tables), they contribute to earning MR Credits 3.1 and 3.2.

Projects that are incorporating existing buildings but do not meet the requirements for MR Credit 1 may apply the reused portions of the existing buildings toward the achievement of MR Credit 2, Construction Waste Management. To do so, project teams will be required to determine an approximate weight for existing building elements.

Calculations

MR Credit 1.1 / 1.2

This credit is based on surface areas of major existing building structural and envelope elements. Structural support elements, such as columns and beams, are considered to be a part of the larger surfaces they are supporting and are not required to be quantified separately. Prepare a spreadsheet listing all envelope and structural elements within the building. Quantify each item, listing existing area (sq.ft.) and retained area (sq.ft.). Determine the percent of existing elements that are retained by dividing the total retained materials area (sq.ft.) by the total existing materials area (sq.ft.). Projects that retain a minimum of 75% of existing envelope and structural components will be awarded 1 point for MR Credit 1.1. Projects that retain a minimum of 95% of existing envelope and structural components will be awarded 2 points (MR Credit 1.1 and MR Credit 1.2).

The area measurements are made in the same way as would be completed by a contractor preparing a bid for construction of a building. For structural floors and roof decking, calculate the square footage of each component. For existing exterior walls and existing walls adjoining other buildings or additions, calculate the exterior wall surface area (sq.ft.) only and subtract the area of exterior windows and exterior doors from both the existing and reused area tallies. For interior structural walls (i.e., shear walls), calculate the surface area (sq.ft.) of both sides of the existing wall element.

Table 1 below provides an example of the calculations for MR Credit 1.1 and 1.2.

Project teams should exclude the following items from this calculation: non-structural roofing materials; window assemblies; structural and envelope materials that are deemed to be unsound from a structural perspective; structural

Table 1: Example Building Structure / Envelope Reuse Calculation

Structure / Envelope Element	Existing Area (SF)	Reused Area (SF)	Percentage Reused (%)
Foundation / Slab on Grade	11,520	11,520	100%
2nd Floor Deck	11,520	10,000	87%
1st Floor Interior Structural Walls	240	240	100%
2nd Floor Interior Structural Walls	136	136	100%
Roof Deck	11,520	11,520	100%
North Exterior Wall (excl. windows)	8,235	7,150	87%
South Exterior Wall (excl. windows)	8,235	8,235	100%
East Exterior Wall (excl. windows)	6,535	6,535	100%
West Exterior Wall (excl. windows)	6,535	5,820	81%
TOTALS	**64,476**	**61,156**	**95%**

and envelope materials that are considered hazardous and pose a contamination risk to building occupants.

MR Credit 1.3

This credit is focused on reuse of interior, non-structural elements, and compares the retained/reused elements to the total completed area of interior elements. It is not necessary to calculate the total area of existing interior non-structural elements prior to demolition.

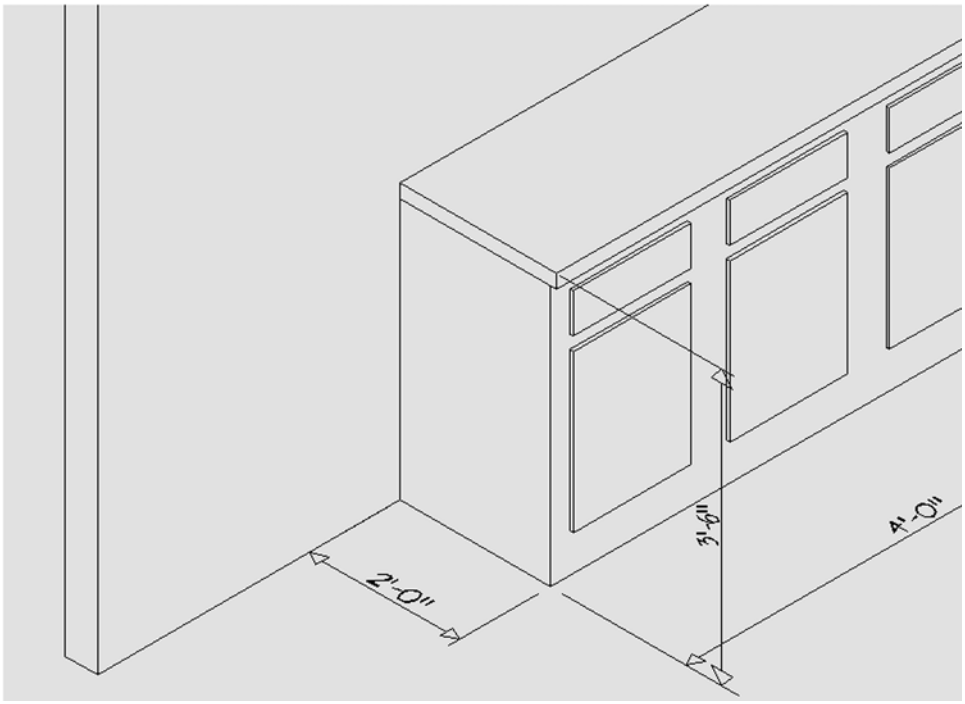
Prepare a spreadsheet listing all interior non-structural elements within the building. Quantify each item, listing total area (sq.ft.)—including new construction—and area (sq.ft.) of retained elements. Determine the percent of existing elements that are retained by dividing the total area (sq.ft.) of all retained interior non-structural elements by the total area (sq.ft.) of interior non-structural elements. Projects demonstrating that the total area (sq.ft.) of existing and/or reused non-structural interior components account for a minimum of 50% of the area of all interior non-structural building elements will be awarded 1 point for MR Credit 1.3. **Achievement of MR Credit 1.1 or 1.2 is not required for projects to be considered for MR Credit 1.3.**

Finished ceilings and finished flooring areas (tile, carpeting, etc.) are straightforward and should be calculated as simple areas (one sided). For interior non-structural walls, determine the finished area between floor and ceiling. Note: both sides of interior non-structural walls should be calculated. For example: an interior, non-structural wall that is 20 feet long and 10feet high (from floor to finished ceiling) should be counted as 400 sq.ft. (20 ft x 10 ft x 2) to account for both sides of the wall.

The surface area of interior doors should be calculated and counted only once. Interior casework that is retained should be calculated using the visible surface area of the assembly. **Figure 1** below provides an example of how to calculate casework.

Table 2 provides an example of a tabulation spreadsheet that can be used for determining credit compliance. In the example, the total area (sq.ft.) of all new and existing building materials (following construction) is entered in the "Total Area" column. The total area (sq.ft.) of only the existing/reused components is then entered in the "Existing/Reused Area" column. The sum of the existing materials is then divided by the sum of the total building materials to obtain the overall percentage of reused materials. Since the overall percentage of reused non-structural interior materials is greater than 50% of the total area of all non-structural interior building materials, the project would be eligible for one point under MR Credit 1.3.

Figure 1: Area Calculation for Existing Casework



Surface	Area (SF)
Top	8
Left Side	7
Front	14
Rear	0
Right Side	0
TOTAL REUSED CASEWORK	**29**

Remember to include items that have been saved but may have been relocated in this tabulation, such as full-height demountable walls and doors that were re-hung in a new section of wall. Items counted in this credit are not to be included in MR Credits 3.1 and 3.2. However, if the project includes an addition that is greater than 200% of the existing building's square footage, the reused existing building's materials may be included in the calculations for MR Credit 2.

Exemplary Performance

There are no exemplary performance points available for these credits.

Submittal Documentation

These credits are submitted as part of the **Construction Submittal**.

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

MR Credit 1.1 / 1.2

- ❑ Confirm whether the project is strictly a renovation of an existing building or a renovation with an addition. For projects with additions, confirm the square footage of the new addition(s).
- ❑ Provide a tabulation of the existing and reused areas (sq.ft.) of each structural/envelope element.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's approach.

Table 2: Example: Interior Non-Structural Reuse Calculation

Interior Non-Structural Element	Total Area* (SF)	Existing / Reused Area (SF)	Percentage Reused (%)
Gypsum Board Wall Partitions – Full Height	5,400	3,600	67%
Gypsum Board Wall Partitions – Partial Height	650	650	100%
Carpeting	10,000	0	0%
Resilient Flooring	350	350	100%
Ceramic Tile	150	150	100%
Suspended Ceiling Systems	10,400	10,400	100%
Gypsum Board Ceilings	350	350	100%
Interior Doors (Wood)	525	420	80%
Interior Windows / Sidelights	56	56	100%
Interior Doors (Metal)	42	42	100%
Interior Casework / Cabinetry	235	150	64%
TOTALS	**28,158**	**16,168**	**57%**

** Note: The Total Area calculation includes both new and existing/reused materials.*

MR Credit 1.3

- ❑ Confirm whether the project is strictly a renovation of an existing building or a renovation with an addition. For projects with additions, confirm the square footage of the new addition(s).
- ❑ Provide a tabulation of the total and reused areas (sq.ft.) of each non-structural interior element.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's approach.

Considerations

Environmental Issues

Reusing existing buildings significantly reduces construction waste volumes. Reuse strategies also reduce environmental impacts associated with raw material extraction, manufacture and transportation.

Economic Issues

Reuse of existing components can reduce the cost of construction substantially. For instance, the Southern California Gas Company reused an existing building for its Energy Resource Center and estimated savings of approximately $3.2 million, based on typical first costs for a 44,000 square-foot building. The largest savings were realized in masonry (87% savings), site work (57% savings), concrete (49% savings) and carpentry (70% savings).

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Print Media

How Buildings Learn: What Happens After They're Built by Stewart Brand.

Definitions

Prior Condition is the state the project space was in at the time it was selected. Removing the demolition work from the project scope by making it the building owner's responsibility defeats the objective of this credit.

Prior Condition Area is the total area of finished ceilings, finished floors, full height walls and demountable partitions, interior doors and built-in case goods that existed when the project area was selected; exterior windows and exterior doors are not considered.

SS	WE	EA	MR	EQ	ID
Credit 1					

Completed Design Area is the total area of finished ceilings, finished floors, full height walls and demountable partitions, interior doors and built-in case goods in the space when the project is completed; exterior windows and exterior doors are not considered.

Retained Components are those portions of the finished ceilings, finished floors, full height walls and demountable partitions, interior doors and built-in case goods that existed in the prior condition that remained in the completed design.

Interior Non-Structural Components Reuse is determined by dividing the total area (sq. ft.) of retained interior, non-structural components by the total area (sq. ft.) of the interior, non-structural components included in the completed design.

Case Study

S.T. Dana Building Renovations
Ann Arbor, MI

Owner: University of Michigan

Photo © University of Michigan Photo Services

The S.T. Dana Building, of the University of Michigan's School of Natural Resources & Environment (SNRE), has been awarded LEED Gold Certification under LEED for New Construction for its green building renovations. During renovation, the project maintained 97% of the existing building structure, 98% of the existing building shell, and 61% of the non-shell areas. Where possible, demolished materials were salvaged and reused in the new construction. When designing renovation plans, the University of Michigan strove to create a building that was both a comfortable place to learn and work and simultaneously demonstrated state-of-the-art environmentally conscious design. The building now serves as a laboratory and educational center for ecological disciplines.

Construction Waste Management

Divert 50% from Disposal

SS	WE	EA	MR	EQ	ID
Credit 2.1					

1 point

Intent

Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Recycle and/or salvage at least 50% of non-hazardous construction and demolition. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or comingled. Excavated soil and land-clearing debris does not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

Potential Technologies & Strategies

Establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area(s) on the construction site for segregated or comingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site (see page 253).

1 Point
in addition to
MR Credit 2.1

Construction Waste Management

Divert 75% from Disposal

Intent

Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Recycle and/or salvage an additional 25% beyond MR Credit 2.1 (75% total) of non-hazardous construction and demolition debris. Excavated soil and land-clearing debris does not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

Potential Technologies & Strategies

Establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a specific area(s) on the construction site for segregated or comingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site (see page 251).

Summary of Referenced Standard

There is no standard referenced for this credit.

Approach and Implementation

MR Credits 2.1 and 2.2 address the extent to which waste material leaving the site is diverted from landfills. The percentage represents the amount diverted through recycling and salvage divided by the total waste generated.

Identify construction haulers and recyclers to handle the designated materials; they often serve as valuable partners in this effort. Make sure jobsite personnel understand and participate in the program, with updates throughout the construction process. Obtain and retain verification records (waste haul receipts, waste management reports, spreadsheets, etc.) to confirm the diverted materials have been recycled or salvaged as intended. Note that diversion may include donations to charitable organizations such as Habitat for Humanity®.

The availability of recycling opportunities tends to vary by region. In urban areas, recycling resources are typically more developed, and projects will have choices about whether to separate waste on-site or to hire a comingled waste recycler. Often, recycling construction waste can reduce project costs by significantly reducing landfill tipping fees. Comingled recycling may increase recycling costs but will simplify the waste management effort on-site and ensure that diversion rates will be high. This option is especially useful for projects with tight site constraints where there is no room for multiple collection bins. In more rural and remote areas, recyclers may be harder to find. The environmental benefits of recycling in these cases need to be balanced against the environmental impacts of transporting waste long distances to recycling centers.

Materials can be contaminated by other construction debris and food waste products. Beverages and other liquids can be particularly harmful to materials that may absorb these products, eliminating their ability to be recycled.

Projects that reuse existing buildings, but do not qualify for MR Credit 1, may apply the reused building materials towards achievement of this credit. Materials salvaged and reused on-site can contribute to this credit if they are not included in Credit 3 calculations.

Calculations

Calculations for these credits are based on the amount of waste diverted from the landfill or incineration compared to the total amount of waste generated on-site. Convert all materials to either weight or volume in order to calculate the percentage. Hazardous waste should be excluded from calculations, and should be disposed of appropriately according to relevant regulations. Additionally, excavated soil should be excluded from calculations. Projects that crush and reuse existing concrete, masonry or asphalt on-site should include these materials in the calculations for this credit. **Table 1** provides an example of a summary calculation for waste diversion.

If some data need to be converted to the chosen unit of measurement, use the conversion factors in **Table 2** or other defensible conversion (submit explanation and source for the latter).

For projects that use comingled recycling rather than on-site separation, summaries of diversion rates will be required from the recycler. Typically, the recycler should be required to provide monthly reports.

Exemplary Performance

Project teams may earn an Innovation in Design point for exemplary performance

Table 1: Sample Construction Waste Management Diversion Summary

Diverted / Recycled Materials Description	Diversion / Recycling Hauler or Location	Quantity of Diverted / Recycled Waste	Units (tons / cy)
Concrete	ABC Recycling	138.0	Tons
Wood	Z-Construction Reuse	10.2	Tons
Gypsum Wallboard	ABC Recycling	6.3	Tons
Steel	Re-Cycle Steel Collectors	1.1	Tons
Crushed Asphalt	On-Site Reuse	98.2	Tons
Masonry	ABC Recycling	6.8	Tons
Cardboard	ABC Recycling	1.6	Tons
TOTAL CONSTRUCTION WASTE DIVERTED		262.2	Tons
Landfill Materials Description	Landfill Hauler or Location	Quantity of Diverted / Recycled Waste	Units (tons / cy)
General Mixed Waste	XYZ Landfill	52.3	Tons
TOTAL CONSTRUCTION WASTE SENT TO LANDFILL		**52.3**	**Tons**
TOTAL OF ALL CONSTRUCTION WASTE		**314.5**	**Tons**
PERCENTAGE OF CONSTRUCTION WASTE DIVERTED FROM LANDFILL		**83.4%**	

Table 2: Solid Waste Conversion Factors

Material	Density [lbs/cy]
Cardboard	100
Gypsum Wallboard	500
Mixed Waste	350
Rubble	1,400
Steel	1,000
Wood	300

in Construction Waste Management when the percent of total waste diverted is 95% or greater.

Submittal Documentation

These credits are submitted as part of the **Construction Submittal**.

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

- ❑ Complete the construction waste calculation tables in the Submittal Template. The following information will be required to fill in these tables: general description of each type/category of waste generated; location of receiving agent (recycler/landfill) for waste; quantity of waste diverted (by category) in tons, or cubic yards.
- ❑ Provide a narrative describing the project's construction waste management approach. The narrative should include the project's Construction Waste Management Plan. Please provide any additional comments or notes to describe special circumstances or considerations regarding the project's credit approach.

Considerations

Environmental Issues

Construction and demolition (C&D) activities generate enormous quantities of solid waste. The U.S. EPA estimates that 136 million tons of C&D debris (versus 209.7 million tons of municipal solid waste) was generated in 1996—57% of it from non-residential construction, renovation and demolition activities. This equates to 2.8 pounds per capita per day. Commercial construction generates between 2 and 2.5 pounds of solid waste

per square foot, and the majority of this waste can potentially be recycled.

The greatest environmental benefit is achieved by source control—reducing the total waste generated.

Recycling opportunities are expanding rapidly in many communities. Metal, vegetation, concrete and asphalt recycling opportunities have long been available and economical in most communities. Paper, corrugated cardboard, plastics and clean wood markets vary by regional and local recycling infrastructure, but are recycled in most communities. Some materials, such as gypsum wallboard, have recycling opportunities only in communities where reprocessing plants exist or where soil can handle the material as a stabilizing agent. The recyclability of a demolished material is often dependant on the amount of contamination attached to it. Demolished wood, for instance, is often not reusable or recyclable unless it is deconstructed and de-nailed.

Recycling of construction and demolition debris reduces demand for virgin resources and, in turn, reduces the environmental impacts associated with resource extraction, processing and, in many cases, transportation. Landfills contaminate groundwater and encroach upon valuable green space. Through effective construction waste management, it is possible to extend the lifetime of existing landfills, avoiding the need for expansion or new landfill sites.

Economic Issues

In the past, when landfill capacity was readily available and disposal fees were low, recycling or reuse of construction waste was not economically feasible. Construction materials were inexpensive compared to the cost of labor; thus, construction jobsite managers focused on worker productivity rather than on materials conservation. In addition, recycling infrastructure and a recycled materials marketplace that processes and resells construction debris did not exist. In recent years, particularly with the advent of international competition for both raw and recycled materials, the economics of recycling have improved. During this same period disposal costs have increased. Recognition for, and enactment of, more stringent waste disposal regulations coupled with ever decreasing landfill capacity have changed the waste management equation.

Waste management plans require time and money to draft and implement but they can also provide the guidance to achieve substantial savings throughout the construction process.

Recyclable materials have differing market values depending on the presence of local recycling facilities, reprocessing costs and the availability of virgin materials on the market. In general, it is economically beneficial to recycle metals, concrete, asphalt and cardboard. In most cases it is possible to receive revenue as well as to avoid paying a landfill tipping fee. Market values normally fluctuate from month to month. When no revenue is received for materials, as is often the case for scrap wood and gypsum wallboard, it is still possible to benefit from potentially shorter hauling distances and by avoiding landfill tipping fees.

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Web Sites

Construction and Demolition Debris Recycling Information

California Integrated Waste Management Board

www.ciwmb.ca.gov/ConDemo

(916) 341-6499

A program by the California Integrated Waste Management Board including case studies, fact sheets and links.

Construction Materials Recycling Association

www.cdrecycling.org

(630) 585-7530

A nonprofit dedicated to information exchange within the North American construction waste and demolition debris processing and recycling industry.

Construction Waste Management Handbook

Smart Growth Online

www.smartgrowth.org/library/articles.asp?art=15

(202) 962-3623

A report by the NAHB Research Center on residential construction waste management for a housing development in Homestead, Florida.

Contractors' Guide to Preventing Waste and Recycling

Resource Venture

www.resourceventure.org/rv/issues/building/publications/index.php

(206) 389-7304

A guidebook on waste prevention in construction from the Business and Industry Resource Venture.

Government Resources

Check with the solid waste and natural resources departments in your city or county. Many local governments provide information about regional recycling opportunities.

Recycling and Waste Management During Construction

King County, OR

www.metrokc.gov/procure/green/wastemgt.htm

Specification language from city of Seattle and Portland Metro projects on construction waste management.

A Sourcebook for Green and Sustainable Building

www.greenbuilder.com/sourcebook/ConstructionWaste.html

A guide to construction waste management from the Sourcebook for Green and Sustainable Building.

Environmental Specifications for Research Triangle Park

U.S. Environmental Protection Agency

www.epa.gov/rtp/new-bldg/environmental/specs.htm

Waste management and other specifications.

Waste Spec: Model Specifications for Construction Waste Reduction, Reuse and Recycling

Triangle J Council of Governments

http://www.tjcog.dst.nc.us/regplan/wastspec.htm

(919) 558-9343

Model specifications developed by Triangle J Council of Governments in North Carolina. Ten case studies show results of using the specifications (downloadable PDF document).

Definitions

Construction and Demolition (C&D) Debris includes waste and recyclables generated from construction, renovation, and demolition or deconstruction of preexisting structures. Land clearing debris including soil, vegetation, rocks, etc. are not to be included.

Recycling is the collection, reprocessing, marketing and use of materials that were diverted or recovered from the solid waste stream.

Reuse is a strategy to return materials to active use in the same or a related capacity.

Tipping Fees are fees charged by a landfill for disposal of waste volumes. The fee is typically quoted for one ton of waste.

Case Study

Clearview Elementary School
Hanover, PA

Owner: Hanover Public School District

Photo © Jim Schafer Photos courtesy of L. Robert Kimball and Associates

On March 24, 2004, Clearview Elementary School in Hanover, PA, achieved LEED® v2.0 Gold, becoming the first elementary school to achieve LEED certification in Pennsylvania. Located in a mixed-use neighborhood as part of the Hanover Public School District, the project diverted 90% of their construction waste from the landfill by recycling materials, such as the concrete from the project—which was removed from the site and reused as clean back fill. The construction administration supervised the contractor's performance in managing the construction waste. In addition to constructing a LEED certified building, the school district has further committed to augmenting its curriculum to teach students about the building and its green features.

SS	WE	EA	MR	EQ	ID
Credit 2					

SS	WE	EA	MR	EQ	ID
Credit 3.1					

1 point

Materials Reuse

5%

Intent

Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

Requirements

Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5%, based on cost, of the total value of materials on the project.

Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Potential Technologies & Strategies

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

1 Point
in addition to
MR Credit 3.1

Materials Reuse

10%

Intent

Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

Requirements

Use salvaged, refurbished or reused materials for an additional 5% beyond MR Credit 3.1 (10% total, based on cost).

Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Potential Technologies & Strategies

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

Summary of Referenced Standard

There is no standard referenced for this credit.

Approach and Implementation

Use of salvaged and refurbished materials in new building projects extends the life of materials and can reduce overall first costs of construction materials. Use of salvaged materials can also add character to the building and can be used effectively as architectural details. Some areas of the United States, such as New England, the Pacific Northwest and California, have well-developed markets for salvaged materials while other regions are just beginning to develop these markets.

For reused materials found on-site, there are two major groups. First are those items that were "fixed" components on-site before the project started. To qualify as reused for this credit, these fixed items must no longer be able to serve their original function, and must then have been reconditioned and installed for a different use or in a different location. An example would be a fire door removed and modified to serve as the counter top for the receptionist station. The remaining fixed items, such as walls, ceilings and flooring that remain as such in the new building are excluded from this credit, but are covered by MR Credits 1.2 and 1.3.

Another type of reused material found on-site is "finish" material that can be kept and refurbished. These reused components may continue to serve their original function, but have undergone refurbishment to become functional. An example would be refurbished door hardware.

For reused materials obtained from off-site, the primary stipulation for qualifying as reused is that they must have been previously used. Note: Materials eligible for reuse are not limited to materials used in buildings. These materials may be purchased as salvaged, similar to any other project material, or they may be relocated from another facility (including one previously used by the occupant). The salvaged materials from both on-site and off-site can be applied to MR Credit 5, Regional Materials, if they comply with the requirements of that credit. Materials contributing toward achievement of Credit 3 cannot be applied to MR Credits 1, 2, 4, 6 or 7. If MRc3 is not being attempted, applicable materials can be applied to another LEED credit if eligible.

Furniture and furnishings (CSI Division 12 components) are excluded from the calculations for this credit, unless they are included consistently across MR Credits 3–7. This credit applies primarily to CSI MasterFormat 1995 divisions 2–10. Mechanical and electrical components, along with appliances and equipment cannot be included in this credit, as they are generally not appropriate and/or feasible. This exclusion is consistent with MR Credits 4 and 5.

Calculations

List the reused or salvaged materials used on the project. **Table 1** provides an example of a salvaged materials tracking log. Determine the cost of each material. This cost will either be the actual cost paid or the replacement value, if the material came from on-site. The replacement value can be determined by pricing a comparable material in the local market. When the actual cost paid for the reused or salvaged material is below the cost of an equivalent new item, use the higher value (or replacement cost) in the calculations. When the cost to reclaim an item found on-site is less than the cost of an equivalent new item, use the cost of the new item (or replacement cost) in the calculations.

Table 1: Sample Salvaged Materials Tracking Log

Salvaged / Reused Material Description	Source for Salvaged / Reused Material	Value / Product Cost ($)
Salvaged Brick	ABC Salvage Suppliers	$62,500
Salvaged Wood Floor	Salvage Company Y	$24,200
Remanufactured Wood Doors (Used as Built-in Countertops)	On-Site Salvage / Remanufacture	$4,200
SUB-TOTAL SALVAGED / REUSED MATERIALS		**$90,900**
TOTAL CONSTRUCTION MATERIALS COST – OR 45% DEFAULT MATERIALS VALUE		**$1,665,498**
SALVAGED / REUSED MATERIALS AS A PERCENTAGE OF TOTAL MATERIALS COST		**5.5%**

Determine the Total Materials Cost for the project. The Total Materials Cost may be derived by multiplying the total construction cost (hard costs only in CSI MasterFormat 1995 divisions 2–10) by 0.45. Alternately, the Total Materials Cost may be a tally of actual materials cost in CSI MasterFormat 1995 divisions 2–10 from the project Schedule of Values or a similar document. The benefit of using actual materials costs, as opposed to the default 45%, is that projects with less than 45% materials cost would find it easier to achieve the 5% and 10% credit thresholds, since total materials cost is in the denominator of the equation below.

Calculate Percent Reuse Materials according to Equation 1.

Exemplary Performance

An Innovation in Design point for exemplary performance is available when a project documents that the value of salvaged or reused materials used on the project is equal to at least 15% of the total materials cost.

Submittal Documentation

These credits are submitted as part of the **Construction Submittal**.

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

- ❑ Provide the total project materials cost (Divisions 2–10) or provide the total project cost for Divisions 2–10 to apply the 45% default materials value.
- ❑ Provide a tabulation of each salvaged/reused material used on the project. The tabulation must include a description of the material, the source/vendor for the material and the product cost.
- ❑ Provide a narrative describing the materials reuse strategy implemented by the project. Include specific information about reused/salvaged materials used on the project.

Considerations

Environmental Issues

Reuse strategies divert material from the construction waste stream, reducing the need for landfill space and environmental impacts pertaining to associated water and air contamination issues. Use of salvaged materials also reduces the environmental impacts of producing new construction products and materials. These impacts are significant since buildings account for

Equation 1

$$\text{Percent Reuse Materials} = \frac{\text{Cost of Reuse Materials (\$)}}{\text{Total Materials Cost (\$)}}$$

a large portion of our natural resources consumption, including 40% of raw stone, gravel and sand, and 25% of virgin wood.

Economic Issues

Some salvaged materials are more costly than new materials due to the high cost of labor involved in recovering and refurbishing processes. However, salvaged materials are often of higher quality and more durable than available new materials. Local demolition companies may be willing to sell materials recovered from existing buildings to avoid landfill tipping fees and to generate income. In some areas, municipalities and waste management companies have established facilities to sell salvaged building materials at landfill sites. Sometimes salvaged materials are offered at prices that appear to be cost-effective but may include hidden costs such as the need for reprocessing, exorbitant transportation costs or liabilities associated with toxic contamination. Conversely, certain salvaged materials may be impossible to duplicate (such as turn-of-the century lumber and casework) and may well be worth the higher cost compared to new but inferior materials.

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Web Sites

California Materials Exchange California Integrated Waste Management Board

www.ciwmb.ca.gov/CalMAX

(877) 520-9703

A program of the California Integrated Waste Management Board, this site allows users to exchange non-hazardous discarded materials online.

Government Resources

Check with the solid waste authority and natural resources departments in your city or county. Many local governments provide information about regional materials exchanges and other sources.

Guide to Resource-Efficient Building Elements

www.crbt.org/index.html

The Center for Resourceful Building Technology Directory of environmentally responsible building products. This resource provides introductory discussions per topic and contact information for specific products, including salvaged materials. (The CRBT project is no longer active, and the CRBT Web site is no longer updated. The National Center for Appropriate Technology is providing this Web site for archival purposes only).

Materials Exchanges on the Web

Industrial Materials Exchange (IMEX) Local Hazardous Waste Management Program in King County, OR

www.govlink.org/hazwaste

(206) 296-4899

A listing of materials exchanges on the Web.

Reuse Development Organization (ReDO)

www.redo.org

(410) 669-7245

A national nonprofit located in Indianapolis, Indiana, that promotes reuse as an environmentally sound, socially beneficial and economical means of managing surplus and discarded materials. See the List of ReDO Subscribers for contacts around the United States.

Salvaged Building Materials Exchange

Green Building Resource Guide

www.greenguide.com/exchange/search.html

A searchable database of salvaged building materials.

Building Materials Reuse Association (formerly Used Building Materials Association)

www.ubma.org

(877) 221-UBMA

BMRA is a nonprofit, membership-based organization that represents companies and organizations involved in the acquisition and/or redistribution of used building materials.

Used Building Materials Exchange

www.build.recycle.net

(519) 767-2913

A free marketplace for buying and selling recyclables and salvaged materials.

Old to New: Design Guide, Salvaged Building Materials in New Construction

The Greater Vancouver Regional District (GVRD)

http://www.lifecyclebuilding.org/resources/Old%20to%20New%20Design%20Guide.pdf

A useful and detailed guide book, produced by the Greater Vancouver Regional District, to the use of salvaged materials, with real-life case studies.

Definitions

Chain-of-Custody is a tracking procedure to document the status of a product from the point of harvest or extraction to the ultimate consumer end use.

Salvaged or Reused Materials are construction materials recovered from existing buildings or construction sites and reused in other buildings. Common salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick and decorative items.

Recycled Content

10% (post-consumer + 1/2 pre-consumer)

SS	WE	EA	MR	EQ	ID
Credit 4.1					

1 point

Intent

Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

Requirements

Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project.

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Recycled content shall be defined in accordance with the International Organization for Standardization document, *ISO 14021—Environmental labels and declarations—Self-declared environmental claims (Type II environmental labeling)*.

Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Potential Technologies & Strategies

Establish a project goal for recycled content materials and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed. Consider a range of environmental, economic and performance attributes when selecting products and materials.

SS | WE | EA | **MR** | EQ | ID

Credit 4.2

1 Point
in addition to
MR Credit 4.1

Recycled Content

20% (post-consumer + 1/2 pre-consumer)

Intent

Increase demand for building products that incorporate recycled content materials, thereby reducing the impacts resulting from extraction and processing of virgin materials.

Requirements

Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes an additional 10% beyond MR Credit 4.1 (total of 20%, based on cost) of the total value of the materials in the project.

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Recycled content shall be defined in accordance with the International Organization for Standardization document, *ISO 14021—Environmental labels and declarations—Self-declared environmental claims (Type II environmental labeling)*.

Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Potential Technologies & Strategies

Establish a project goal for recycled content materials and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed. Consider a range of environmental, economic and performance attributes when selecting products and materials.

Summary of Referenced Standard

International Standard ISO 14021 – 1999 - Environmental Labels and Declarations — Self-Declared Environmental Claims (Type II Environmental Labeling)

International Organization for Standardization (ISO)

www.iso.org

This International Standard specifies requirements for self-declared environmental claims, including statements, symbols and graphics, regarding products. It further describes selected terms commonly used in environmental claims and gives qualifications for their use. This International Standard also describes a general evaluation and verification methodology for self-declared environmental claims and specific evaluation and verification methods for the selected claims in this standard. The definitions section for this credit contains the relevant details, and thus the standard need not be acquired.

Approach and Implementation

Recycled content goals should be established during the design phase. Careful research may be required to determine the percentages of recycled content that can realistically be expected in specific products and materials. Project teams are encouraged to run a preliminary calculation during the design phase as soon as a project budget is available in order to set appropriate recycled content targets. Many standard materials in the marketplace contain recycled content as a matter of course due to the nature and economics of their manufacture (examples include steel, gypsum board, and acoustical ceiling tile). Other materials may require research by design and construction teams to achieve higher levels of recycled content or to verify which models of a certain product line feature the desired recycled content (examples include carpet and ceramic tile).

The project team should work with subcontractors and suppliers to verify availability of materials that contain recycled content. The contractor should run preliminary calculations based on the construction budget or schedule of values during the preconstruction phase whenever possible. This will allow the construction team to focus during the buy-out phase on those materials with the greatest contribution to the project recycled content value.

The project team is typically responsible for documenting the amounts and values of recycled content of any given material used on the project. The project team must identify products which contain recycled content and pursue documentation from suppliers, manufacturers and vendors directly or through the subcontractors to confirm the actual recycled content for each product.

It is also important to distinguish between post-consumer and pre-consumer recycled content when tracking materials for the purpose of credit calculations. Detailed definitions of these terms are provided in the Definitions section of this guide.

Calculations

To calculate the percentage of recycled content materials used on a project, list all recycled content materials and products and their costs. For each product, identify the percentage of post-consumer and/or pre-consumer recycled content by weight, and list the recycled content information source. Note that LEED requires that the information be from a reliable, verifiable source.

Calculate the Recycled Content Value of each material according to Equation 1.

Equation 1

Recycled Content Value ($) = (% post-consumer recycled content x material cost) + 0.5 x (% pre-consumer recycled content x material cost)

Determine the Total Materials Cost for the project.

The Total Materials Cost may be derived by multiplying the total construction cost (hard costs for CSI MasterFormat 1995 divisions 2–10 only) by 0.45. Alternately, the Total Materials Cost may be a tally of actual materials cost (CSI MasterFormat 1995 divisions 2–10 only) from the project Schedule of Values or similar document. The benefit of using actual materials costs, as opposed to the default 45%, is that projects with less than 45% materials cost would find it easier to achieve the 10% and 20% credit thresholds, since total materials cost is in the denominator of the equation below. The purpose of the default value is to streamline the documentation process, as it can be challenging to separate the materials costs from labor and equipment costs for all materials on the project.

Calculate the project Percent Recycled Content according to Equation 2.

Furniture and furnishings (CSI Division 12 components) are excluded from the calculations for this credit, unless they are included consistently across MR Credits 3–7. This credit applies primarily to CSI MasterFormat 1995 divisions 2–10. Mechanical, electrical and plumbing components, along with appliances and equipment cannot be included in this credit. These are excluded because, when compared with structural and finish materials, mechanical and electrical equipment tends to have a high dollar value relative to the amount of material it contains. That high dollar value would skew the results of the calculation, reducing the incentive to use recycled-content in high-mass materials.

Default Recycled Content

For steel products where no recycled content information is available, assume the recycled content to be 25% post-consumer. No other material has been recognized as having a similar consistent minimum recycled content. Note that many steel products will contain 90%, or higher, recycled content if manufactured by the electric arc furnace process, so it may be beneficial for a project to obtain actual information from the manufacturer rather than relying on the default value.

Calculating Assembly Recycled Content

Assemblies include all products that are composed of multiple materials, either in reaching a formulation for a material (i.e., composite wood panels), or of all the sub-components (i.e., a window system). For assembly recycled content values, consider the percents by weight of the post-consumer recycled content and the pre-consumer recycled content in the assembly. When there are sub-components, the final two percentages (post-consumer and pre-consumer) must be determined by using the weights of the smaller sub-component elements. No consideration is given to relative costs of the materials or the sub-components, when calculating these percentages of recycled content. For example, a pound of steel in a window assembly is of equal significance in determining recycled content of an assembly as a pound of fabric on a movable wall panel.

Equation 2

$$\text{Percent Recycled Content} = \frac{\text{Total Recycled Content Value (\$)}}{\text{Total Materials Cost (\$)}}$$

Supplementary Cementitious Materials

In the case of supplementary cementitious materials (SCMs) used in concrete that are recycled from other operations, it is allowable to calculate the recycled content value based on the mass of the cementitious materials only, rather than on the entire concrete mix. For example, if 150 pounds of coal fly ash is used per yard of concrete, the fly ash would represent only a small fraction (5%) of the roughly 3,000 pounds of materials in that concrete. The project team can choose instead to calculate it as a fraction of the cementitious materials only. To accomplish this, the value of the cementitious materials will have to be obtained from the concrete supplier separately from the total cost of the concrete. (See **Example 1**.) Note: fly ash is a Pre-Consumer Recycled Content material.

Exemplary Performance

Project teams may earn an Innovation in Design point for exemplary performance when the requirements reach the next incremental step. For recycled content, the total recycled value must be 30% or greater.

Submittal Documentation

These credits are submitted as part of the **Construction Submittal**.

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

- ❑ Provide the total project materials cost (Divisions 2–10) or provide the total project cost for Divisions 2–10 to apply the 45% default materials value.
- ❑ Provide a tabulation of each material used on the project that is being tracked for recycled content. The tabulation must include a description of the material, the manufacturer of the material, the product cost, the pre-consumer and/or post-consumer recycled content percentage, and the source of the recycled content data.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's credit approach.

Considerations

Environmental Issues

Building products with recycled content are beneficial to the environment because they reduce virgin material use and solid waste volumes. Success breeds future success: as the number of building products containing recycled content grows, the marketplace for recycled materials develops.

Economic Issues

Many commonly used products are now available with recycled content, including metals, concrete, masonry, acoustic tile, carpet, ceramic tile and insulation. Most recycled content products exhibit per-

Example 1: Sample Supplementary Cementitious Materials Calculation

Mix #	Mass of Portland cement* [lbs]	Mass of recycled SCMs [lbs]	Mass of total cementitious materials [lbs]	SCMs as a percentage of total cementitious materials [%]	Dollar value of all cementitious materials (from concrete supplier)	Recycled content value per yard [(SCM/2) x dollar value]
2	200	50	250	20%	$35	$3.50
3	300	100	400	25%	$45	$5.63

**This column also includes any other cementitious ingredients that are not recycled.*

formance similar to products containing only virgin materials and can be incorporated into building projects with ease and minimal to no cost premium.

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Web Sites

Recycled Content Product Directory

California Integrated Waste Management Board

www.ciwmb.ca.gov/rcp

(916) 341-6606

A searchable database for recycled content products, developed by the California Integrated Waste Management Board.

Government Resources

Check with the solid waste and natural resources departments in your city or county. Many local governments provide information on recyclers and recycled content product manufacturers within their region.

GreenSpec

BuildingGreen, Inc.

www.buildinggreen.com/menus/index.cfm

(802) 257-7300

Detailed listings for more than 1,900 green building products, including environmental data, manufacturer information and links to additional resources.

Guide to Resource-Efficient Building Elements

www.crbt.org/index.html

The Center for Resourceful Building Technology Directory of environmentally responsible building products. This resource provides introductory discussions per topic and contact information for specific products, including salvaged materials. (The CRBT project is no longer active, and the CRBT Web site is no longer updated. The National Center for Appropriate Technology is providing this Web site for archival purposes only).

Oikos

www.oikos.com

A searchable directory of resource-efficient building products and sustainable design educational resources.

"Recycled Content: What is it and What is it Worth?"

Environmental Building News, February 2005.

www.buildinggreen.com/auth/article.cfm?filename=140201a.xml

U.S. EPA Comprehensive Procurement Guidelines Program

www.epa.gov/cpg/products.htm

Contains EPA information on recycled content materials with guidelines for recycled percentages. Includes a searchable database of suppliers.

Definitions

Assembly Recycled Content includes the percentages of post-consumer and pre-consumer content. The determination is made by dividing the weight of the recycled content by the overall weight of the assembly.

Post-Consumer Waste is material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of materials from the distribution chain (Source: ISO 14021). Examples of this category include construction and demolition debris, materials collected through curbside and drop-off recycling programs, broken pallets (if from a pallet refurbishing company, not a pallet mak-

ing company), discarded products (e.g. furniture, cabinetry and decking) and urban maintenance waste (leaves, grass clippings, tree trimmings, etc.).

Pre-Consumer Content, previously referred to as Post-Industrial Content, is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it (Source ISO 14021). Examples in the pre-consumer category include planer shavings, plytrim, sawdust, chips, bagasse, sunflower seed hulls, walnut shells, culls, trimmed materials, print overruns, over-issue publications, and obsolete inventories.

Regional Materials

10% Extracted, Processed & Manufactured Regionally

SS	WE	EA	MR	EQ	ID
Credit 5.1					

1 point

GREENING OPPORTUNITY

Can assist in certification under LEED for Existing Buildings

Intent

Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

Requirements

Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Potential Technologies & Strategies

Establish a project goal for locally sourced materials, and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed. Consider a range of environmental, economic and performance attributes when selecting products and materials.

SS | WE | EA | **MR** | EQ | ID

Credit 5.2

1 Point
in addition to
MR Credit 5.1

GREENING OPPORTUNITY

Can assist in certification under LEED for Existing Buildings

Regional Materials

20% Extracted, Processed & Manufactured Regionally

Intent

Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

Requirements

Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for an additional 10% beyond MR Credit 5.1 (total of 20%, based on cost) of the total materials value. If only a fraction of the material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

Potential Technologies & Strategies

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed. Consider a range of environmental, economic and performance attributes when selecting products and materials.

Summary of Referenced Standard

There is no standard referenced for this credit.

Approach and Implementation

Careful research may be required to determine what products can be sourced locally and can realistically be expected to be purchased for the project. As a result, it may be beneficial to evaluate this credit early in the design process, despite the appearance of it being exclusively a construction consideration. Project teams are encouraged to run a preliminary calculation during the design phase, as soon as a project budget is available, in order to set appropriate regional materials targets. For example, if the project has a $10 million budget, the materials cost (and subsequently 10% of that cost) can be estimated using the 45% default rate. The team would calculate that the project would need to use at least $450,000 of materials meeting the requirements of this credit to achieve MR Credit 5.1 ($450,000 is 10% of $4.5 million, which is 45% of the $10 million project cost). This estimate will likely be high, since the final calculation is based on Divisions 2–10, but it is still useful as a conservative estimate.

The general contractor should work with subcontractors and suppliers to verify availability of materials which are extracted/harvested/recovered and manufactured locally (within 500 miles of the project site). The contractor should run preliminary calculations based on the construction budget or schedule of values during the preconstruction phase whenever possible. This will allow the construction team to focus on those materials with the greatest contribution to this credit during the buy-out phase.

The general contractor is typically responsible for documenting the amounts and values of regionally harvested and manufactured materials used on the project. The general contractor must track the materials cost of each locally harvested and manufactured product that will be applied to the LEED credit.

Calculations

List those products that are believed to be extracted/harvested/recovered and manufactured within 500 miles of the project site.

Indicate the name of the manufacturer, the product cost, the distance between the project site and the manufacturer, and the distance between the project site and the extraction site for each raw material contained within each product.

Determine the Total Materials Cost for the project.

The Total Materials Cost may be derived by multiplying the total construction cost (hard costs for CSI MasterFormat 1995 divisions 2–10 only) by 0.45. Alternately, the Total Materials Cost may be a tally of actual materials cost (CSI MasterFormat 1995 divisions 2–10 only) from the project Schedule of Values or similar document. The benefit to using actual materials costs, as opposed to the default 45%, is that projects with less than 45% materials cost would find it easier to achieve the 10% and 20% credit thresholds, since total materials cost is in the denominator of the equation below. The purpose of the default value is to streamline the documentation process, as it is often challenging to break out the materials costs from labor and equipment costs for all materials on the project.

Calculate the Percent Local Materials according to Equation 1.

Furniture and furnishings (CSI Division 12 components) are excluded from the calculations for this credit, unless they are considered consistently across MR

Equation 1

$$\text{Percent Local Materials} = \frac{\text{Total Cost of Local Materials (\$)}}{\text{Total Materials Cost (\$)}}$$

Credits 3–7. This credit applies primarily to CSI MasterFormat 1995 divisions 2–10. Mechanical, electrical and plumbing components, along with appliances and equipment cannot be included in this credit for reasons of fairness and simplification: limited manufacturing locations, skewed results due to relatively high cost compared to the actual mass of materials in the product, and the complexity of some systems is not conducive to gathering the data needed for LEED credits (the exclusion also applies to credits 3 and 4).

Reused and Salvaged Materials

Reused and salvaged materials that satisfy the requirements of MR Credits 3.1 and 3.2, may also contribute to MR Credits 5.1 and 5.2. The location from which they were salvaged is to be used as the point of extraction, and the location of the salvaged goods vendor is to be used as the point of manufacture. On-site salvaged materials automatically qualify.

For a material with more than one point of manufacture or extraction, all within the 500-mile radius, list a single item with the greatest distance. If a portion of the material was either manufactured or extracted beyond the 500-mile radius, list only that portion and associated cost satisfying the credit requirement.

For assemblies or products manufactured within the 500-mile radius but containing only some components that also were extracted within the 500-mile radius, use multiple lines in your list. Base the proportionality of such products' costs on the weight of their various components. (See the example for concrete shown in **Table 1** and **Table 2**.)

Exemplary Performance

An Innovation in Design point for exemplary performance may be available when the next incremental percentage threshold is achieved. For regionally harvested, extracted and manufactured materials, the credit calculation must be 40% or greater.

Submittal Documentation

These credits are submitted as part of the **Construction Submittal**.

Table 1: Sample Assembly Percent Regionally Extracted Calculation for Concrete

Components	Weight [lbs]	Distance between Project & Extraction Site [miles]	Weight Contributing to Regional Extraction [lbs]
Cement	282	1,250	0
Fly Ash	282	125	282
Water	275	1	275
Slag	750	370	750
Recycled Concrete & Aggregate	1,000	8	1,000
Sand	1,200	18	1,200
Component Totals	3,789		3,507
Percent Regionally Extracted Materials [3,507 / 3,789]			92.6%

Table 2: Sample MR Credit 5 Calculation

Product	Manufacturer	Distance Between Project & Manufacturer [mi]	Distance Between Project & Extraction/ Harvest [mi]	Product Cost [$]	Value Qualifying as Regional	Information Source
Plant material	Green's Landscape	5	5	$6,770	$6,770	contractor submittal
Concrete aggregate	Joe's Concrete	15	15	$21,000	$21,000	contractor submittal
Insulation	UR Warm	105	1,080	$9,250	-	product cut sheet
Gypsum board	Gypsum R Us	75	288	$8,550	$8,550	letter from manufacturer
Carpet	Fiber Good	355	721	$15,333	-	letter from manufacturer
Casework	Top Counter	18	320	$12,200	$12,200	contractor submittal
Lumber	My Mill	110	320	$38,990	$38,990	contractor submittal
Wood Doors	Closeby	71	320	$7,000	$7,000	contractor submittal
Total Cost of Regional Materials					**$94,510**	
Total Materials Cost (Divisions 2–10)					**$751,000**	
Percent Regional Materials					**13%**	
Points Earned					**1**	

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

- ❑ Provide the project's total project cost (for application of 45% default factor) or total materials cost. Note this reported value must be consistent across all MR credits.
- ❑ Complete the regional materials calculation table in the Submittal Template. The following information will be required to fill in this table: product name for each tracked material; material manufacturer; total product cost for each tracked material; percentage of product, by weight, that meets both the extraction and manufacture criteria; distance between the project site and extraction/harvest/recovery site; distance between the project site and the final manufacturing location.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's credit approach.

Considerations

Environmental Issues

By purchasing regionally manufactured building materials, the local economy is supported, transportation costs and environmental impacts are reduced, and money paid for these materials is retained in the region, supporting the regional economy. The availability of regionally manufactured building materials is dependent on the project location. In some areas, the majority of products needed for the project can be obtained within a 500-mile radius. In other areas, only a small portion or none of the building materials can be sourced locally. It also is important to address the

source of raw materials used to manufacture building products. Raw materials for some building products are harvested or extracted far from the point of manufacture, contributing to air and water pollution due to environmental impacts associated with transportation between point of extraction and point of manufacture.

The use of regional building materials reduces transportation activities and the accompanying pollution associated with delivering materials to the job site. Trucks, trains, ships and other vehicles deplete finite reserves of fossil fuels and generate air pollution. By selecting building materials that are produced from regional materials, transportation impacts are further reduced.

Economic Issues

Regional building materials are more cost effective for projects due to reduced transportation costs. Also, the support of regional manufacturers and labor forces retains capital for the community, contributing to a more stable tax base and a healthier local economy.

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Government Resources

Check with your local Chamber of Commerce and regional and state economic development agencies for building materials manufacturers in your area.

Definitions

Regionally Manufactured Materials, for use in this credit, must be assembled as a finished product within a 500-mile radius of the project site. Assembly, as used for this credit definition, does not include on-site assembly, erection or installation of finished components, as in structural steel, miscellaneous iron or systems furniture.

Regionally Extracted Materials, for use in this credit, must have their source as a raw material from within a 500-mile radius of the project site.

Rapidly Renewable Materials

SS	WE	EA	MR	EQ	ID
Credit 6					

1 point

Intent

Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

Requirements

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5% of the total value of all building materials and products used in the project, based on cost.

Potential Technologies & Strategies

Establish a project goal for rapidly renewable materials and identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard and cork. During construction, ensure that the specified renewable materials are installed.

Summary of Referenced Standard

There is no standard referenced for this credit.

Approach and Implementation

After the project goal has been established for the use of rapidly renewable materials, identify the materials and suppliers that meet the stated criteria and that can achieve this goal, and incorporate products into the project specifications and plans. Project teams are encouraged to run a preliminary calculation during the design phase, as soon as a project budget is available, in order to determine the feasibility of this credit. For example, if the project has a $10 million budget, the materials cost (and subsequently 2.5% of that cost) can be estimated using the 45% default rate. The team would calculate that the project would need to use at least $112,500 of materials meeting the requirements of this credit ($112,500 is 2.5% of $4.5 million, which is 45% of the $10 million project cost). This estimate will likely be high, since the final calculation is based on Divisions 2–10, but it is still useful as a conservative estimate.

Table 1: Examples of Rapidly Renewable Materials

Examples of Rapidly Renewable Materials
Bamboo Flooring
Cotton Batt Insulation
Linoleum Flooring
Sunflower Seed Board Panels
Wheatboard Cabinetry
Wool Carpeting
Cork Flooring

See examples of rapidly renewable materials in **Table 1**. During construction, ensure that the specified rapidly renewable materials are installed.

Calculations

Identify those products that are considered rapidly renewable and their material costs to the project.

Determine the Total Materials Cost for the project.

The Total Materials Cost may derived by multiplying the total construction cost (hard costs for CSI MasterFormat 1995 divisions 2–10 only) by 0.45. Alternately, the Total Materials Cost may be a tally of actual materials cost (CSI MasterFormat 1995 divisions 2–10 only) from the project Schedule of Values or similar document. The benefit to using actual materials costs, as opposed to the default 45%, is that projects with less than 45% materials cost would find it easier to achieve the credit thresholds, since total materials cost is in the denominator of the equation below. The purpose of the default value is to streamline the documentation process, as it is often challenging to break out the materials costs from labor and equipment costs for all materials on the project.

Calculate the Percent of Rapidly Renewable Materials using Equation 1.

Assembly Rapidly Renewable Content

Assemblies include all products that are made of multiple materials, either in reaching a formulation for a material (i.e., particle board), or of all the subcomponents (i.e., a work surface). For assembly rapidly renewable content, the fraction of the assembly that is considered rapidly

Equation 1

$$\text{Percent of Rapidly Renewable Materials} = \frac{\text{Total Cost of Rapidly Renewable Materials (\$)}}{\text{Total Materials Cost (\$)}}$$

renewable is determined by weight. That fraction is then applied to the material cost to determine the rapidly renewable material cost for that assembly.

Exemplary Performance

An Innovation in Design point for exemplary performance may be available when the next incremental percentage threshold is achieved. For rapidly renewable materials, the percentage must be 5% or greater.

Submittal Documentation

This credit is submitted as part of the **Construction Submittal**.

The following project data and calculation information is required to document prerequisite compliance using the v2.2 Submittal Templates:

- ❑ Provide the project's total project cost (for application of 45% default factor) or total materials cost. Note this reported value must be consistent across all MR credits.
- ❑ Complete the rapidly renewable materials calculation table in the Submittal Template. The following information will be required to fill in this table: product name for each tracked material; material manufacturer; total product cost for each tracked material; percentage of product, by weight, for each material that meets the rapidly renewable criteria.
- ❑ Provide an optional narrative describing any special circumstances or considerations regarding the project's credit approach.

Considerations

Environmental Issues

Many conventional building materials require large inputs of land, natural resources, capital and time. Conversely, rapidly renewable materials generally require less of these inputs and are therefore likely to be more environmentally responsible. Rapidly renewable resources are those materials that substantially replenish themselves faster than traditional extraction demand (i.e., planted and harvested in less than a 10-year cycle).

Rapidly renewable resources sometimes provide the opportunity to displace raw materials that have greater environmental impacts. Common examples include composite panels that are made from agricultural fiber such as wheat, substituting for composite wood panels. Irresponsible forestry practices cause ecosystem and habitat destruction, soil erosion and stream sedimentation. Rapidly renewable crops require significantly less land—often due to higher density and shorter growing cycles—to produce the same amount of end product, and are often by-products that are otherwise considered waste. Bio-based plastics (e.g., from corn starch) and other rapidly renewable resources are beginning to provide alternatives to some petroleum-based plastics.

Economic Issues

Because rapidly renewable resources may be harvested more quickly, they tend to give a faster payback on investment for manufacturers. As demand increases, they are expected to become cost-competitive with conventional materials.

The land saved from the production requirements of rapidly renewable resources may be used for a variety of other uses, including open space and other agricultural products. Rapidly renewable materials, by virtue of a more consistent harvesting cycle, may sustain a community over a longer period than the steady and eventual depletion of finite resources or the degradation of a productive ecosystem.

Resources

Please see the USGBC Web site at www.usgbc.org/resources for more specific resources on materials sources and other technical information.

Web Sites

Environmental Building News

BuildingGreen, Inc.

www.buildinggreen.com/products/bamboo.html

(802) 257-7300

An article in Environmental Building News on bamboo flooring, including a listing of bamboo flooring suppliers.

Environmental Design + Construction

www.edcmag.com

(search for Highlights of Environmental Flooring)

An Environmental Design + Construction article providing information on bamboo flooring, linoleum and wool carpeting.

GreenSpec

BuildingGreen, Inc.

www.buildinggreen.com/menus/index.cfm

(802) 257-7300

Detailed listings for more than 1,900 green building products, including environmental data, manufacturer information, and links to additional resources.

Oikos

www.oikos.com

A searchable directory of resource-efficient building products and sustainable design educational resources.

Definitions

Rapidly Renewable materials are considered to be an agricultural product, both fiber and animal, that takes 10 years or less to grow or raise, and to harvest in an ongoing and sustainable fashion.

Certified Wood

SS	WE	EA	MR	EQ	ID
Credit 7					

1 point

Intent

Encourage environmentally responsible forest management.

Requirements

Use a minimum of 50% of wood-based materials and products, which are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria, for wood building components. These components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes.

Include materials permanently installed in the project. Wood products purchased for temporary use on the project (e.g., formwork, bracing, scaffolding, sidewalk protection, and guard rails) may be included in the calculation at the project team's discretion. If any such materials are included, all such materials must be included in the calculation. If such materials are purchased for use on multiple projects, the applicant may include these materials for only one project, at its discretion. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Potential Technologies & Strategies

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed.

Summary of Referenced Standard

Forest Stewardship Council's Principles and Criteria

www.fscus.org

(877) 372-5646

Certification is a "seal of approval" awarded to forest managers who adopt environmentally and socially responsible forest management practices, and to companies that manufacture and sell products made from certified wood. This seal enables consumers, including architects and specifiers, to identify and procure wood products from well-managed sources and thereby use their purchasing power to influence and reward improved forest management activities around the world.

LEED accepts certification according to the comprehensive system established by the internationally recognized Forest Stewardship Council (FSC). FSC was created in 1993 to establish international forest management standards (known as the FSC Principles and Criteria) to assure that forestry practices are environmentally responsible, socially beneficial and economically viable. These Principles and Criteria have been established to ensure the long-term health and productivity of forests for timber production, wildlife habitat, clean air and water supplies, climate stabilization, spiritual renewal, and social benefit, such as lasting community employment derived from stable forestry operations. These global Principles and Criteria are translated into meaningful standards at a local level through region-specific standards setting processes.

FSC also accredits and monitors certification organizations. These "certifiers" are independent, third-party auditors that are qualified to annually evaluate compliance with FSC standards on the ground and to award certifications. There are two types of certification:

- **Forest Management Certification** is awarded to responsible forest managers after their operations successfully complete audits of forestry practices and plans.
- **Chain-of-Custody (COC) Certification** is awarded to companies that process, manufacture and/or sell products made of certified wood after audits verify proper accounting of material flows and proper use of the FSC name and logo.

Approach and Implementation

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. Research the availability of the wood species and products that you wish to use to ensure that they are available from FSC-certified sources. Another method for lowering the impact of wood resources is to research and specify quality grades that are most readily available from well-managed forests. Using lower grades of wood can dramatically reduce pressure on forests, which produce only limited quantities of top-grade timber (i.e., Architectural Woodwork Institute [AWI] Grades 2 or 3 for lumber or veneer rather than Grade 1).

At the earliest opportunity make contact with local vendors, suppliers and manufacturers that provide FSC-certified products. Provide project bidders with a list of certified vendors and encourage them to make contact early in the project to establish product availability and pricing. See the Resources section for information on product databases and boilerplate forms. As the availability of certain certified wood products may vary over the life of a project, consider having the owner pre-purchase, store and supply particular items to the contractor ("Furnished by the Owner, Installed by the Contractor," or FOIC). Finding a storage location that

best mimics the final ambient moisture of the space will ensure proper installation. Because of the typically high ambient moisture present during construction, a job site is not the best location to store wood if FOIC is being implemented.

Specify in contract documents that wood products shall come from forests that are certified as well-managed according to the rules of the FSC, and require chain-of-custody documentation. Wherever possible, employ a line-item strategy based on current availability of specific products rather than a blanket approach.

Chain-of-Custody Requirements

COC certification is required to different extents based on two scenarios: products with and without the on-product FSC label. If a manufacturer places its FSC COC label on product packaging used for individual sale (generally applying to fabricated products), then subsequent entities in the supply chain are not required to have COC certification unless the product's packaging or form is changed before it reaches the end consumer. (*Note:* this instruction is meant for LEED compliance only; it varies from FSC rules). For example, a wholesaler or retailer does not need COC to market a packaged case good kit that is labeled with the manufacturer's COC number. A fabricator using a labeled product as a component of a larger assembly will need to have COC certification since it is altering the product's packaging, and possibly its form.

For products that are not individually packaged for sale to be sold as FSC-certified, the vendor to the consumer is required to have COC certification. Contractors and subcontractors are considered the end consumers; they can demonstrate with copies of invoices (if requested) the quantity purchased for the job and their suppliers' COC numbers. For example, a contractor or subcontractor that installs non-labeled FSC wood panels is not required to have COC certification; its supplier must have COC certification. A manufacturer that installs its own product (e.g. custom cabinetry) is not required to have COC certification.

Calculations

List all new wood on the project and identify which components are FSC-certified. Using **Equation 1**, tally both the new wood and the FSC-certified wood.

Assemblies

In the case of an assembly, only the percentage of FSC-certified wood can be applied toward the credit. Wood components that are labeled "FSC Pure" or "FSC Mixed" are 100% FSC (the latter is assured via volume credit accounting). Determine the amount of new wood as a percent of the total weight, volume or cost and the amount of FSC-certified wood as a percent of the total weight, volume or cost. The cost basis is expected to be useful for veneer. Enter these amounts in the MRc7 Submittal Template along with the total value of the product. The template's spreadsheet will calculate all certified wood value as a percent of all new wood materials.

Project teams should develop a separate spreadsheet to calculate the amount of new wood and amount of FSC-certified wood for complicated assemblies and enter the summary data as one line item in the Submittal Template.

Equation 1

$$\text{Certified Wood Material Percentage} = \frac{\text{FSC-certified Wood Material Value (\$)}}{\text{Total New Wood Material Value (\$)}}$$

The calculations for certified wood shall include only new wood products. The value of any recycled wood fiber content of a product that qualifies as contributing to MR Credit 4, Recycled Content Materials, shall be excluded.

Exemplary Performance

Project teams may earn an Innovation in Design point for exemplary performance when the requirements reach the next incremental step. For FSC-certified wood, the credit calculation must be 95% FSC-certified wood or greater.

Submittal Documentation

This credit is submitted as part of the **Construction Submittal**.

The following data and calculation information is required in order to complete the v2.2 Submittal Templates:

- ❑ A list of items (and/or components of products) claimed as FSC certified, including product type, manufacturer, and the appropriate entity's COC certification number. Each product name can then be cross-referenced with the manufacturer or vendor COC number during the LEED certification review.

An optional narrative can be submitted describing any special circumstances or considerations regarding the project's credit approach.

Considerations

Environmental Issues

The negative environmental impacts of irresponsible forest practices can include destruction of forests, loss of wildlife habitat, soil erosion and stream sedimentation, water and air pollution, and waste generation. The FSC Standard incorporates many criteria that contribute to the long-term health and integrity of forest ecosystems. From an environmental perspective, the elements of responsible FSC-certified forestry include sustainable timber harvesting (i.e., not removing more timber volume than replaces itself over the cutting interval or rotation), preserving wildlife habitat and biodiversity, maintaining soil and water quality, minimizing the use of harmful chemicals, and conserving high conservation value forests (e.g., endangered and old-growth forests).

Economic Issues

World trade in forest products has increased dramatically in the last 30 years, from $47 billion in 1970 to $139 billion in 1998. As more developing countries embrace world forest product markets and their growing economies encourage domestic consumption, the protection of forests will become a critical issue. Currently, the costs of FSC-certified wood products are equal to or higher than conventional wood products and availability varies by region. The price of FSC-certified wood products is expected to be more competitive with conventional wood products in future years as the world's forest resources are depleted and the forest industry embraces more widespread adoption of sustainable business principles.

Irresponsible logging practices can have negative social impacts. Thus, the socioeconomic and political components to FSC certification include respecting indigenous people's rights and adhering to all applicable laws and treaties. Certification also involves forest workers and forest-dependent communities as stakeholders and beneficiaries of responsible forest management. Through the encouragement of responsible forest practices local timber economies are stabilized and forestland is preserved for future generations.

Resources

Web Sites

Forest Stewardship Council, United States

www.fscus.org/green_building

(202) 342-0413

For information and practical tools such as databases of certified product suppliers, referral service, specification language, and the "Designing & Building with FSC" guide and forms.

Print Media

Sustainable Forestry: Philosophy, Science, and Economics by Chris Maser, DelRay Beach, St. Lucie Press, 1994.

The Business of Sustainable Forestry: Strategies for an Industry in Transition by Michael B. Jenkins and Emily T. Smith, Island Press, 1999.

Definitions

Chain-of-Custody (COC) is the path taken by raw materials, processed materials, and products from the forest to the consumer, including all successive stages of processing, transformation, manufacturing and distribution. The COC certificate number is listed on invoices for non-labeled products to document that an entity has followed FSC guidelines for product accounting. COC is not required by distributors of a product that is individually labeled with the FSC logo and manufacturer's COC number.

Sustainable Forestry is the practice of managing forest resources to meet the long-term forest product needs of humans while maintaining the biodiversity of forested landscapes. The primary goal is to restore, enhance and sustain a full range of forest values—economic, social and ecological.

A **Vendor** is defined as the company that supplies wood products to building project contractors or subcontractors for on-site installation.

SS	WE	EA	MR	EQ	ID
Credit 7					