

Guide to the Use of Wood in LEED™ Projects

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Provides design teams and projects the opportunity to be awarded points for exceptional performance above the requirements set by the LEED™ Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED™ Green Building Rating System.

ID Credits 1.1 to 1.4

Up to 4 points are possible under this category.

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Introduction

The primary intent of this guide is to provide information to the design community and to the wood products community about the LEED™ rating system and how that system relates to the use of wood products. It is hoped that this guide will serve as a tool to those interested in pursuing LEED™ certification for their projects, by helping them to gain an understanding of the opportunities and challenges of incorporating wood products in their designs, and the requirements of the relevant LEED™ credits. This guide should also help to inform and provide background information to suppliers, contractors and related industries, all of whom are vital links in the LEED™ certification process.

The amount of wood which is incorporated into buildings can vary tremendously depending on both

building type (institutional, commercial, industrial etc.) and building classification (combustible or non-combustible). As illustrated in the Wood in Construction Table in Appendix A, the value of wood products alone can exceed 40% of the total value of construction materials. The values in this table have been derived from the material and labour cost estimates prepared for various projects. The school building examples may be seen as a fair representation of typical new school construction in British Columbia, as the architectural program and floor areas (and hence the number of rooms, doors, building and roof areas and partitions etc.) are based on current BC Ministry of Education standards. As also indicated in the Table, the costs of various components of buildings such as substructure, above-grade structure, exterior and interior finishes, and

Organization of the Document:

The document contains a section devoted to each credit for which wood plays a significant role, either directly, as in the **Local/Regional Materials Credit**, which requires that a calculation of the percent of material harvested within a five hundred mile distance from the project be completed, or indirectly, as in **Low Emitting Materials - Composite Wood Credit** which prohibits the presence of certain binders.

Within each section of the guide, wording has been inserted directly from the *LEED™ Green Building Rating System Version 2.1* (<http://www.usgbc.org/LEED/publications.asp>), for the **Intent Requirements, Submittals** and **Referenced Standards** subsections to avoid any reader confusion.

A short introductory paragraph serves to give some background information on the credit topic and/or referenced standard as appropriate.

Sections on **LEED™ Implementation Strategies, Project Specifications** and **LEED™ Documentation** attempt to explain what is required to include in the contract documents and subsequent submittal package to achieve the Credit Intent.

LEED™ Credit Synergies helps to explain relationships to other LEED™ credits. For example, dimension lumber which is locally milled would qualify to be counted towards the requirement of MR Credit 5.1 for 20% of the building materials and products to be manufactured locally. If that same lumber was harvested locally, it would also qualify to be counted towards the requirement of MR Credit 5.2 for 50% of the locally manufactured products to be extracted or harvested locally. If this same lumber were certified, it would also be eligible to be counted towards the requirements of MR Credit 7 Certified Wood.

Sustainable Design Issues provides commentary and overview on issues related to the intent and content of each credit.

millwork may vary tremendously between different building types.

The use of wood is addressed directly in only one of the sixty-five available credits: **Materials and Resources Credit 7: Certified Wood**. However, wood use is involved indirectly in at least 10 credits. In all cases where wood or wood products have been selected for use within a building, there are additional opportunities to achieve recognition within the LEED™ rating system. Given the high quality and ready availability of wood and the proximity of the many primary wood and composite wood processing facilities within BC, there are many opportunities available to incorporate wood into buildings in BC and to comply with the requirements of the LEED™ system.

Challenges facing the Design Community:

To meet the requirements of the current version of LEED™, the primary challenge facing the LEED™ design team in the use of wood is to assemble the required documentation. The type of data required by LEED™ for wood related credits includes:

- Cost data: documentation of the base cost of building products - without the related labour component associated with fabrication and installation of these products.
- Source of materials: documentation to verify where materials have been harvested or originate and their place of manufacture or assembly.
- Composition of materials: documentation to verify that all components of a given product conform to the requirements of the specific LEED™ credit.

The documentation required to verify source and composition of building products has traditionally not been required of materials suppliers and contractors by the contract documents. Consequently, building designers must adapt the relevant aspects of their specifications and submittals requirements to

include reference to and assign responsibility for submittals to conform to the LEED™ required documentation. Documenting costs in the manner required by the related LEED™ credits is also a challenge: cost estimates must be adapted to allow cost of materials to be extracted separately from the cost of labour, and building contractors traditionally have not been required to submit detailed cost information in this manner.

Sustainable Design Issues

While LEED™ has been successful at accelerating the environmental awareness of the entire design and construction sector, it has some shortcomings. As such, some of its credits may not lead to the intended environmental, economic or social effects. In order to address such issues on a continuous basis, the USGBC has committed to major revisions of LEED™ on a regular basis.

Life Cycle Assessment (LCA) is an emerging concept which has the potential to enable the evaluation of building products in a cradle-to-grave context. A comprehensive database or LCA reference standard of building products - which would enable comparisons between different products and processes - has not yet been developed, so the criteria currently employed by LEED™ rely on third party regulations and standards.

Better integration of LCA into LEED™ would give building designers the ability to make choices based on a clearer understanding of the overall environmental impacts associated with different building products and materials.

A Brief Introduction to LEED™

The LEED™ (Leadership in Energy and Environmental Design) rating system is an effort by the U.S. Green Building Council to provide a standard benchmark for the design of green or high performance buildings against which individual buildings can be measured.

The LEED™ rating system identifies five Design Categories:

- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environmental Quality

A sixth category – Innovation & Design Process encourages designers to implement innovative strategies to address performance issues not directly covered by the requirements which characterize the other 5 design categories.

The system operates on a Credit system, awarding points for credits successfully achieved through the design, construction and certification process. There are a total of sixty-five available credits within the six design categories, some offering more than one point for a total of sixty-nine possible points.

LEED™ certified projects are rated according to the number of credits which have been achieved.

- LEED™ Certified 26 -32 points
- LEED™ Silver 33 - 38 points
- LEED™ Gold 39 - 51 points
- LEED™ Platinum 52 + points

The USGBC publishes the *LEED™ Green Building Rating System* (<http://www.usgbc.org/LEED/publications.asp>), a document which explains the Design Categories and provides some information on the intentions and requirements which must be fulfilled in order to be awarded a point(s) for each **credit**. The (USGBC) document is structured with the following subheadings for each Credit:

- Intent
- Requirement
- Submittals
- Technologies & Strategies

Participation in the LEED™ certification process is on a voluntary basis. LEED™ does not establish its own set of standards; rather, it makes extensive use of existing standards which have been developed by third parties. Finally, LEED™ relies on a self-assessing and independent verification system. The design team assesses the design, collects and produces the required documentation, and submits it for certification to the USGBC.

The USGBC has also provided for the resolution of conflicts and ambiguities within the requirements through a process referred to as Credit Interpretation. When a question of this nature does arise, USGBC members can access a webpage containing all of the Credit Interpretations made to date to determine if the same situation has been encountered previously. New queries can be made in writing, and all responses from the USGBC are posted on the Credit Interpretation webpage.

The use of LEED™ as a Sustainable Design tool in the United States and Canada has grown dramatically since LEED™ was first introduced in 1998. As of May 2003, there are a total of 737 LEED™ registered projects, of which 34 are located in Canada. Of the 21 LEED™ registered projects in British Columbia to date, one has received LEED™ certification - The Vancouver Island Technology Park. LEED™-BC, a BC version of LEED™, which has been developed to incorporate regional standards, was approved by the USGBC in May 2003.

The Canada Green Building Council was officially initiated in August of 2003. It has been authorized by the USGBC to certify buildings registered under LEED™-BC, and LEED™ Canada, once set up.

Materials & Resources

MR Credit 2 | Construction Waste Management

Intent:

Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements

Credit 2.1 Divert 50% from Landfill

Credit 2.2 Divert 75% from landfill

Referenced Standards

None

Wood Waste

Up to one third of solid waste, by weight, in Canada is generated by construction, renovation and demolition projects. More than a quarter of this solid waste is wood, much of which could be diverted from landfill if it was properly separated from other waste and not contaminated. Clean dimensional wood, plywood, OSB and particle board can all be successfully recycled.

The tipping fees for wood products are approximately half that of regular waste, where recycling facilities exist. In the Lower Mainland, clean wood is chipped and sold to be used in fibreboard. Lesser quality wood is chipped and processed for use as animal bedding, ground cover, etc. Wood pallets, even if broken or damaged can be recycled for free.

Unfortunately, outside of urban areas, facilities often do not exist for the recycling of wood.

Project Specifications

Project specifications must include the submission of a [Waste Management Plan](#) showing how the specified percentage of waste will be diverted from landfill. Requirements for a submission with each application for payment summarizing waste disposal should also be required to track landfill diversion as the project progresses.

Waste Management Programs work best if a designated person on site organizes and is responsible for its implementation. This task would include education and communicating with subcontractors. Depending on the site, bins or piles will need to be located for recyclable products.

Recycling areas on construction sites should be located to avoid contamination of materials to be recycled and also to prevent storm water contamination. Hauling needs to be organized to minimize trips and optimize loads.

Carpentry specification sections should include reference to the Waste Management Plan as well as reuse of wood scraps for other purposes such as blocking and strapping.

LEED™ Documentation

Submittals:

Provide the signed LEED™ Letter Template tabulating the total waste material, quantities diverted and the means of diversion, and declaring that the credit requirements have been met.

Requirements:

Develop and implement a waste management plan, quantifying material diversion goals. Recycle and/or salvage at least 50% of construction, demolition and

land clearing waste. Calculations can be done by weight or volume, but must be consistent throughout.

LEED™ Implementation Strategies

Typical construction projects do not account for separating waste, even though the total amount of savings over the life of a project can be significant. Disposal is often achieved in the most expedient way possible. Contractors are wary of the extra labour, organization, and costs required to sort and recycle waste materials. Adjustments to cash flow may be required in order to implement the Waste Management Program, for example, funds are often required earlier in the project.

Recycling wood at strategic times during the project, such as forming and framing, can collect a substantial amount of wood waste while optimizing space and effort.

Mixed recyclable material is accepted at some facilities, which would allow wood waste and other recyclables to be mixed together while still diverting waste from landfill and saving money on tipping fees.

Construction waste that is reused or recycled on site can also be used for this credit. Possibilities exist to chip wood on site to reuse for landscaping. Wood scraps from framing can be reused for other purposes.

This credit is relatively easy to obtain for projects that are located in areas where recycling is available. 26 out of 30 LEED™ certified projects have obtained the credit, in fact, many of these projects have achieved 75% diversion from landfill.

Credit Synergies

MR Credit 1: Building Reuse:

If the project involves the re-use of an existing

building, the materials that are being salvaged can be counted in this credit as being diverted from landfill, and in MR Credit 1 as building reuse.

Sustainable Design Issues

Diversion of solid waste from landfill has become increasingly important with the increasing pressure on our landfill sites and significant difficulty of establishing new sites. Closing the loop and redirecting recyclable wood back into the manufacturing process avoids wasting still productive materials. Reducing waste going to landfill is a reasonable and obtainable goal.

Regulation by the GVRD (Greater Vancouver Regional District) is expected to mandate certain levels of recycling as well as the tracking of waste. Ongoing private and government partnership is required to ensure market conditions help reduce the amount of landfill by providing facilities for recycling with the appropriate tipping fees. Facilities and methods for solid waste recycling in more remote areas need to be developed.

Although large projects have made strides in solid waste issues, smaller projects such as single family dwellings have not reached significant levels of diversion of waste from landfill. Recycling small amounts of waste becomes less efficient and facilities and methods for smaller projects are not widely established.

Reducing the amount of wood used in a given project by careful planning and by employing design strategies such as wood optimization measures would further minimize waste, but this additional effort is not currently reflected in this credit.

Links & References

Materials & Resources

MR Credit 3 | Resource Re-use

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

Credit 3.1 Use salvaged, refurbished or reused materials, products, and furnishings for at least 5% of building materials

Credit 3.2 Use salvaged, refurbished or reused materials, products, and furnishings for at least 10% of building materials

Referenced Standards

None

Products

Wood and wood products can be successfully salvaged for reuse from the deconstruction of existing buildings. Wood products that have proved worthwhile to salvage include beams, posts, flooring, paneling, doors and frames, furniture and decorative items. These products may be used for their original application or modified for reuse in a different way; in either case, they may be treated or machined according to their final application.

Using salvaged wood and wood products is undeniably a good decision environmentally, but may also be preferable from the point of view of quality, availability, price and appearance. Salvaged wood can be of higher quality than equivalent wood milled today, tending to be denser and to have fewer knots. Some products such as heavy timbers, large dimension lumber and glulam beams are very expensive or

perhaps unavailable as new products, using salvaged products may be the only feasible way to obtain these items. Other salvaged products which are more common, such as dimension lumber, tongue and groove decking, doors, and frames, may actually be cheaper than equivalent new products, and may be a good choice if the quantity of specific items required can be found. Finally, older wood products that are exposed to view in new buildings may be preferable from a visual point of view; aged wood can have a lot of character and be a beautiful rich colour, qualities which could not be obtained using new products.

Supplies of salvaged wood and wood products are limited at the present time. Only 6 projects out of 30 certified LEED™ projects have reached the percentages required for this credit. Most of the projects that have achieved this credit secure reused material on a pre-arranged basis from an on-site building or adjacent building. Larger projects may require this sort of pre-arranged source of materials to make wood product reuse feasible.

Smaller projects can make use of salvaged wood from salvaged building material suppliers or demolition/deconstruction contractors if quantities are available.

Proximity to potential source material is a factor in the reuse of materials; urban areas have more existing source buildings. The further materials have to be transported, the more expensive they become and the less desirable they become in terms of sustainability.

Project Specifications

Specifying salvaged wood products must be carefully researched early in the design stage of a project.

Material sources and procedures for incorporating materials into the building need to be established early on so they can be worked into the design.

Structural design in particular must respond to the components and sizes available. Components can be specified in terms of size ranges to allow flexibility in the actual wood product used. Salvaged wood can be of better quality than lumber available today. Even so, in structural applications it may be hard to reuse because of the lack of grade stamps. All lumber incorporated into contemporary buildings is required to be graded by a certified grader or it is assumed to be of the lowest grade.

Specifications calling for [deconstruction](#) or hand demolition, rather than demolition in the traditional manner with heavy machinery, must be used for existing buildings that are a source of salvaged materials, if this work falls within the scope of work.

Specifications must require that the salvaged wood product supplier submits a list of all products that are salvaged, refurbished or reused and indicates the cost of these products. Contract documents should also specify that the contractor submit the necessary cost breakdown information which is required to enable the design team to complete calculations for the cost of the relevant components.

LEED™ Documentation

Submittals

Provide the LEED™ signed Letter Template declaring that the credit requirements have been met and listing each material or product used to meet this credit. Include details demonstrating that the project incorporates the required percentage of reused materials and products, and showing their costs and the total cost of materials for the project.

Calculations:

Include calculations demonstrating that the project



incorporates the required percentage of reused materials and products and showing their cost as a percentage of reused resources relative to the total cost of all materials for the project. The LEED™ Reference Guide illustrates a sample spreadsheet that shows the level of detail expected in the submittal and an acceptable method of calculating the required percentages and costs. In cases where the salvaged or refurbished materials cost is below market value, replacement cost should be used.

LEED™ Implementation Strategies

Salvaged wood products must be carefully researched in the early design stage in terms of selection of available existing materials. Sufficient quantities of materials of the required quality must be actually available at a cost that works within the project context.

The initial cost of salvaged wood is the same or cheaper than new, however, this does not always mean that the cost will be less when all factors have been taken into account. The cost of refurbishing and incorporating wood or wood products into a new building may be high. Projects that incorporate reused wood typically require more time for design, construction, and sourcing of materials than a conventional project.

Under the traditional Design-Bid-Build process which most projects follow, it is difficult to incorporate

salvaged materials. Salvaged products, unlike other types of building materials, are not available in a consistent manner, so it is difficult to base a building design on the possible availability of these salvaged products.

In order to assure the timely availability of salvaged wood products, the Project Team may need to source and purchase these products well in advance of the actual construction. The additional work of re-processing and grading the products complicates this process and will require the support of the Owner to disburse the necessary funds.

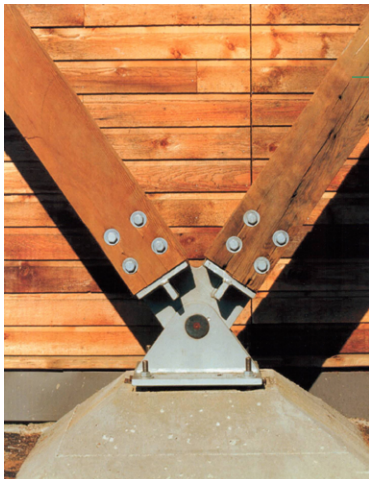
While the 5% minimum requirement for salvaged material is a challenge to attain with wood products alone, incorporating other salvaged materials can help achieve the target.

Credit Synergies

MR credit 5.

Salvaged materials that are sourced within 500 miles of the project site qualify for the manufacturing point of the credit as well as for the harvesting point.

Salvaged materials cannot be applied to MR Credits 1, 2, 4, 6, and 7.



Sustainable Design Issues

The reuse of wood and wood products has a potential for playing a larger role in the provision of wood materials in Canada as markets develop for salvaged materials. The reuse of materials avoids the waste of still productive materials and related landfilling impacts, as well as reducing the negative impact on the environment which would have occurred if the wood products were newly milled or produced. Diverting materials from the construction waste stream reduces the need for landfill and the consequent impact on the environment. Presently, the supply of salvaged material is limited. As markets develop, more buildings will be able to use a substantial amount of salvaged, refurbished or reused material and products.

Links & References

Materials & Resources

MR Credit 4 | Recycled Content

Intent:

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

Requirements:

Credit MR 4 .1: Use materials with recycled content such that post-consumer recycled content constitutes at least 5% of the total value of the materials in the project OR combined post-consumer and post-industrial recycled content constitutes at least 10%.

Credit MR 4.2: Use materials with recycled content such that post-consumer recycled content constitutes at least 10% of the total value of the materials in the project OR combined post-consumer and post-industrial recycled content constitutes at least 20%.

Referenced Standards:

Recycled content materials shall be defined in accordance with the [Federal Trade Commission document Guides for the Use of Environmental Marketing Claims](#)

Recycled Content is defined as follows in the referenced standard:

Recycled content: A recycled content claim may be made only for materials that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer). To the extent the source of recycled content includes pre-consumer material, the manufacturer or advertiser must have substantiation for concluding that the pre-consumer material would otherwise have

entered the solid waste stream. In asserting a recycled content claim, distinctions may be made between pre-consumer and post-consumer materials. Where such distinctions are asserted, any express or implied claim about the specific pre-consumer or post-consumer content of a product or package must be substantiated.

The value of the recycled content portion of a material or furnishing shall be determined by dividing the weight of recycled content in the item by the total weight of all material in the item, then multiplying the resulting percentage by the total value of the item.

Products

The classes of products listed below may be classified as containing recycled content if they are produced using pre-consumer waste material from other milling processes or wood processing operations.

Particleboard: particleboard is an interior grade panel product comprised of wood particles of various sizes combined with a binder. The source material for the wood particles is often the pre-consumer waste stream of wood handling or manufacturing processes of other wood products.

Fibreboard: various densities are available in a variety of thicknesses and sizes. Referred to as High Density Fibreboard (HDF), Medium Density Fibreboard (MDF), and Low Density Fibreboard (LDF). Can be used as interior non structural panels.

There are MDF products available which are made from recycled post consumer waste products and from urban waste wood.

There are also products which contain recycled fiber

in combination with cement and other materials, and are marketed for uses such as decking and siding.

Project Specifications

Specifying Recycled Content:

In order to conform to the requirements of this credit, project specifications should require that product description sheets prepared by the manufacturer/supplier which declare the recycled content of the wood products be submitted for review as part of the shop drawings and submittals process during construction.

The manufacturer/supplier should be required to provide documentation which confirms the composition of each product to be incorporated.

Contract documents should specify that the contractor submit the necessary cost breakdown information which is required to enable the design team to complete calculations for cost of the relevant products as well as the relevant labour and material components.

LEED™ Credit Synergies

The following are possible LEED™ credit synergies to consider when reviewing the selection of wood and wood composite products which contain recycled products:

MR Credit 5: Local/Regional Materials:

With the abundance of local primary producers in the BC, there is a ready source of material that fits the requirements to qualify as recycled product. Within the prescribed distance limits of MR Credit 5, there are numerous facilities which produce products which may qualify to be included under this credit.



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MR Credit 7: Certified Wood:

Fiber from certified wood sources can be combined with non certified fiber in composite wood products. The certified fiber content of these composite wood products incorporated into the project may also be included in the quantity of certified wood included in the project.

EQ Credit 4.4: Low Emitting materials - Composite Wood:

This credit restricts the use of added urea formaldehyde (UF) resins in the project. Currently, many of the particleboard and other composite panel products available do incorporate UF resin as a binder. Use of these UF containing products would cause the project to forego qualification for EQ Credit 4.4. MDF is available which does not contain UF binders.

Sustainable Design Issues

The general intent of this LEED™ credit is to encourage the use of products which contain recycled materials. By recovering waste materials and incorporating them into composite wood products, the overall efficiency of wood processing is increased, the overall volume of solid waste reduced and consequently there is less pressure to harvest virgin materials for the manufacture of equivalent products.

Product Information

The challenge facing the LEED™ design team is the process of assembling the required documentation. The construction industry has traditionally not been required to provide the level of documentation required by this credit. For locally manufactured composite wood products as described in this section, it should be a fairly straightforward process to document the composition of the products.

However, it does take some effort to obtain this type of documentation of the source of raw materials for wood industry building products, as this information has not traditionally been requested by the design community or required of suppliers and building contractor for submittals during the construction process.



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Links + References

Materials & Resources

MR Credit 5 | Local / Regional Materials

Intent:

Increase demand for building products that are extracted and manufactured within the region, thereby supporting the regional economy and reducing the environmental impacts resulting from their transportation.

Requirement:

Two points are available under this Credit.

Credit MR 5.1: Use a minimum of 20% of materials and products that are manufactured regionally within a radius of 500 miles

Credit MR 5.2: Of the regionally manufactured materials documented for MR Credit 5.1, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within 500 miles.

Referenced Standards:

none

Local/Regional Products

The local wood industry supplies many raw materials which are used to produce lumber, composite wood products, and pre-assembled products such as trusses. This LEED™ credit requires that the source of the raw material and its point of manufacture be identified, and that they meet the criteria for proximity to the project.

Project Specifications

Specifying Locally Harvested Materials: In Canada, the Agreement on Internal Trade (AIT) requires public agencies to follow a policy of open procure-

ment through the public tender process. As such, public agencies cannot exercise preferential treatment based on geography when procuring goods and services. However, these LEED™ points should be available to public agencies as long as their project's specifications do not require or suggest that locally harvested/manufactured wood products will be favoured over other products. Private projects are not governed by the AIT.

Specifications should require that product description sheets prepared by the local manufacturer/supplier which declare the location of manufacture of wood products be submitted for review as part of the shop drawings and submittals process during construction. In order to qualify for MR 5 Credits, the manufacturer/supplier should be required to provide documentation which confirms the source for each product.

The percentage requirements for local/regional materials refers to cost of material (not including labour and equipment related to installation) compared with the material costs for the project. Contract documents should specify that the contractor submit the necessary cost breakdown information which is required to enable the design team to complete calculations for cost of the relevant components as well as the labour and material components.



LEED™ Implementation Strategies

There are a multitude of primary and composite wood products harvested and manufactured in BC, within the prescribed distance limit of 500 miles between point of manufacture and project site for both Credits 5.1, and 5.2. Products which are manufactured in BC from BC sourced wood products may be eligible to be counted towards both credits. As mentioned above, LEED™ defines manufacture as the location of final assembly of a product (refer to the LEED™ documentation for actual wording), which would allow most BC wood and composite wood products to be eligible for both points available under this credit.

In public projects it may be possible for the Owner to arrange the pre-purchase of certain wood products. Storage of the material until needed, and transportation of the material to the site are factors which need to be considered.

LEED™ Documentation

LEED™ Template Letter: submit the LEED™ Letter Template, completed and signed, stating that the credit requirements have been met.

Calculations: Include calculations demonstrating that



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the project incorporates the required percentage of regional materials/products and showing their cost, the percentage of regional components, the distance from project to manufacturer, and the total cost of all materials for the project. The LEED™ Reference Guide illustrates a sample spreadsheet which shows the level of detail expected in the submittal and an acceptable method of calculating the required percentages and costs.

LEED™ Credit Synergies

The following are possible LEED™ credit synergies to consider when reviewing the selection of wood and wood composite products:

MR Credit 4: Recycled Content.

Many composite wood products are manufactured from the waste stream of sawmills and other primary wood processing facilities. These products may qualify as containing post-industrial recycled material.

MR Credit 7: Certified Wood:

Any certified wood products incorporated into the project may also qualify for MR Credit 7 if these products also meet the requirements for local/regional materials.

EQ Credit 4.4: Low Emitting Materials - Composite Wood:

Any locally-manufactured composite wood products may qualify towards this credit.

Innovation In Design:

Several LEED™ 2.0 projects have been successful in achieving a point under this credit category for the exemplary use of local/regional materials.

Sustainable Design Issues

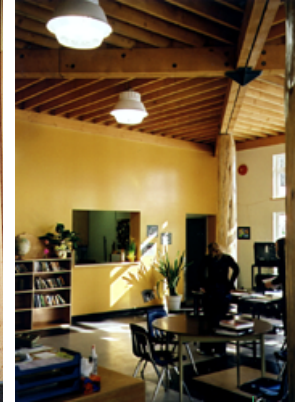
The general intent of this LEED™ credit is to encourage the use of regional raw materials and manufactured products, reducing the expenditure of resources necessary to transport building materials over long distances, and to encourage participation in the local and regional economy. There is significant potential for the wood industry to promote the sustainable aspects of the relationship of wood products to the local/regional economy and the design and construction of buildings.

Product Information

The challenge facing the LEED™ design team is the process of assembling the required documentation. Although a large percentage of wood and composite wood products which are utilized in our local buildings are manufactured locally from wood originating from local forests, the manufacturers and



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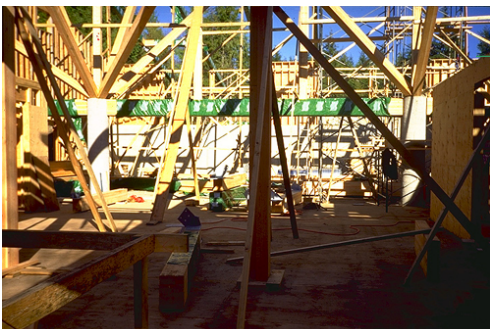


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suppliers do not market their products emphasizing this feature.

Consequently, it does take some effort to obtain this type of documentation of the source of raw materials for wood industry building products, as this information has not traditionally been requested by the design community or required of suppliers and building contractors for submittals during the construction process.

Links + References



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Materials & Resources

MR Credit 6 | Rapidly Renewable Materials

Intent:

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

Requirement:

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 5% of the total value of all building materials and products used in the project.

Referenced Standards:

none

Products

The classes of products which meet this requirement should have a harvest cycle of 10 years or less. Our research to date has not successfully identified a single wood or composite wood product which meets this requirement and is manufactured in Canada from Canadian fiber.

The *LEED™ Reference Guide Version 2.0* refers to Poplar OSB as a product which meets this requirement. In Canada, the harvest cycle for similar wood species is considerably longer.

Project Specifications

In order to conform to the requirements of this credit, project specifications should require that product description sheets prepared by the manufacturer/supplier which declare the rapidly renewable content of the wood products be submitted for review as part of the shop drawings and submittals process during construction.

The manufacturer/supplier should be required to provide documentation which confirms the composition of each product to be incorporated.

Contract documents should specify that the contractor submit the necessary cost breakdown information which is required to enable the design team to complete calculations for cost of the relevant products as well as the relevant labour and material components.

LEED™ Documentation

Provide the LEED™ Letter Template, signed by the Architect or responsible party, declaring that the credit requirements have been met. Include calculations demonstrating that the project incorporates the required percentage of rapidly renewable products. Show their cost and the percentage of rapidly renewable components, and the total cost of all materials for the project.

LEED™ Credit Synergies

The following are possible LEED™ credit synergies to consider when reviewing the selection of wood and wood composite products which contain rapidly renewable products.

MR Credit 7: Certified Wood:

Fiber from certified wood sources can be combined with non-certified fiber in composite wood products. The certified fiber content of these composite wood products incorporated into the project may also be included in the quantity of certified wood included in the project.

EQ Credit 4.4: Low Emitting materials - Composite Wood:

This credit restricts the use of added urea formaldehyde (UF) resins in the project. Any composite wood products containing UF resins would cause the project to forego qualification for this credit.

Sustainable Design Issues

The general intent of this LEED™ credit is to encourage the use of products which have a substantially lower harvest cycle than traditional building materials. In the context of the harvest cycle of trees in the typical Canadian forest, the ten-year harvest cycle seems to rule out the possibility of using Canadian wood products.

On a more positive note, OSB and other composite wood products do make extensive use of species, such as aspen or poplar, not traditionally used for lumber, many of which have a potentially much shorter harvest cycle than the species traditionally used for lumber.

It is interesting to note that only 2 of the 32 LEED™ 2.0 certified projects for which the LEED™ score sheets were posted on the USGBC website at the time of publication of this paper, received a point for the Rapidly Renewable Materials credit, an indication of the relative difficulty and/or cost of incorporating the limited range of products available with the specified harvest cycle.

Links + References

Materials & Resources

MR Credit 7 | Certified Wood

Intent:

Encourage environmentally responsible forest management.

Requirements:

Use a minimum of 50% of wood-based materials and products, certified in accordance with the Forest Stewardship Council's Principles and Criteria, for wood building components including, but not limited to, structural framing and general dimensional framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete formwork and pedestrian barriers. To qualify for this credit, wood-based materials and products must constitute at least 2% of the total value of all materials for the building.

Submittals:

Provide the LEED™ Letter Template, signed by the architect, owner or responsible party, declaring that the credit requirements have been met and listing the FSC-certified materials and products used. Include calculations demonstrating that the project incorporates the required percentage of FSC-certified materials/products and their cost together with the total cost of all materials for the project. For each material/product used to meet these requirements, provide the vendor's or manufacturer's Forest Stewardship Council chain-of-custody certificate number.

Referenced Standards:

[Forest Stewardship Council Guidelines](#)

Sustainable Forest Management touches on all aspects of forest products from harvest through the milling and other processes to the end user through *chain-of-custody documentation*. Sustainable forest management practice also includes a process to verify

that the sustainable principles are upheld on the ground. The industry has taken major steps to embrace these practices, but currently only a minority of BC's working forests have been certified by one of the three predominant certification organizations in North America.

Currently, the only sustainable wood products which LEED™ recognizes are those certified by the Forest Stewardship Council. A Canadian standard [CSA Z809](#) along with the PLUS 1163 Chain of Custody has been developed, and has been recently updated with a major revision issued in December 2002.

Certification of wood products is an extremely complex process with many published articles which detail the many interrelated issues. (Please refer to the Links section).

Project Specifications

Specifications should include the following:

- Contact information on certified wood suppliers should be included in the bid package
- As with other wood products which are subject to availability and cost factors, such as salvaged timbers and lumber, consider arranging for the prepurchase of the certified material if the Owner is supportive.
- The LEED™ requirement is to incorporate 50% of wood-based materials – specifications should be specific on the certified content for each distinct product type.
- Contract documents should specify that the contractor submit the necessary cost breakdown information which is required to enable the design team to complete calculations for cost of the relevant components as well as the labour and material components.
- Specifications should require that any supporting

documentation needed to verify the status of the wood products be submitted. At the time of bidding a certified wood compliance form should be required. Examples of the required documents are available at the [Certified Forests Products Council](#).

LEED™ Implementation Strategies

As the supply of FSC certified wood is currently very limited, it is important to identify for which aspects of the project it will be possible to source certified products. During the preliminary design phase, potential suppliers of the various products should be identified. All wood incorporated into the building including structural, finishes, furnishings (if these are part of the project scope) and temporary structures such as formwork are eligible to be included in the percentage calculation. Composite products with varying levels of certified content such as particle board and MDF are also eligible to be included in the calculation.

LEED™ Documentation

LEED™ Template Letter: submit the LEED™ Letter Template, completed and signed, stating that the credit requirements have been met.

Calculations: Include calculations demonstrating that the project incorporates the required percentage of certified wood products and showing their cost, the percentage of each component, and the total cost of all materials for the project. The LEED™ Reference Guide includes a sample spreadsheet which illustrates the level of detail expected in the submittal and an acceptable method of calculating the required percentages and costs.

Wood Certification Documentation: Certification labels or product certificates and contractor invoices may be required to verify the chain-of-custody of

each product.

LEED™ Credit Synergies

The following are possible LEED™ credit synergies to consider when reviewing the selection of wood and wood composite products which contain recycled products:

MR Credit 4: Recycled Content:

Many composite wood products are manufactured from the waste stream of sawmills and other primary wood processing facilities. Waste from FSC certified stock used in the manufacture of composite wood products is also eligible to be counted as post-industrial recycled material.

MR Credit 5: Local/Regional Materials:


Any local or regionally harvested FSC certified wood products incorporated into the project may also qualify for this credit.

EQ Credit 4.4: Low Emitting Materials – Composite Wood:

Composite wood products made from FSC Certified source material may also qualify for this credit provided that the products themselves comply with the requirements of this credit.

Sustainable Design Issues

The intent of this LEED™ credit is to encourage sustainable forestry management practices. The emergence of certification standards and the movement by industry to embrace these practices are steps on the path to including Life Cycle Assessment (LCA) as a factor in the measurement of the greenness of building materials. LCA, as the name implies, looks at the environmental impact over the entire life of building materials, from harvest or extraction of the raw materials, and includes the environmental impact of manufacturing processes and factors such



as embodied energy. Viewed in this way, wood products, carrying a *chain-of-custody* certification compare favourably with other types of building materials such as steel.

Product Information

The challenge facing the LEED™ design team is the limitation created by the small percentage of FSC certified wood products available in the market. This market condition can result in high demand for limited supply and may affect the cost adversely. It is interesting to note that of the 32 LEED™ 2.0 certified projects for which the LEED™ score sheets were posted on the USGBC website at the time of publication of this paper, only seven received a point for the Certified Wood credit, a possible indication of the relative difficulty in achieving the required percentage of FSC certified wood at an acceptable cost.

Links + References

Indoor Environmental Quality

EQ Credit 4.1 | Low Emitting Materials: Adhesives & Sealants

Intent:

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirement:

The VOC content of adhesives and sealants used must be less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, and all sealants used as fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

Referenced Standards:

[South Coast Air Quality Management District \(SCAQMD\) Rule #1168](#)

[Bay Area Air Quality Management District Regulation 8, Rule 51](#)

term, can affect air quality significantly. In addition, many adhesives and sealants contain other toxic components although only VOCs are restricted by this credit. In general, it is preferable to use water-based products where possible as they contain less VOCs than the conventional solvent based products.

The referenced standards on which this credit is based set specific VOC content limits for adhesives and sealants used in different applications. For example, the referenced standard specifies that the VOC content of wood flooring adhesives must be less than 100 g/litre and that of structural wood member adhesive at less than 140g/litre. The VOC content limit specified for architectural sealants is less than 250 g/litre, but the sealant primer for wood need only be less than 775 g/litre.

Sealants used as fillers must also abide by the Bay Area Air Quality Management Restriction which is very similar to Rule #1168.

Volatile Organic Compounds (VOCs) in Adhesives & Sealants

The referenced standard limits the concentration of VOCs and other chemical compounds in adhesives and sealants which are used in the construction of buildings. VOCs are a group of carbon based chemical compounds which are unstable and tend to react with the environment into which they are released. VOCs contribute to the formation of ground level ozone and smog.

Acceptable Products

Although only small amounts of adhesives and sealants are used with wood in buildings, VOC off-gassing from these products, especially in the short

Project Specifications:

Wood adhesives are included in the carpentry and millwork specification sections. In each case, they should be specified to have a VOC content which falls within the limits of Rule #1168 for the specific use intended. Lower VOC, water based products and low toxicity products are available for most interior applications.

There are a myriad of different sealants and caulking available for different applications which are usually specified together in the Caulking and Sealants specification section. For each application each product should be specified to have a VOC content which falls within the limits of the referenced standard for each specific use. In general, low VOC/low toxicity sealants are available for most

indoor uses. Sealants with the lowest VOC emissions are polyurethane, latex, polysulphide, and silicone sealants.

Information regarding the actual VOC and chemical content of adhesives and sealants is not readily available on standard information sheets provided by the manufacturers of these products and further enquiries are usually necessary.

LEED™ Documentation:

Submit signed Letter Template listing the adhesives and sealants used in the building and declaring that they meet the noted requirements.

LEED™ Credit Synergies:

None.

Sustainable Design Issues

Generally, low VOC and low toxicity wood adhesives are available.

Caulking and sealants are necessary components of the building envelope and interior assemblies as their application cuts down air infiltration significantly and reduces energy loss as well as providing a seal where required. Although low or zero VOC and low toxicity products are available for some uses, other applications necessitate the use of products which can negatively effect IAQ. Many of the products intended for use in more extreme environments, such as wet or humid conditions, contain chemicals, including fungicides and petrochemicals, of varying toxicity, which are not regulated by the referenced standard for this credit.

Reducing the use of both adhesives and sealants in a building is the best way to avoid negative effects on

IAQ. Sealant use can be reduced or avoided altogether by carefully designed detailing where possible.

This credit governs only site applied adhesives and sealants used in the interiors of buildings – adhesives and sealants used in the building envelope and in assemblies fabricated off-site are not governed by the requirements of this credit.

Links & References

Indoor Environmental Quality

EQ Credit 4.2 | Low Emitting Materials: Paints & Coatings

Intent:

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirement:

VOC emissions from paints and coatings must not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

Referenced Standards:

[Green Seal's Standard GS-11](#)

Volatile Organic Compounds (VOCs) in Paint

The definition, developed by the Environmental Protection Agency (EPA), of what constitutes a VOC has been used for the purposes of this credit by the referenced standard. This standard, Green Seal GS-11, is based on this definition, but is focused exclusively on VOC and chemical content in paints. Green Seal is a non-profit organization that identifies products and services that are less harmful to the environment.

Paint is formulated from three basic components: the pigment, the binder, and the carrier. Most paints contain VOCs either in their carrier (oil based paints) or to a lesser extent in their binder (water based paints). VOCs contribute to the formation of ground level ozone and smog. Architectural coatings are estimated to be responsible for about 9% of the VOC emissions from all products in the US. This problem is considered so serious that many regions have set VOC limits for all paints to try and combat smog formation. Indoor air quality is affected directly by VOCs and their reaction with other chemicals, and

are the probable cause of many health problems. VOCs are not the only indicators of paint toxicity; paints contain a number of other chemicals, some of which are limited by GS-11. Most commercial paints contain petrochemicals and titanium dioxide pigment, both of which are major causes of pollution during their manufacturing processes, and whose contents are not limited by GS-11.

Products

Wood products often receive paint or coatings for protection or for visual appearance. Traditionally, most paints and coatings contained a high level of VOCs and other toxic chemicals. Recent developments in paint formulations have resulted in a wider selection of paints and coatings that are safer and easier to use and which approach the performance characteristics of oil-based paint. The trend has moved away from oil-based paints, which use petrochemicals as a solvent and have higher VOC levels, towards water-based paint products which have a much reduced negative effect on air quality. Low VOC paints, zero VOC paints, low-toxicity paints and recycled paints are now widely available.

Project Specifications:

Specify VOC and chemical component amounts within the limits set out in the referenced standard for all interior paints and coatings.

Specifications should require the submission of information sheets prepared by the manufacturer/supplier which indicate and highlight the chemical and VOC content of all interior paints and coatings. [The Master Painters Institute](#) has a searchable site which indicates which paints meet the level required by this standard.

LEED™ Documentation:

Provide the LEED™ signed Letter Template listing all the paints and coatings used in the building and stating that they comply with the current VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

LEED™ Credit Synergies:

The following are possible LEED™ credit synergies to consider when reviewing product selection.

MR Credit 2: Construction Waste Management.

Leftover paint can be diverted from the waste stream and sent to one of over 100 collection sites in British Columbia to be recycled. The sites have been set up by the Product Care Association using eco-fees charged at the point of sale for each gallon of paint. The diversion from waste stream can be used for this credit.

MR Credit 4: Recycled Content.

Recycled paint is made from paint that is left over from other projects, which has been collected, remixed, and made available to new users. Low VOC paint that has also been recycled is available in some locations and can qualify for MR Credit 4 as well as EQ Credit 4.2.

Sustainable Design Issues

Although chemical composition and VOC content limited by this credit are important sustainable design issues, other issues are also important in understanding the overall environmental implications related to the use of paint. The life cycle of paints and coatings used in buildings is important, for example, the longer a paint lasts, the less repainting needs to be done, and the resulting cumulative VOC emissions from paint are reduced. The colour of paint is also an important factor; lighter colours are

more environmentally friendly as they contain less pigment, which contains relatively high concentrations of chemicals within paint formulations. The amount of VOCs given off by paint and coatings with lighter colours is less, and fewer coats are needed to cover properly. Lighter colours also reflect more light and can reduce the amount of artificial light needed. Avoiding the use of paint altogether and leaving wood natural is definitely another strategy worth consideration.

Apart from issues of appearance and aesthetics, exterior paints and coatings are used on wood products as a protective barrier. High performance products are more durable and last longer in demanding environments. This credit does not restrict VOC content in paints for exterior applications; only interior paints are included in this credit. Exterior paints contribute significantly to ground level ozone and smog, and consideration of their components should also be a factor in their selection.

Links & References

Indoor Environmental Quality

EQ Credit 4.4 | Low Emitting Materials: Composite Wood

Intent:

Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and wellbeing of installers and occupants.

Requirement:

Composite Wood and agrifiber products must contain no added urea-formaldehyde resins.

Referenced Standards:

none

Composite Wood Products

Composite wood products are manufactured with two primary ingredients: wood fibre or particles from a variety of sources, and binders which serve to adhere or bind the wood components. Engineered wood products have been developed that are far stronger than comparably sized wood members, as well as being much more dimensionally stable. Many diverse products have been developed since plywood was first introduced in the early 20th century.

Types of products now available include:

- Structural engineered products which replace large dimension framing lumber and timbers, such as laminated beams and I-joists
- Structural panel products such as plywood and OSB (oriented strand board)
- Non-structural products such as Medium Density Fiberboard and strawboard.

Products

The products listed and described below are grouped by generic product type.

Many excellent resources are available which describe the composite wood products below in greater detail. See the Links & References section.

Structural Engineered Wood Products

Plywood

Plywood has been available for many years. Plywood is comprised of thin veneers of wood glued together.

Glued Laminated Timber (GLULAM)

GLULAM is manufactured from small dimension lumber glued together to form much larger structural members capable of carrying heavy loads and long spans. The manufacturing process allows the fabrication of arches and camber in beams.

Oriented Strand Board (OSB)

These structural panel products are made from flakes or slices of small diameter trees, and partly from species not traditionally used for lumber. This structural panel product is comparable in performance to plywood.

Laminated Veneer Lumber (LVL)

This product is essentially a type of plywood. The direction of the wood grain in the veneers is the same, unlike plywood, in which the veneer direction is alternated between layers. Used primarily as beams and headers.

Laminated Strand Lumber:

Comprised of strands of oriented fiber, this product is intended for use in headers, joists, and studs.

Parallel Strand Lumber

This structural product consists of long strands of veneer pressed together with a binder. Uses include beams, and columns.

Wood I-Joists

This composite product is manufactured using OSB webs. Top and bottom flanges are made from various other wood products, including sawn lumber, and LVL.

Non Structural Products

Particleboard:

This panel product is made up from small sized wood particles bound together. Used extensively in furniture and casework (cabinets).

Fibreboard:

Various densities are available in a variety of thicknesses and sizes. Referred to as high density fibreboard (HDF), medium density fibreboard (MDF), and low density fibreboard (LDF). Used for interior non structural panels.

Decking:

Includes products comprised of wood particles and other materials intended to replace solid wood in exterior deck applications.

LEED™ Implementation Strategies

In order to qualify for this LEED™ point, none of the engineered wood products incorporated into a LEED™ project may use urea formaldehyde (UF) as the binder. UF binders, are not to be confused with phenol formaldehyde (PF) binders, as both are commonly used in engineered and other composite wood products today. Both binders off-gas formaldehyde, but the quantity of gas is far less with PF binders. Another binder used is polymeric methylene diisocyanate (PMDI), which does not contain any formaldehyde.

In general, UF binders are found in most interior grade plywood, particleboard, and medium density fibreboard (MDF). PF binders are found in glue



laminated timber (GLULAM), and Laminated Veneer Lumber (LVL). PMDI binders may be found in OSB, Laminated Strand Lumber (LSL), and some MDF products and in straw particleboard products.

Project Specifications:

Specifications must clearly indicate that UF binders will not be acceptable for each product or class of product to be incorporated into the project. As mentioned above, it is necessary to clearly identify unacceptable binders in this way to avoid the use of UF in any of the composite wood products used. Manufacturer's literature for each product class should be consulted to determine which binder(s) have been used in their products. This information is generally available, but finding it requires some effort. However, as with most sustainable design issues and products, it is becoming more readily available due to increased demand on the part of the design community.

Specifications should also require that product description sheets prepared by the manufacturer which declare all components of each composite wood product be submitted for review as part of the shop drawings and submittals process during construction.

LEED™ Documentation:

The LEED™ Letter Template, which lists all composite wood products used in the project, and declares that these products contain no **added urea-formaldehyde resins**, must be included in the LEED™ documentation package.

LEED™ Credit Synergies:

The following are possible LEED™ credit synergies to consider when reviewing product selection.

MR Credit 4: Recycled Content.

There are MDF products available that have been manufactured from up to 100% waste wood products. This type of MDF is also manufactured with PF binder rather than the more common UF binder found in most MDF products. This product is priced with a slight premium over regular MDF, and is available locally. Particleboard is manufactured from waste wood products, but may contain UF binders.

MR Credit 6: Rapidly Renewable materials

Oriented Strand Board: source material must be made from stock conforming to the required 10 year harvest cycle.

MR Credit 5.1 & 5.2 Local Regional Materials:

Many composite wood products are manufactured in

BC using locally harvested wood resources and may help contribute to values required for both Credit 5.1 (regional manufacture of products) and Credit 5.2 (regional sourcing of raw materials).

MR Credit 7: Certified Wood:

Some products available contain a percentage of certified wood products, which may contribute to the percentage of certified wood products incorporated into the project.

Sustainable Design Issues

Composite wood products use many wood industry waste products, thereby increasing the overall efficiency of the industry. In addition, many of the products take advantage of species not traditionally used for making dimension lumber. Products such as GLULAM are manufactured using smaller dimension lumber than is required for solid wood timbers. All of these factors contribute to a lessening in the demand for lumber and other wood products made from the traditional species.

Although there are many composite wood products available which meet the prescribed LEED™ requirements for this point, there are relatively few composite wood products currently available which address other wood related sustainable issues.

Despite the fact that composite wood products are a more efficient use of a precious natural resource, and therefore collectively represent an industry movement in a sustainable direction, it remains a challenge for building designers to source, research, and specify composite wood products which encompass a wider range of sustainable issues than addressed by this single LEED™ point.

Links & References



Innovation and Design Process

ID Credit 1-4 | Innovation in Design

Intent:

To provide design teams and projects the opportunity to be awarded points for exceptional performance above the requirements set by the LEED™ Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED™ Green Building Rating System.

Requirements:

Credit 1.1 (1 point)

In writing, identify the intent of the proposed innovation credit, the proposed requirements for compliance, the proposed submittals to demonstrate compliance, and the design approach (strategies) that might be used to meet the requirements.

Credit 1.2 (1 point) Same as Credit 1.1

Credit 1.3 (1 point) Same as Credit 1.1

Credit 1.4 (1 point) Same as Credit 1.1

Referenced Standards:

none

Submittals:

Provide the proposal(s) within the LEED™ Letter Template (including intent, requirements, submittals and possible strategies and relevant evidence of performance achieved.

LEED™ Implementation Strategies:

The intent of this credit is to:

- encourage design teams to pursue and implement design innovation in areas of sustainable design not defined in the other five LEED™ categories
- encourage design teams to pursue and implement designs which substantially exceed the prescriptive requirements for any of the other LEED™ credits.

There are 4 individual credits available within this category. Any single design strategy is eligible to receive a maximum of a single credit. It is possible for a project to achieve all four credits available in this category with the design and implementation of four distinct design strategies.

The USGBC has established the Credit Interpretation process to respond to queries regarding ambiguities in the credit requirements, and to create a means by which design teams can query the potential of specific Innovative Design concepts for credit approval. It is recommended that design teams submit queries for interpretation during the early design stage to gain clarification as to whether the particular strategy proposed is appropriate and will be eligible to qualify for a credit.

Credit interpretations from all past queries are posted and available for viewing to USGBC members on the LEED™ website. These interpretations are an excellent resource for consultants to gain insight into questions which have been raised by other design teams in their efforts to successfully implement design strategies acceptable for credit, and also to understand the approach and the criteria which the USGBC has applied to innovative design strategies.

Potential Technologies and Strategies

- Substantially exceed a LEED™ performance credit such as energy performance or water efficiency.
- Apply strategies or measures that are not covered by LEED™ such as acoustic performance, education of occupants, community development, or lifecycle analysis of material choices.

Project Specifications:

See LEED™ documentation below.

successfully demonstrated that the requirements for some of the credits can be exceeded by a substantial margin.

LEED™ Documentation:

In general, documentation approach required by the USGBC for credits which fall under the other five categories involve submittals which include detailed documentation of the relevant aspect of the design, as well as supporting documentation which verifies that the design intent has actually been implemented in the completed building. Innovative design strategies, if deemed appropriate and that demonstrate environmental benefit, are required to be accompanied by a similar level of documentation for both the design and verification aspects.

Links & References

LEED™ Credit Synergies:

Innovative Design credits have been awarded for exceeding the prescribed benchmarks for specific LEED™ credits by a substantial amount.

Within the Materials and Resources category, Innovative Design credits have been awarded for:

- Exemplary Performance – Local Manufactured Materials
- Exemplary Performance – Local Harvested Materials
- Construction Waste Management
- Exemplary Recycled Content

One certified project has gained a credit for the use of non CCA preservative wood treatment.

Sustainable Design Issues

As is the nature of prescriptive rating systems, the standards embedded within it are the minimum acceptable. Many LEED™ certified projects have

References + Information Links

General

- **LEED™ Green Building Rating System** Version 2.1, November 2002, U.S. Green Building Council.
- **LEED™ BC Adaptation Guide for Facilitating the Use of the LEED™ Green Building System**, March 2003. DRAFT ONLY.
- **LEED™ Reference Guide Version 2.0**, June 2001, U.S. Green Building Council.

MR Credit 2 | Construction Waste Management

- **GVRD (Greater Vancouver Regional District)**
<http://www.gvrd.bc.ca/recycling-and-garbage/business-services.htm>

The GVRD's (Greater Vancouver Regional District) Construction/ Demolition/ Recycling Program makes the following information available for the GVRD area and provides general information for other areas:

- *Project Waste Management Master Specification*
 - *Job Site Recycling a Guide of Building Contractors*
 - *Demolition & Salvage Guide*
 - *Local Recycling Depots*
 - *Hauling Services*
- **Public Works and Government Services Canada Environmentally Responsible Construction and Renovation Handbook**
http://www.pwgsc.gc.ca/rps/aes/content/ercr_handbook_chap8-e.html

Document provides general information on construction waste see: "Construction, Renovation and Demolition Waste" Chapter 8.

- **The LA SRCRD Los Angeles Solid Resources Citywide Recycling Division**
<http://www.ci.la.ca.us/SAN/srcrd/publist.pdf>

Produces a number of excellent publications on waste management, available for free. For example see: "Wood You Recycle?" 1988: A guide to Wood Re-Use and Recycling in the Los Angeles Area, but much information is applicable anywhere.

- **"Waste: doing it right!"** The Journal of Commerce. June, 2003. Available on line at:
<http://www.journalofcommerce.com>

MR Credit 3 | Resource Re-Use

- Kerman, P. **"Design Guide: Salvaged Building Materials in New Construction"** 3rd Edition. Greater Vancouver Regional District Policy and Planning Department, Jan 2002.
Available from the Greater Vancouver Regional District.
- **Directory of Resource-Efficient Building Products.** 3rd Edition. VVRD/BCBC 2001(CD)
Directory lists used building materials suppliers located in the Lower Mainland. Available from the Greater Vancouver Regional District.
- **Greater Vancouver Regional District**
<http://www.gvrd.bc.ca/recycling-and-garbage/business-services.htm>
 - *Demolition & Salvage Guide*
 - *Deconstruction Specification*

MR Credit 4 | Recycled Content

- **Directory of Resource-Efficient Building Products.** 3rd Edition. VVRD/BCBC 2001 (CD).

Directory lists building materials with recycled content available in the Lower Mainland. Available from the Greater Vancouver Regional District.

- **Environmental Building News**
<http://www.buildinggreen.com/products>
Lists products using recycled contents.
- Wilson, Alex, **“Building Materials: What makes a Product Green?”** Environmental Building News. Volume 9. No. 1. Jan 2000.
Available on line at:
http://www.buildinggreen.com/features/gp/green_products.cfm

MR Credit 5 | Local/Regional Materials

- **Directory of Resource-Efficient Building Products.** 3rd Edition. VVRD/BCBC 2001 (CD).

Directory lists used building materials suppliers located in the Lower Mainland. Available at the Greater Vancouver Regional District.

- **Canadian Wood Council**
<http://www.cwc.ca/products/manufacturers/index.html>
The council provides lists of Canadian wood and engineered wood products.
- **Federal Trade Commission For The Consumer**
<http://www.ftc.gov/bcp/grnrule/guides980427.htm>
Guides for the Use of Environmental Marketing Claims.

MR Credit 6 | Rapidly Renewable Materials

None

MR Credit 7 | Certified Wood

- **The Future of our Forests, Certification Canada**
<http://www.certificationcanada.org/status.htm>
Status of certification in Canada
- **Certified Forest Products Council**
<http://www.certifiedwood.org/search-modules/SearchProducts.aspx>
Excellent site for finding certified wood. Documentation forms from the Project Toolkit achieving wood-related credits under LEED™.

<http://www.certifiedwood.org/education-modules/specifying-using-certified-wood.htm>
Sample documentation forms for achieving wood-related credits under LEED™.
- **Forest Stewardship Council of Canada**
<http://www.fscCanada.org>
- **Canadian Wood Council**
http://www.cwc.ca/environmental/sustainable_buildings/certification/supply.html
Overview of forest certification
- Mayer, Erika. B.Arch., B.A. **“Building a Sustainable Future with Wood”**. Construction Canada. March 2003.
- Wilson, Alex & Nadav Malin. **“Forest Certification Growing Fast”**. Environmental Building News. Volume 12. No. 4. April 2003.
Available on line at:
<http://www.buildinggreen.com/features/12-4/index.cfm>

- **CSA International**

www.csa-international.org

CSA standard can be purchased.

EQ Credit 4.1 | Low Emitting Materials: Adhesives & Sealants

- **South Coast Air Quality Management District**

<http://www.w.aqmd.gov/rules/html/r1168.html>

South Coast Rule #1168: the purpose of this rule is to reduce emissions of volatile organic compounds (VOCs) from the application of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers or any other primers.

- **Bay Area Air Quality Management District**

<http://www.baaqmd.gov/>

Regulation 8, Rule 51 regarding sealants used as fillers.

- **Environmental Choice Program**

<http://www.environmentalchoice.com/>

[Company.cfm?group=118&cat=36](http://www.environmentalchoice.com/Company.cfm?group=118&cat=36)

Sets standards for adhesives.

- **Public Works and Government Services
Canada Environmentally Responsible Construction and Renovation Handbook**

http://www.pwgsc.gc.ca/rps/aes/content/ercr_handbook_appenda11-e.html

Information on caulking and sealants.

EQ Credit 4.2 | Low Emitting Materials: Paints & Coatings

- Malin, Nadav. **“Paint the Room Green”**, Environmental Building News. Volume 8. Number 2. February 1999.

- **“The Green Paper”**. Volume 1. Issue 1. December, 2001.

Available on line at:

http://www.paintinfo.com/green/green_nov_01.pdf

- **Green Seal**

<http://www.greenseal.org/standards/paints.htm>

Green Seal promotes products that have less impact on the environment and work well.

Green Seal's environmental standard for paints GS-11 regulates the VOC and chemical components of paints and coatings.

- **Master Painters Institute**

www.paintinfo.com

Lists paints by category indicating VOC content range and which paints achieve the VOC level required by LEED™.

- Kernan, P. **“Best Practices Guide – Materials Choices for Sustainable Design”**. 3rd Edition.

Greater Vancouver Regional District Policy and Planning Department. January 2002.

- **Product Care Association**

<http://www2.vpl.vancouver.bc.ca/dbs/redbook/orgpgs/2/2289.html>

Information on recycling paint in British Columbia

EQ Credit 4.4 | Low Emitting Materials: Composite Wood

- Wilson, Alex & Nadav Malin. **“Structural Engineered Wood: Is It Green?”**. Environmental Building News. Vol. 8. No. 11. November 1999.

Available online at:

<http://www.buildinggreen.com/ecommerce/cat.jsp?s=6x>

- **Directory of Resource-Efficient Building Products.** 3rd Edition. VVRD/BCBC 2001 (CD).

Directory lists building materials suppliers located in the Lower Mainland.

Available from the Greater Vancouver Regional District

ID Credits 1-4 | Innovation in Design

- **The US Green Building Council Credit Interpretations**

http://www.usgbc.org/LEED/LEED_main.asp

LEED™ Credit Interpretations are available for USGBC members.

- **LEED™ Reference Guide V. 2.0**, June 2001, published by the U.S. Green Building Council.

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2 - *Ibid.*

MR Credit 4:

3 - Surrey City Centre, Surrey BC
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4 - *Ibid.*

MR Credit 5:

5 - CNC Hundigger Machine
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6 - Kispiox Community School, Kispiox BC
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7 - *Ibid.*

8 - Cormorant Island Community Health Centre, BC
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9 - Redstone Community School, Alexis Creek BC
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10 - Bamfield Community School, Bamfield BC
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11 - Smithers Secondary School, Smithers BC
Larry McFarland Architects Ltd.

12 - Bulkley Valley Learning Centre, Smithers BC
Larry McFarland Architects Ltd.

EQ Credit 4.4:

13 - J.V. Humphries Community School, Kaslo, BC
Larry McFarland Architects Ltd.

14 - Smithers Secondary School, Smithers BC
Larry McFarland Architects Ltd.



Appendix A

Comparison of LEED™ Version 2.0 Certified Projects

Wood in Construction

Table prepared by James Bush & Associates for Larry McFarland Architects Ltd.

Comparison of LEED Version 2 Certified Projects

PROJECT	LEED Category	MR 2.1 Construction Waste Management, Divert 50%	MR 2.2 Construction Waste Management 75%	MR 3.1 Resource Re-use (5%)	MR 3.2 Resource Re-use (10%)	MR 4.1 Recycled Content (5%/10%)	MR 4.2 Recycled Content (10%/20%)	MR 5.1 Regional Materials Manufactured (20%)	MR 5.2 Regional Materials Extracted (50%)	MR 6 Rapid Renewal to Materials	MR 7 Certified Wood	EQ 4.1 Low Emitting Materials Adhesives/Sealants	EQ 4.2 Low Emitting Materials Paints and Coatings	EQ 4.4 Low Emitting Materials, Composite Wood	Innovation and Design Process Total ID Credits Awarded
Cambria Office Building, Ebensburg, PA				●		●	●	●		●		●	●	●	3
Capital Area East End Complex Block 225, Sacramento, CA		●	●			●	●	●				●	●	●	4
French Wing Addition to Conservation Centre, Concord, NH		●	●			●	●	●	●			●	●		5
Herman Miller C1 Main Site, Zeeland, MI		●	●			●	●	●		●		●	●		4
IslandWood: A School in the Woods, Bainbridge Island, WA		●	●	●		●	●	●	●			●	●	●	3
Jean Vollum Natural Capital Centre, Portland, OR		●	●	●	●	●	●	●	●		●*	●	●		5
Northwest Regional Facility, Gresham, Or		●	●			●	●	●	●			●	●	●	3
The Herman Miller MarketPlace - an Intellisys building, Zeeland, MI		●				●	●	●		●		●	●	●	5
The William and Flora Hewlett Foundation, Menlo Park, CA		●				●	●	●		●		●	●	●	5*1
Third Creek Elementary School, Statesville, NC		●				●	●	●		●		●	●	●	4*2
Vancouver Island Technology Park, Victoria, BC		●	●	●		●		●	●			●	●	●	5*3
625 Broadway Office Complex for the New York State Department of Environmental Conservation, Albany, NY		●				●	●	●	●		●	●	●	●	4
Balfour-Guthrie Building, Portland, OR		●	●	●		●	●	●	●		●	●	●	●	1
Central Supply Facility, Argonne, IL		●				●		●	●			●	●		5
North Boulder Recreation Centre, Boulder, CO		●	●	●				●	●					●	2
PNP Firstside Centre, Pittsburgh, PA						●	●	●	●						4
Sabre Corporate Campus, Southlake, TX		●				●	●	●	●			●	●		4
Sokol Blosser Winery Barrel Aging Cellar, Dundee, OR		●	●			●	●	●	●			●	●		3
Whitehead Biomedical Research Building, Atlanta, GA						●	●	●				●	●		4
Building 1, Austin, TX		Scorecard not available													
Cottonwood Administration Building, Deweyville, TX		●				●	●	●				●	●		5
Detroit Lions Headquarters and Training Facility, Allen Park, MI		●	●			●	●	●				●	●		3
Ecoworks at Southlake Phase One, Lenexa, KS						●	●	●	●			●	●	●	5
Eugene M. & Christine Lynn Business Centre, DeLand, FL		●	●					●				●	●		3
Federal Building United States Courthouse, Youngstown, OH		●				●	●	●				●		●	2
Goodwillie Environmental School, Ada, MI		●				●	●	●				●	●	●	2
Ice Mountain Bottling Plant, Stanwood, MI		●	●			●	●	●				●	●	●	1
Premier Automotive Group North American Headquarters, Irvine, CA		●				●		●	●						3
Social Security Administration Annex Building Renovation, Baltimore, MD		●	●					●	●						2
Social Security Administration Child Care Centre, Baltimore, MD		●	●			●	●	●	●			●			2
The Russell Family Foundation, Gig Harbour, WA		●	●			●	●	●	●			●	●		1
Viridian Place, Portland, OR		Scorecard not available													

* 66% certified: lumber, plywood, decking and windows.
 *1 Exemplary performance certified wood.
 *2 Wood preservative materials (non CCA).
 *3 Recycled content 33% includes millwork.

WOOD IN CONSTRUCTION
for Larry McFarland Architects Inc.

31-Jul-03

Assumptions:

- 2 storey Wood Frame Building (Elementary School)
- Floor Area 2,205 m²
- Total Building Cost \$2,350,000

Element	Element Total	WOOD PORTION	WOOD (Lab/Material)	WOOD Material ONLY
Below Grade Structure	80,000 3%	Formwork Portion	31,000 1.32%	\$10,850 0.46%
Above Grade Structure	413,300 18%	Wood Portion, incl. sheathing, stairs, no SOG	374,200 15.92%	\$232,004 9.87%
Exterior Finishes	310,900 13%	Wood Siding/trim	91,928 3.91%	\$50,560 2.15%
Interior Finishes	335,800 14%	Wood panelling, trim, Gym Floor, Doors	108,600 4.62%	\$65,160 2.77%
Millwork	138,000 6%	Cabinetwork	124,200 5.29%	\$83,214 3.54%
			TOTAL 31.1%	TOTAL 18.8%
Specialties, Miscell, Elevator	162,000			% of Lab & Mat 60.5%
Mechanical	410,000			
Electrical	280,000			
GC's	220,000			
TOTAL	2,350,000			

TOTAL ALL MATERIALS	\$1,057,500.00	
TOTAL WOOD	\$441,788	41.8%

Assumptions:

- Single Wood Frame Building (Elementary School - deep foundations 1.2m - 1.8m)
- Floor Area 2,900 m²
- Total Building Cost \$2,850,000

Element	Element Total	WOOD PORTION	WOOD (Lab/Material)	WOOD Material ONLY
Below Grade Structure	128,000 4%	Formwork Portion	51,200 1.80%	\$17,920 0.63%
Above Grade Structure	482,400 17%	Wood Portion, incl. sheathing, no SOG	413,000 14.49%	\$256,060 8.98%
Exterior Finishes	410,500 14%	Wood Siding/trim	130,298 4.57%	\$71,664 2.51%
Interior Finishes	326,700 11%	Wood panelling, trim, Gym Floor, Doors	115,000 4.04%	\$69,000 2.42%
Millwork	180,500 6%	Cabinetwork	162,450 5.70%	\$108,842 3.82%
			TOTAL 30.6%	TOTAL 18.4%
Specialties, Miscell	203,900 7%			% of Lab & Mat 60.0%
Mechanical	525,000 18%			
Electrical	328,000 12%			
GC's	265,000 9%			
TOTAL	2,850,000			

TOTAL ALL MATERIALS	\$1,282,499.96	
TOTAL WOOD	\$523,485	40.8%

Assumptions:

- 3 storey Wood Frame Building (Seniors Housing, over 1 level concrete underground parking)
- Floor Area 7,000 m²
- Total Building Cost \$6,950,000

Element	Element Total	WOOD PORTION	WOOD (Lab/Material)	WOOD Material ONLY
Below Grade Structure	1,010,300 15%	Formwork Portion	371,200 5.34%	\$141,056 2.03%
Above Grade Structure	1,116,600 16%	Wood Portion, incl. sheathing	1,001,600 14.41%	\$550,880 7.93%
Exterior Finishes	876,100 13%	Siding & Trim (Windows Vinyl)	239,900 3.45%	\$143,940 2.07%
Interior Finishes	942,550 14%	Wood panelling, trim, basebd, Doors	168,450 2.42%	\$101,070 1.45%
Millwork	244,100 4%	Cabinetwork	244,100 3.51%	\$163,547 2.35%
			TOTAL 29.1%	TOTAL 15.8%
Specialties, Miscell, Elevator	484,650 7%			% of Lab & Mat 54.3%
Mechanical	936,000 13%			
Electrical	748,300 11%			
GC's	591,400 9%			
Site	244,400 4%			
Contingency	228,100 3%			
TOTAL	6,950,000			

TOTAL ALL MATERIALS	\$3,127,500.00	
TOTAL WOOD	\$1,100,493	35.2%