

Steel-Reuse Information Paper No.3

Earning LEED™ Credits Through Reuse of Steel

This Information Paper concerns the reuse of steel components to earn points towards a LEED™ "green building" rating.

What is LEED™ ?

The LEED™ (Leadership in Energy and Environmental Design) green building rating system was originally developed by the US Green Building Council (USGBC) to establish a standard for what constitutes a "green building" and to provide definitions to questions such as, "What is sustainable design?" and "How green is this project?" The goal was to initiate and promote practices which limit the negative impact of buildings on the environment and their occupants and to create a market-driven rating system to accelerate the development and implementation of green building practices. Through its use as a design guide and third-party certification tool, LEED™ aims to improve the well-being of occupants, the environmental performance of the building, and economic returns from the project. This may be achieved using both established and innovative practices, standards, and technologies. The rating scheme is also intended to prevent exaggerated or false claims of sustainability and to provide a standard for measurement.

The LEED™ Canada-NC v1.0 green building rating system (CaGBC, 2004) was developed by the Canadian Green Building Council (CaGBC) and adopted in 2004. It addresses new commercial constructions, major renovations, and high-rise residential buildings in Canada. Credits are organized within six core categories: *Sustainable Sites*, *Water Efficiency*, *Energy and Atmosphere*, *Materials and Resources*, *Indoor Environmental Quality*, and *Innovation and Design Process*. In some categories there are prerequisites that must be met, such as minimum energy performance, CFC elimination, and collection of recyclables. A total of seventy points are available that can be earned through a range of measures, including both proven practices and emerging technologies. Depending upon the total number of points earned, a building can be classified as Certified (26 to 32 points), Silver (33 to 38 points), Gold (39 to 51 points) or Platinum (52 or more points).

This paper is based on the requirements of LEED™ Canada NC version 1.0, which vary in detail compared to LEED version 2.1 used in the USA.

LEED™ and steel

Steel components can help a building earn LEED™ points in a variety of ways, although it should be noted that most of the points require a co-ordinated approach by the design team and cannot be achieved merely by the use of a particular material or technology.

In the *Sustainable Sites* section, prefabrication and just-in-time delivery of steel to the site can help to reduce negative environmental impacts in dense urban locations, as they minimize disturbance to the site and surrounding area. Also, Energy Star-compliant steel roofs, with a high reflectance and emissivity, can reduce cooling loads, thus lessening the heat island effect in urban areas.

Parkwood Residences is an example of an existing steel structure that was adapted for a new residential development on Bond Street in Oshawa. It uses a steel frame from a commercial building to create new residential accommodation.



Figure 1, This commercial building was stripped back to its structural frame to be used to create new apartments in Oshawa.

In the *Energy and Atmosphere* section, steel can help to create energy-efficient designs and steel cladding is becoming increasingly available with photo-voltaic (PV) cells integrated into the surface, which can generate on-site electricity from solar radiation.

In the *Indoor Environmental Quality* section, the use of appropriate paints and finishes on steel components can contribute to earning points. Also, two points are available for good daylight qualities and views. The adaptability of steel structures, cladding, and partitioning can provide the designer with flexibility and scope for achieving good daylighting, and the maintenance of unobstructed views, thus meeting the requirements of this credit.

Credits for *Innovation in Design* may be awarded for strategies that go significantly beyond what is required in the other LEED™ credits, or for new ideas not covered elsewhere. Steel may contribute some innovative solutions - possible options include design for future deconstruction and reusability, use of composite members or other innovative steel structural solutions that reduce material volume, and integration of structure and services.

Reused steel and LEED™

The *Materials and Resources* section of LEED™ focuses on building and component reuse, waste management, and use of recycled, certified, and local or regional materials. Incorporation of reclaimed steel components can be a major means of scoring points under this section.

The "Building Reuse" credit (*Materials & Resources*, credit 1) offers up to three points for extending the life of existing buildings, thus avoiding the consumption of new materials. For one point to be awarded, a minimum of 75 percent of the main portion of the building structure and shell should remain in place. More points are available if a greater proportion is reused.

Steel-frame buildings are flexible and are suitable for reuse. They are also often readily extendable and adaptable to new uses. In refurbishment, potential for modification and reinforcement of existing structures is an important attribute. There are many examples of steel-frame structures adapted for a new use, and some cases of steel structures that have been dismantled and reassembled in a new location. Another beneficial characteristic of steel structures is their light weight, which means that often, floors can be added to existing buildings to extend their usefulness.

The "Construction Waste Management" credit (*Materials & Resources*, credit 2) aims to address the huge volume of construction waste generated. One or two points are available for diverting 50 percent or 75 percent, respectively, of the weight of debris created by construction, demolition, and land-clearing from landfill disposal.

Reclaiming steel for reuse or recycling can help to reduce waste generation. Virtually all steel generated by demolition is sent for recycling or reuse, which is of significant benefit in the pursuit of this credit. In addition, the use of steel components onsite generates very little waste, as the components are generally manufactured to tight tolerances in the factory and delivered to site for assembly. Any steel off-cuts that may result are valuable and can be readily recycled. Thus, using steel structures and other steel components should contribute significantly to reducing waste on site.

The "Resource Reuse" credit (*Materials & Resources*, credit 3) aims to extend the useful life of building components by specifying salvaged or refurbished components. This saves the resources needed to produce new components. One or two points are available if 5 percent or 10 percent of the total value of building materials comes from reused sources. Reuse is generally seen as more beneficial than recycling, since it requires little processing.

A historic example of steel component reuse is the *Hotel Saskatchewan* in Regina, steel-frame structure built in 1927. This building uses the structural steel from a nearby CNR building, erected in 1912, that had been intended for use as a hotel, but was never finished. The old building was dismantled and the steel moved across town and used in the creation of the prestigious new hotel.



Figure 2 The steel structure of the original building can be seen in the left corner of this old picture.

This is where LEED™ gives credit for steel components recovered from demolition or refurbishment projects and reused in new projects. These would include structural sections, cladding, and studs and smaller components such as stairs, handrails, etc. Increasingly, designers are interested in sourcing reclaimed components and specifying their use in new projects.

The "*Resource Reuse*" credit is calculated according to the value of reused material as a percentage of the total value of materials. Since steel components often have a relatively high value compared to other building materials, the use of reclaimed steel can be of considerable significance to this credit. LEED™ requires that the salvage status of each component be validated, but if the cost of reused components is lower than that of their new equivalents, it allows the market value of new products to be used in the calculations.

The "*Recycled Content*" credit (*Materials & Resources*, credit 4) aims to increase demand for building materials, such as steel, that incorporate recycled content. One point is awarded if the sum of the value of post-consumer recycled content plus one half of the post-industrial recycled content constitutes at least 7.5 percent of the total value of materials for the project. A second point is awarded if this percentage is doubled.

Steel structures and components can play a significant part in a building's achieving this LEED™ credit. One of the greatest environmental advantages of steel is its high recycled content. Steel can be recycled many times without loss of quality. Unlike other materials, the infrastructure for steel recycling is well established, and steel's magnetic qualities make it easy to extract from the waste stream. Many steel mills will provide data on the recycled content of their steel products.

Further Information

- CaGBC. (2004). *LEED™ Canada NC v1.0 Green Building Rating System*, Ottawa, Canadian Green Building Council. See www.cagbc.com
- Gorgolewski, M. (2005). *Steeling LEED™*, Canadian Sheet Steel Building Institute. See www.cssbi.ca
- US Green Building Council. See www.usgbc.org/LEED

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The crowd stand at the *Cloverdale Rodeo* in Vancouver reused the steel structure from the RCMP music ride at Expo 86. Important members of the structure were x-rayed for problems that may have occurred during transport. Originally designed for smaller snow load (one winter during expo 86 rather than 30 years snow), the steel roof had to be strengthened to accommodate additional loads. The structure is still in service, performing satisfactorily.

The credit for "*Regional Materials*" (*Materials & Resources*, credit 5.1) is intended to increase demand for locally manufactured materials, thereby reducing the environmental impact of transportation and supporting the local economy. To achieve one point with LEED™ Canada NC v1.0, 10 percent of materials (measured by value) must be extracted, processed, and manufactured within 800 km (500 miles) of the site, or if primarily rail or water transport is used this distance is extended to 2,400 km (1,500 miles). For a second point, 20 percent of materials must meet this requirement. Locally salvaged steel would contribute to this credit. For reclaimed steel, the distance is measured from the location where the material last served a useful purpose. Most scrap steel used in Canada is from sources located close to the steelmaking operations.

Conclusion

Reuse of steel components offers a variety of opportunities to earn several LEED™ credits, particularly in the Materials and Resources section, and can be an important part of any strategies for obtaining a LEED™ rating. In addition, using steel with a high recycled content can help achieve additional credits.