

Hot-Dip Galvanizing (Zinc + Steel) Takes LEED® With Recycled Content

Project owners, designers, and architects have long recognized the structural and functional advantages of hot-dip galvanized steel. Increasingly, they are recognizing its environmental attributes, especially its high reclamation rate and recycled content. Recycling zinc, and the steel it protects from corrosion, is not only economically smart, but also conserves energy and reduces solid, liquid, and gaseous waste. Furthermore, it distributes the energy impact associated with the original mining and manufacturing of zinc and steel over infinite generations of hot-dip galvanized steel.

There are two measures of recyclability, percentage of recycling content and reclamation rate. Hot-dip galvanized steel rates highly on both measures, with approximately 70% of all steel and 30% of all zinc consumed made of recycled material. The primary reason more recycled zinc is not used is it is unavailable – it is so durable it is still in use! The reclamation rate, a measure of how often a product is actually recycled at the end of its useful life, is even higher for both, with virtually 100% of structural and plate steel and 80% of zinc recycled into new products.

The high interest in recycled material is primarily being driven by individual environmental awareness and the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED®) rating system. Currently, only the percentage of recycled content is considered in garnering LEED® points, and not the equally important reclamation rate.

Recyclability of Hot-Dip Galvanized Steel		
	Zinc	Steel ^a
Reclamation Rate	80%	100%
Recycling Rate	30%	70%

^aFor structural and plate steel typically produced from electric arc furnaces

LEED® and Hot-Dip Galvanizing (HDG)

By promoting the use of established, creative practices, standards, and technologies, the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) rating system envisions buildings improving economic return, environmental performance, and personal health. Following the update of the rating system to LEED® 2009, the American Galvanizers Association (AGA) has identified a number of areas where hot-dip galvanized steel may be able to contribute to your LEED® score.

Materials & Resources (MR) Credit 4: Recycled Content

MR Credit 4 has the objective to increase the use of building products like hot-dip galvanized steel that have high recycled content, thus reducing the impacts caused by extraction and processing of raw metal and ores. The following is required by LEED® 2009 for credits in this area:

Use materials with recycled content such that the sum of postconsumer recycled content plus ½ of the preconsumer content constitutes at least 10% or 20% based on cost, of the total value of the materials in the project. The minimum percentage materials recycled for each point threshold is as follows:*

- 10% – 1 point
- 20% – 2 points

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

Since hot-dip galvanized steel is both the material and the building product (zinc metallurgically reacts with iron in the steel becoming one product), the value of the steel building product is directly multiplied by hot-dip galvanized steel's recycled content.

According to the International Zinc Association¹ (IZA), 30.2% or 3.2 million tons of the 10.6 million tons of zinc consumed each year are of recycled content. Of that 3.2 million tons, 1.5 million (14.6%) are post-consumer (end-of-life) and 1.7 million (15.6%) are pre-consumer (in-process sources such as skimmings, dross, and machined scrap). The Steel Recycling Institute² reports structural steel has post consumer recycled content of 56.9% and pre-consumer recycled content of 31.4%. For the average structural steel assembly of wide-flange beams, channels, angles, and plate with 250 ft²/ton, the zinc coating is 1.8% of the hot-dip galvanized product by weight. Thus, the combined recycled content is as follows:

Post-consumer recycled content – hot-dip galvanized steel

$$(1.8 \times 14.6\%) + (98.2 \times 56.9\%) = 56.1\%$$

Pre-consumer recycled content – hot-dip galvanized steel

$$(1.8 \times 15.6\%) + (98.2 \times 31.4\%) = 31.1\%$$

$$31.1\% / 2 = 15.6\%$$

With more than 70% (56.1% + 15.6%) recycled content value, HDG easily exceeds the 20% goals of MR Credit 4, and can even contribute an additional point for Exemplary Performance (ID Credit 1, Path 2).



Additional MR Credits HDG May Provide

MR Credit 5: Regional Materials

Because USGBC has now recognized the steel fabricator as a final point of assembly, hot-dip galvanized steel may also be able to provide credits under MR Credit 5. This would be determined on a job-by-job basis and awarded if the fabrication and galvanizing facility are within a 500-mile radius of the job-site. The requirement is:

Use materials or products that have been extracted, harvested, or recovered and manufactured within 500 miles of the project site for a minimum of 10% or 20%, based on cost, of the total materials value. If only a fraction of a product or material is extracted, harvested, or recovered and manufactured locally, then only that percentage (by weight) can contribute to the regional value. The minimum percentage regional materials for each point threshold is as follows:*

- 10% – 1 point
- 20% – 2 points

**Per USGBC, the steel fabricator is the final point of assembly and is therefore the manufacturer in terms of LEED® Local/Regional Materials credits (unless steel is delivered directly from the mill to the site).*

MR Credit 3: Materials Reuse

Similar to MR Credit 5, this would be evaluated on a job-by-job basis. There are a number of examples of material from one demolition site being reused on the existing site during reconstruction or used at another location. The LEED® 2009 requirement is:

Use salvaged, refurbished or reused materials, the sum of which constitutes at least 5% or 10%, based on cost, of the total value of materials on the project. The minimum percentage materials reused for each point threshold is as follows:

- 5% – 1 point
- 10% – 2 points

Innovation in Design Credits

In addition to the Materials and Resources Credits already outlined, hot-dip galvanized steel may be able to contribute “bonus” points under Innovation in Design (ID) Credit 1. There are two paths for earning credit and depending on the job, HDG may contribute in both.

ID Credit 1: Innovation in Design

Path 1: Innovation in Design (1-5 points)

There are numerous possibilities here with sufficient explanation of how the use of hot-dip galvanized steel is adding to the overall environmental performance of the building.

Achieve significant, measurable environmental performance using a strategy not addressed in the LEED® 2009 for New Construction and Major Renovations Rating System.

Example: Material efficiency: utilizing hot-dip galvanized Architecturally Exposed Structural Steel (AESS) eliminates additional materials required for finishing as well as additional materials for future maintenance and/or the use of castellated beams (in a parking structure) provides the same strength with less material

Path 2: Exemplary Performance (1-3 points)

Exemplary performance point for MR Credit 4 is always achievable when utilizing HDG due to the 70% recycled content value. The additional exemplary point for MR Credit 5 or other areas would be on a job-by-job basis.

Achieve exemplary performance in an existing LEED® 2009 for New Construction and Major Renovations prerequisite or credit that allows exemplary performance as specified in the LEED® Reference Guide for Green Building Design & Construction, 2009 Edition. An exemplary performance point may be earned for achieving double the credit requirements and/or achieving the next incremental percentage threshold of an existing credit in LEED®.

- 1 point for MR Credit 4: Recycled Content (exceeding by an additional 10%)
- 1 point for MR Credit 5: Regional Materials (if exceeded by an additional 10%)

¹ International Zinc Association, Zinc Recycling, 2004, p. 6-7

² Steel Recycling Institute, Steel Takes LEED® with Recycled Content, March 2009