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Petersen Aluminum

Leadership in Energy and Environmental Design (LEED®) Guidelines

This guideline provides a summary of the USGBC’s LEED green building rating program. It offers an overview of how metal roofing products from Petersen Aluminum Corporation can contribute to a LEED certified building project.

A roofing system is only one component of an integrated building design program. LEED takes into account the building envelope and interior design technologies that affect the energy usage, environmental impact, and social quality of the design, construction and operation of a building.

This guideline describes potential points in the LEED credit qualifications for metal roofing products manufactured by Petersen Aluminum Corporation.

What is LEED?

The US Green Building Council established the Leadership in Energy and Environmental Design (LEED) green building rating program in 1998. It uses a consensus-based process to create standards for transforming the building environment and emphasizing sustainable building design. LEED is the green building certification program used by many architects and most Federal agencies, states and local governments.

LEED promotes an integrated “whole building” design approach to sustainability and recognizes six key areas:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere

- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design Process

LEED programs exist for New Construction (NC), Existing Building Operations and Maintenance (EB), Commercial Interiors (CI), Core and Shell (CS), Neighborhood Development (ND), Schools, Retail and Homes.

This guideline is based on the LEED NC Version 2.2. LEED 2009 has been approved and as more information becomes available this guideline will be updated.

To earn LEED NC certification, a building must meet certain requirements and benchmarks related to the building's performance. Points are awarded for credits in each of the six key areas listed above.

Note: LEED® is a registered trademark of the U.S. Green Building Council
The point structure of each category is as follows:

- Sustainable Sites (SS) – max 14 points
- Water Efficiency (WE) – max 5 points
- Energy and Atmosphere (EA) – max 17 points
- Materials and Resources (MR) – max 13 points
- Indoor Environmental Quality (EQ) – max 15 points
- Innovation and Design Process (ID) – max 5 points

Building projects are awarded LEED certification at four distinct levels:

- Certified (26 – 32 points)
- Silver (33 – 38 points)
- Gold (39 -51 points)
- Platinum (52 -69 points)

How do Cool Metal Roofing products from Petersen Aluminum Corporation contribute to a LEED certified building project?

Sustainable Sites

A Petersen Aluminum Corporation cool metal roof has solar reflectance and thermal emittance values that can meet the Solar Reflectance Index criteria for this credit.

Credit 7.2: Heat Island Effect Roof (1 pt)

“Use roofing materials having a Solar Reflectance Index (SRI) equal to or greater than the values listed below for a minimum of 75% of the roof surface.”

Low-Sloped Roof – ≤2:12 pitch SRI 78

Steep-Sloped Roof - >2:12 pitch SRI 29

The Solar Reflectance Index (SRI) is an alternative method for measuring the radiative properties of roofing materials. SRI is defined by ASTM Standard E1980-01 and is a calculation that uses the solar reflectance (ASTM E903 or C1549) and thermal emittance (ASTM C1371) properties of a surface. EPA summarizes SRI as “the relative steady-state surface temperature with respect to the standard white (SRI=100) and standard black (SRI=0) under the standard solar and ambient conditions.” SRI is often used as an alternative measurement for roof products that have a low thermal emittance but a very high solar reflectance (ex. unpainted or natural metal roofing). In theory, the higher solar reflectance will outweigh the impact of low thermal emittance.

Refer to table 1A below for a listing of Petersen Aluminum Corporation metal roofing products and their SRI as determined by the Cool Roof Rating Council’s directory information.

TABLE 1A – Cool Roof Ratings Council Values for Min. 75% Roof Coverage, Min. SRI of 29 required, for Steep Slope Roofs

PAC-CLAD Finish	Solar Reflectance	Thermal Emittance	Solar Reflectance Index
Almond	0.56	0.83	64
Arcadia Green	0.33	0.84	33
Bone White	0.71	0.85	86
Cardinal Red	0.42	0.84	45
Cityscape	0.37	0.85	39
Colonial Red	0.34	0.85	35
Granite	0.36	0.84	37
Hemlock	0.30	0.85	30
Medium Bronze	0.30	0.85	30
Musket Gray	0.32	0.84	32
Patina Green	0.34	0.85	35
Sandstone	0.51	0.83	57
Sierra Tan	0.38	0.85	40
Slate Gray	0.38	0.84	40
Stone White	0.61	0.86	72
Terra Cotta	0.37	0.84	39
Champagne Metallic	0.45	0.78	57
Copper Penny Metallic	0.45	0.82	49
Silver Metallic	0.53	0.80	59
Zinc Metallic	0.30	0.85	30
Galvalume Plus (Non Kynar Finish)	0.68	0.14	57

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Above chart represents PAC finishes/products that meet LEED requirements when roof panels cover a minimum of 75% of the roof surface. For projects in which 100% of the roof surface will be covered by metal roofing panels, the criteria for achieving 1 LEED point is SRI of 21.75 on steep slope roofs. The following table 1B displays additional PAC finishes which meet this criteria:

TABLE 1B – Cool Roof Ratings Council Values for 100% Roof Coverage, Min SRI of 21.75 required, for Steep Slope Roofs

PAC-CLAD Finish	Solar Reflectance	Thermal Emittance	Solar Reflective Index
Charcoal	0.28	0.84	27
Dark Bronze	0.27	0.85	26
Evergreen	0.27	0.85	26
Hunter Green	0.26	0.84	26
Mansard Brown	0.26	0.84	24
Military Blue	0.29	0.84	28
Slate Blue	0.25	0.84	23
Teal	0.26	0.85	24
Aged Copper Metallic	0.27	0.83	25

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Materials & Resources

Petersen Aluminum Corporation’s metal roofing products have a high recycled content, are 100% recyclable at the end of their useful life, and are very durable materials. The roof can be reused for the building envelope of a new project. These properties and characteristics allow for metal roofing to contribute to the following points in the Materials & Resources category of LEED.

Credit 1.1: Building Reuse: Maintain 75% of Existing Walls, Floors and Roof (1 pt)

“Maintain at least 75% (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and non-structural roofing material). Hazardous materials that are remediated as a part of the project scope shall be excluded from the

calculation of the percentage maintained. If the project includes an addition to an existing building, this credit is not applicable if the square footage of the addition is more than 2 times the square footage of the existing building.”

Credit 1.2: Building Reuse: Maintain 95% of Existing Walls, Floors and Roof (1 pt)

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

Credit 2.1: Construction Waste Management: Divert 50% from Disposal (1 pt)

“Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris.

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

Credit 2.2: Construction Waste Management: Divert 75% from Disposal (1 pt)

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

Credit 3.1: Materials Reuse : 5% (1 pt)

“Use salvaged, refurbished or reused materials such that the sum of these materials constitutes at least 5%, based on cost, of the total value of materials on the project. Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3-7.”

Credit 3.2: Materials Reuse : 10% (1 pt)

“Use salvaged, refurbished or reused materials for an additional 5% beyond MR Credit 3.1 (10% total, based on cost). Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3-7.”

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

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

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.... Recycled content shall be defined in accordance with the International Organization for Standardization document, ISO 14021 – Environmental labels and declarations – Self declared environmental claims (type II environmental labeling)...”

Credit 4.1: Recycled Content: 20% (post-consumer + 1/2 pre-consumer) (1 pt)

“Use materials with recycled content such that the sum of post-consumer recycled content plus

one-half of the pre-consumer content constitutes an additional 10% beyond MR Credit 4.1 (total of 20% based on cost) of the total value of the materials in the project.

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.... Recycled content shall be defined in accordance with the International Organization for Standardization document, ISO 14021 – Environmental labels and declarations – Self declared environmental claims (type II environmental labeling)...”

PAC Recycled Content:

PAC-CLAD Aluminum – 88%

- Post Consumer – 35%; Pre-Consumer – 53%

PAC CLAD Steel – 28 – 35%

- Post Consumer – 25%; Pre-Consumer – 7.3%

Energy and Atmosphere

Petersen Aluminum Corporation’s cool metal roof products have excellent thermal performance and can contribute toward improving the energy efficiency of a building’s design. In order to receive points in this credit category the building must demonstrate a percentage increase in energy savings in accordance with ASHRAE standards.

Credit 1: Optimize Energy Performance (1-10 pts)

“OPTION 1: Whole Building Energy Simulation: Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 (without amendments) by a whole building project simulation using the Building Performance Rating Method in Appendix G of the Standard. The minimum energy cost savings percentage for each point threshold is as follows:

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<i>New Buildings</i>	<i>Existing Building Renovations</i>	<i>Points</i>
10.5%	3.5%	1
14.0%	7.0%	2
17.5%	10.5%	3
21.0%	14.0%	4
24.5%	17.5%	5
28.0%	21.0%	6
31.5%	24.5%	7
35.0%	28.0%	8
38.5%	31.5%	9
42.0%	35.0%	10

Water Efficiency

Petersen Aluminum Corporation's cool metal roofing products can provide an excellent surface for rainwater harvesting. Integrating a rainwater collection system with the cool metal roof can contribute to the following points in this credit category:

Credit 1.1: Water Efficient Landscaping: Reduce by 50% (1 pt)

"Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case. Reductions shall be attributed to any combination of the following items:

- *Plant species factor*
- *Irrigation efficiency*
- *Use of captured rainwater*
- *Use of recycled wastewater*
- *Use of water treated and conveyed by a public agency specifically for non-potable uses*

Credit 1.2: Water Efficient Landscaping: No Potable Water Use or No Irrigation (1 pt)

"Achieve WE Credit 1.1 and:

Use only captured rainwater, recycled wastewater, recycled graywater, or water treated and conveyed by a public agency specifically for non-potable uses for irrigation.

OR

Install landscaping that does not require permanent irrigation systems. Temporary irrigation systems used for plant establishment are allowed only if removed within one year of installation."

Credit 2: Innovative Wastewater Technologies (1 pt)

Reduce potable water use for building sewage conveyance by 50% through the use of water-conserving fixtures (water closets, urinals) or non-potable water (captured rainwater, recycled graywater, and on-site municipally treated wastewater)

OR

Treat 50% of wastewater on-site to tertiary standards. Treated water must be infiltrated or used on-site."

Credit 3.1: Water Use Reduction: 20% Reduction (1 pt)

"Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers and kitchen sinks.

Credit 3.2: Water Use Reduction: 30% Reduction (1 pt)

"Employ strategies that in aggregate use 30% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals,

lavatory faucets, showers and kitchen sinks.

Innovation in Design (1-4 pts)

In certain areas of a building design, Petersen Aluminum Corporation's metal roofing products may contribute toward points in this category if they are shown to contribute toward substantially exceeding a LEED performance credit. According to LEED, the design team must "apply strategies or measures that demonstrate a comprehensive approach and quantifiable environment and/or health benefits."

Conclusion

Even though the roof may be directly responsible for one point in the Sustainable Sites Category based on its radiative properties, metal roofing can also help to contribute toward many other points in a LEED certified building. The design team made up of architects, facility managers, construction managers, designers and owners need to integrate all products and processes in a whole building approach in their efforts to create a sustainable building. The LEED program is a tool to achieve this. Petersen Aluminum Corporation's metal roofing products can play a role in any building project achieving LEED certification.

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