LEEDv4 FOR BUILDING DESIGN AND CONSTRUCTION

The LEEDv4 for New Construction rating system was designed primarily for new construction or major renovation of commercial buildings including schools, retail, data centers, warehouse and distribution centers, hospitality and healthcare buildings.

The nine categories in the assessment contain credits that total 118 possible points, which are translated into the four levels of certification. (see Tables 1 and 2).

TABLE 1: SUMMARY OF LEEDv4 FOR BUILDING DESIGN AND CONSTRUCTION (NEW CONSTRUCTION)

Categories	Number of Credits	Number of Prerequisites	Total Possible Points
Integrative Process	1	1	1
Location and Transportation	8	0	32
Sustainable Sites	11	2	10
Water Efficiency	4	3	25
Energy & Atmosphere	7	4	11
Materials & Resources	9	3	13
Indoor Environmental Quality	9	3	16
Innovation	2	0	6
Regional Priority	1	0	4

TABLE 2: THE CERTIFICATION LEVELS IN THE LEEDv4 FOR BUILDING DESIGN AND CONSTRUCTION (NEW CONSTRUCTION)

Achievement Level	Points Required
Certified	40 – 49
Silver	50 – 59
Gold	60 – 79
Platinum	80 and above

DESCRIPTION OF CATEGORIES AND CREDITS IN LEEDv4

1. Integrative Process

A point is awarded in this credit for performing a preliminary "simple box" energy modeling analysis before the completion of schematic design that explores how to reduce energy loads in the building and accomplish related sustainability goals by questioning default assumptions. The analysis assesses strategies associated with site conditions, massing and orientation, basic envelope attributes, lighting level, thermal comfort ranges, plug and process load needs, and programmatic and operational parameters. It also assesses multifunctioning spaces, operating schedules, space allotment per person, teleworking, reduction of building area, and anticipated operations and maintenance.

2. Location and Transportation

Credit categories include:

- **LEED for Neighborhood Development Location:** This credit is designed to reduce vehicles' miles traveled, to enhance livability and to improve human health by encouraging daily physical activity. A project must be located within an area certified as LEED for Neighborhood Development.
- **Sensitive Land Protection:** The intent of this credit is to avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site. To comply, a project can be located on land that has been previously developed.
- **High Priority Site:** Encourages locating the project on an infill location in a historic district, a priority zone site or on a site undergoing brownfield remediation.
- **Surrounding Density and Diverse Uses:** This credit encourages a project team to conserve land and protect farmland and wildlife habitat by locating the building in areas with existing infrastructure. This promotes walkability, transportation efficiency and reduced vehicle distance traveled.
- **Access to Quality Transit:** To comply with this credit, the building site must be within walking distance of an existing or planned bus stop, light or heavy rail station, or commuter ferry terminal.
- **Bicycle Facilities:** This credit intends to promote bicycling and transportation efficiency and reduce vehicle distance traveled.
- **Reduced Parking Footprint:** To comply with this credit, the project must provide parking capacity that is below the base ratios recommended by the Parking Consultants Council. This helps to minimize the environmental harms associated with parking facilities.
- **Green Vehicles:** This credit reduces pollution by promoting alternatives to conventionally fueled automobiles. Compliance is based on providing preferred parking for green vehicles or providing electric vehicle charging facilities.

3. Sustainable Sites

There are two prerequisites in this category.

- **Construction Activity Pollution Prevention:** An Erosion and Sediment Control (ESC) plan must be implemented for all construction activities to minimize soil loss, sedimentation of receiving waters and dust and particulate pollution.

- **Environmental Site Assessment:** This is a prerequisite only for school and healthcare projects. It requires a Phase 1 Environmental Site Assessment as described in ASTM E527-5 to determine whether environmental contamination exists at the site.

Credits in this category include:

- **Site Assessment:** A point is awarded when a site is assessed and documented for how the design will be influenced by the topography, hydrology, climate, vegetation, soils, human use and human health effects.
- **Site Development- Protect or Restore Habitat:** Points are awarded for conserving existing natural areas and restoring damaged areas to provide habitat and promote biodiversity. This can be achieved by preserving and protecting 40% of the greenfield area on the site (if it exists) from all development and construction activity.
- **Open Spaces:** Recognizes a portion of the total site area that is an outdoor space, a portion of which must be vegetated, to encourage interaction with the environment, social interaction, passive recreation and physical activities.
- **Heat Island Reduction:** Points are awarded for shading the building area, using paving and roofing materials with high solar reflectance; and/or vegetating the roof area.
- **Rainwater Management:** Points are awarded for reducing runoff volume and improving water quality by replicating the natural hydrology and water balance of the site, based on historical conditions and undeveloped ecosystems in the region. This can be achieved by minimizing land disturbance, preserving vegetation, minimizing impervious cover, rain gardens, vegetated swales and buffers, permeable pavement, rainwater harvesting, and soil amendments.
- **Light Pollution Reduction:** Recognizes designs that reduce night sky pollution, taking into account uplight shielding, glare shielding and backlight shielding.
- **Site Master Plan:** This credit applies only to school projects. A site master plan must be developed in collaboration with school authorities.
- **Tenant Design and Construction Guidelines:** This credit applies only to Core and Shell projects. This credit requires the team to prepare guidelines for extending the sustainable design of the base building into tenants' individual spaces.
- **Places of Respite:** This credit applies only to healthcare projects. The team must provide places of respite for patients, visitors and staff that are outdoors or located in interior atria, greenhouses, solaria or conditioned spaces.
- **Direct Exterior Access:** This credit applies only to healthcare projects. Direct access to an exterior courtyard, terrace, garden or balcony must be provided.
- **Joint Use of Facilities:** This credit applies only to school projects. This credit is for making building space open to the general public or to specific organizations.

4. Water Efficiency

There are three prerequisites in this category.

- **Outdoor Water Use Reduction:** Show that the project's landscape requires no permanent irrigation system or reduce the landscape water requirements by 30% through plant species selection and irrigation system efficiency.
- **Indoor Water Use Reduction:** Reduce aggregate water consumption by 20% from baseline and ensure all newly installed lavatory fixtures that are eligible for labeling must be WaterSense labeled.
- **Building –Level Water Metering:** Install water meters measuring total potable water use for the building and grounds. Data must be compiled into reports to the USGBC over a five year period.

Credits in this category include:

- **Outdoor Water Use Reduction:** Points are awarded for reducing outdoor water consumption by 50% of the calculated baseline. This can be achieved by reducing irrigation through the use of rainwater harvesting systems.
- **Indoor Water Use Reduction:** Points are awarded for reducing indoor water consumption. This can be achieved by providing alternatives to potable water, including rainwater.
- **Cooling Tower Water Use:** The intent of this credit is to conserve water used for cooling tower makeup while controlling microbes, corrosion and scale in the condenser water system.
- **Water Metering:** Install permanent water meters to support water management and identify opportunities for additional water savings by tracking water consumption.

5. Energy and Atmosphere

There are four prerequisites in this category:

- **Fundamental Commissioning and Verification:** There must be independent verification that the building's process activities for mechanical, electrical, plumbing, and renewable energy systems are operating efficiently and according to design and owners' needs.
- **Minimum Energy Performance:** The proposed building must demonstrate an improvement of 5% compared to the baseline building performance rating according to ASHRAE 90.1-2010 using a simulation model; or comply with the mandatory and prescriptive provisions of ASHRAE 90.1-2010 and comply with the appropriate ASHRAE 50% Advanced Buildings Core Performance Guide.
- **Building-Level Energy Metering:** This involves the installation of building-level energy meters that measure total energy consumption which is shared with USGBC for a five year period.
- **Fundamental Refrigerant Management:** In order to reduce stratospheric ozone depletion, chlorofluorocarbons (CFCs) must not be part of new HVAC systems. Where existing HVAC systems are reused, a comprehensive CFC phase-out conversion must be completed.

Credits in this category include:

- **Enhanced Commissioning:** This builds on the prerequisite for owners to contract a commissioning Authority (CxA). The CxA must have documented commissioning process experience. The process activities include mechanical, electrical, plumbing, renewable energy, energy, water, and the building's thermal envelope.
- **Optimize Energy Performance:** This credit achieves increased levels of energy performance beyond the Minimum Energy Performance prerequisite. Improvement in proposed building performance rating can be done with energy simulation analyses or through a prescriptive path using the appropriate ASHRAE 50% Advanced Energy Design Guide.
- **Advanced Energy Metering:** This credit requires the installation of advanced energy metering for the energy sources used by the building and any individual energy end uses representing at least 10% of the total annual consumption of the building.
- **Demand Response:** This encourages the project team to design buildings and equipment for participation in demand response programs through load shedding or shifting.
- **Renewable Energy Production:** Points are awarded for the use of renewable energy systems that offset building energy use and cost.
- **Enhanced Refrigerant Management:** The intent of this credit is to reduce ozone depletion, support early compliance with the Montreal Protocol, and minimize direct contributions to climate change. Compliance requires either not using refrigerants or selecting HVAC&R systems that minimize or eliminate compounds that have global warming potential or ozone depleting potential. Design elements that take advantage of passive solar heating, passive cooling and natural ventilation can help reduce dependence on HVAC&R systems.
- **Green Power and Carbon Offsets:** This credit is designed to encourage the reduction of greenhouse gas emissions through the use of grid-source, renewable energy technologies and carbon mitigation projects. The project must engage in a contract for green power, carbon offsets or renewable energy certificates (RECs)

6. Materials and Resources

There are three prerequisites in this category:

- **Storage and Collection of Recyclables:** To reduce the waste that is generated by building occupants and hauled to and disposed of in landfills.
- **Construction and Demolition Waste Management Planning:** This helps to reduce construction and demolition waste and debris disposed of in landfills and incineration facilities by recovering, reusing and recycling materials. A construction and demolition management plan must be established that describe the diversion strategies.
- **PBT Source Reduction – Mercury:** This prerequisite is only for healthcare projects. To reduce mercury-containing products and devices and mercury release through product substitution, capture and recycling.

Credits in this category include:

- **Building Life-Cycle Impact Reduction:** This credit helps to demonstrate reduced environmental impacts of materials used on the project. A whole-building Life Cycle Assessment is required. For new construction, points are awarded if the proposed building shows a 10% reduction, compared with a baseline building, in at least three of six environmental impact categories.
- **Building Product Disclosure and Optimization – Environmental Product Declarations:** This credit encourages the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. Points are awarded for materials that disclose life cycle assessment, industry-wide environmental product declaration, or product-specific environmental product declaration.
- **Building Product Disclosure and Optimization – Sourcing of Raw Materials:** To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner. Points are awarded when manufacturers of materials have a publicly released report from raw material suppliers, related to extraction locations, responsible sourcing criteria, commitments to responsible land use, and commitments to reduce environmental harms.
- **Building Product Disclosure and Optimization- Material Ingredients:** To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. Points are awarded if materials demonstrate their chemical inventory, and/or the optimization of the ingredients against specific lists of chemicals of concern, or optimizing the product manufacturer supply chain.
- **PBT Source Reduction-Mercury:** This credit applies only to healthcare projects. Specify and install fluorescent lamps with low mercury content and long lamp life.
- **PBT Source Reduction – Lead, Cadmium and Copper:** This credit applies only to healthcare projects. To comply, the project must specify substitutes for materials manufactured with lead and cadmium. Specific uses of Copper are described in LEED.
- **Furniture and Furnishings:** This credit applies only to healthcare projects. This credit is to enhance the environmental and human health performance attributes associated with freestanding furniture and medical furnishings.
- **Design for Flexibility:** This credit applies only to healthcare projects. Intentionally design facilities for adaptive use to reduce the resource inputs and waste generation associated with renovation.
- **Construction and Demolition Waste Management:** To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials. Points are awarded if the project can reduce the total waste materials or divert a portion of the total construction and demolition materials into different material streams.

7. Indoor Environmental Quality

There are three prerequisites in this category:

- **Minimum Indoor Air Quality Performance:** Compliance with ASHRAE 62.1-2010 (Sections 4-7) sets the prerequisite minimum standard for indoor ventilation rates in both mechanically and naturally ventilated buildings.
- **Environmental Tobacco Smoke Control:** The prerequisite can be achieved through two prescriptive paths that prohibit smoking in the building, except in designated smoking areas that must be located 25 feet away from any building entry, air intake point, or operable window.
- **Minimum Acoustic Performance:** This applies only to school projects. The prerequisite is based on providing classrooms that facilitate teacher-to-student and student-to-student communication through effective acoustic design.

Credits in this category include:

- **Enhanced Indoor Air Quality Strategies:** This credit promotes occupant's comfort, well-being, and productivity by improving indoor air quality. Strategies for air filtration, natural ventilation designs, and prevention of cross-contamination are paths toward compliance.
- **Low-Emitting Materials:** Points are awarded for complying with standards which specify maximum volatile organic compound (VOC) concentrations of materials used in the building interior and exterior. Materials such as paints, coatings, adhesives and sealants are included.
- **Construction Indoor Air Quality Management Plan:** This credit involves the development and implementation of an indoor air quality management plan for the construction and pre-occupancy phases of the project. The SMACNA IAQ Guidelines for Occupied Buildings Under Construction, 2nd edition, 2007, Chapter 3 must be met or exceeded.
- **Indoor Air Quality Assessment:** The intent of this credit is to establish better quality indoor air in the building after construction and during occupancy. Before occupancy new filtration media must be installed and the building must perform a flush-out of outdoor air. An option is to conduct baseline IAQ testing using a variety of protocols.
- **Thermal Comfort:** To promote occupants' productivity, comfort and well-being by designing HVAC systems and the building envelope to meet ASHRAE 55-2010.
- **Interior Lighting:** This credit covers ways to provide high quality lighting in occupant spaces by providing individual lighting controls and using other strategies.
- **Daylight:** This credit helps to reduce the use of electrical lighting by introducing daylight into the regularly occupied spaces. This is done with computer simulations of the daylight quality and daylight levels. Glare control is another strategy covered in this credit.
- **Quality Views:** To comply with this credit, the building must be designed to provide a direct line of sight to the natural outdoor environment and by a variety of strategies to improve the quality of the views offered to the regularly occupied spaces.
- **Acoustic Performance:** This credit covers HVAC background noise, sound transmission, reverberation time and sound masking strategies. Compliance is based on the 2011 ASHRAE Handbook, HVAC Applications Chapter 48.

8. Innovation

Credits in this category include:

- **Innovation:** This credit is designed to encourage and reward designs that perform above LEED standards and/or innovations not specifically addressed by LEED.
- **LEED Accredited Professional:** This credit encourages the project team to use a LEED Accredited Professional as at least one principal participant, in order to streamline the application and certification process.

9. Regional Priority

Credit in this category includes:

- **Regional Priority:** This provides an incentive for suggesting a credit that has regional importance for the project, as identified by USGBC Regional Chapters.PAC metal roofing products can be utilized in greener building design to improve energy efficiency and thermal comfort, reduce energy and reduce water consumption.

The credits affected by the use of PAC roofing products in a LEEDv4-registered project (Building Design and Construction – New Construction) are summarized in Table 3.

TABLE 3

Category	Credit	Maximum Points in Credit
Integrative Process	Integrative Process	1
Sustainable Sites	Heat Island Reduction	2
	Rainwater Management	3
Water Efficiency	Outdoor Water Use Reduction	2
	Indoor Water Use Reduction	6
Energy & Atmosphere	Optimize Energy Performance	18
	Renewable Energy Production	3
Materials & Resources	Building Life-Cycle Impact Reduction	5
	Building Product Disclosure and Optimization · Environmental Product Declarations	2
	· Sourcing of Raw Materials	2
	· Material Ingredients	2
	Construction and Demolition Waste Management	2
Indoor Environmental Quality	Thermal Comfort	1
Innovation	Innovation	5

SUMMARY OF CREDITS LISTED IN TABLE 3

Integrative Process Category

PAC metal roofing products can help realize many of the design elements that are key to reducing energy demand. The use of energy efficient metal roofing can be factored into the energy modeling that is recommended in the integrative process.

Location and Transportation Category

n/a

Sustainable Sites Category

PAC Metal roofing is available with high Solar Reflectance Index (SRI) values. These products reflect a higher proportion of incoming solar energy away from a roof surface. By reflecting more of the solar energy, the surface temperature of a metal roof surface is lowered which helps to reduce the intensity of urban heat islands (UHIs).

Integrating a rainwater harvesting system with a PAC metal roof installation will help to manage rainwater on site. Techniques that harvest or divert rainwater mean that stormwater can be used on-site, and is not contributing to the erosion of soil on-site, or in the receiving environment.

Water Efficiency Category

Harvested rainwater from a PAC metal roof can be used for non-potable purposes such as irrigation and toilet flushing, which reduces indoor and outdoor potable water use.

Energy & Atmosphere Category

Energy efficient PAC cool metal roofing systems can help realize many of the design elements that are key to reducing energy demand. Energy efficient building envelope systems, such as cool roofing help to reduce heat gain/loss, reduce peak energy demand, and improve energy performance of the building. In warmer climates, light colored reflective roofs can be used to reflect energy away from the building and reduce energy demand for internal cooling. Further, the high thermal emittance of painted steel products means that solar energy that is absorbed into the building space below the roof is quickly re-radiated at night. Metal roofing can also be used in cool climates to create more energy efficient buildings. Dark roofs are effective at absorbing solar energy and result in warmer buildings that require less energy to heat.

Metal roofing is also the ideal platform for photovoltaic and/or wind generation, outlasting the equipment and allowing attachment with no penetrations… This helps to reduce the environmental footprint of the building by offsetting fossil fuel based energy sources while maintaining roof integrity for decades.

Materials & Resources Category

Because metal building components, and entire building envelopes, can be cut to measure off-site, any waste that is produced can be reclaimed within the process that created the product, and there is minimal on-site waste to be diverted from landfill. Because steel and aluminum are 100% recyclable, but not 100% recovered, ensuring that any components that cannot be used, or reused, are recycled is a meaningful contribution to resource sustainability Segregating recyclable waste or debris from metal panels on a construction site helps to divert that material from landfills.

The USGBC has ruled on the use of industry-average recycled content of materials. As of January 1, 2013, recycled content claims must now be "…specific to the installed product", where the term 'specific product' refers to "a unique product distinguished by color, type, and/or location of manufacturer as identified to the consumer SKU or other means". For the purposes of LEED, steel has a previously established industry average of 25% post-consumer reycled content, which does not require documentation on a per product basis. It is, in essence, a default minimum value if a product-specific value is unavailable.

PAC participated in an industry-wide Life Cycle Assessment of the metal coil coating and rollforming processes. The life cycle inventory of their environmental impact data from that LCA project can be used in a whole-building LCA as required in credit "Building Life-Cycle Impact Reduction". The industry-wide Environmental Product Declaration documents covering metal cladding (roof panels or wall panels) can be used for steel cladding on a LEED project, as described in credit "Building Product Disclosure and Optimization – Environmental Product Declarations." Any corporate report from PAC's suppliers on the responsible sourcing of raw materials can be part of an optimization strategy in LEEDv4. Likewise, the reported disclosure of material ingredients is a transparent effort that is seen as positive and useful information by many architectural/engineering firms.

Indoor Environment Quality Category

Energy efficient building envelope systems, such as a PAC cool roofing system can help to reduce heat gain/loss which affects the thermal comfort design of the building.

Innovation Category

The design flexibility of metal components in a building project can help a design team to feature systems or performance of the building project in areas that go beyond the LEEDv4 requirements.

Summary

LEEDv4 is a transformational change from previous versions of the green building rating program… It is designed to help deliver sustainable buildings during operation, with a particular focus on energy and water efficiency, transparency of environmental impacts and disclosure of chemical ingredients of building materials. . There are no Credits or Points directly assessing steel or aluminum products per se. However, the use of PAC metal roofing products in a LEEDv4-registered project can often contribute to improved whole-building performance, which is awarded in the LEED program.

Resources

USGBC www.usgbc.org

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