

# Addendum to *Ready Mixed Concrete Industry LEED Reference Guide*

The *LEED Reference Guide* was published with LEED version 2.1 in effect. The newest version 2.2 of LEED for New Construction and Major Renovation came into effect January 1, 2006. Many credits have been altered to some degree. This addendum covers changes made in Version 2.2.

The major changes affecting the concrete industry are:

1. MR Credit 4 – Recycled Content – The recycled content of concrete can now be based on the recycled content of just the cementitious materials rather than the recycled content of concrete.
2. SS Credit 7.1 – Heat Island Effect: Non-Roof – Solar Reflectance Index is now used rather than solar reflectance.
3. EA Credit 1 – Optimize Energy Performance – The percent energy savings that must be demonstrated are lower, but are calculated differently so the end result may be similar.
4. MR Credit 5.1 and 5.2 – Requirements for regional materials are less stringent and have changed.

The remainder of this document highlights the changes from version 2.1 to 2.2 that are significant to the cement, concrete, and allied industries. The table below shows the credit name and number, a brief description of what has changed, the relevant sections from LEED NC showing the old and new text, and the significance to the cement, concrete, and allied industries.

Credit name and number and what has changed	Version 2.2	Version 2.1	Significant to the cement, concrete, and allied industries
<b>SS Credit 5.1 – Site Development: Protect or Restore Habitat</b>  Name change	Site Development: Protect or Restore Habitat	Reduce Site Disturbance: Protect or Restore Open Space	Concrete parking garages within buildings can be used to limit site disturbance, including earthwork and clearing vegetation. For example, one LEED criterion is to limit site disturbance to 12 m (40 ft) beyond the building perimeter. Parking garages within buildings help maintain existing natural areas that would be consumed by paved parking. This credit is worth 1 point.
<b>SS Credit 5.2 – Site Development: Maximize Open Space</b>  Name change  Open space definition has been refined to address both urban and suburban settings	Site Development: Maximize Open Space  For projects located in urban areas that earn SS Credit 2 (Development Density & Community Connectivity), pedestrian oriented hardscape areas can contribute to credit compliance as open space. For such projects, a minimum of 25% of the open space counted must be vegetated.	Reduce Site Disturbance: Development Footprint	Concrete parking garages on the lower floors of a building can be used to help reduce the footprint of the development. In this context the building footprint includes the building, access roads, and parking. Parking garages within buildings reduce the building footprint by reducing paved parking areas. This requirement can be met by exceeding the local zoning's open space requirement for the site by 25%. This credit is worth 1 point.
<b>SS Credit 6.1 – Stormwater Design:</b>	Stormwater Design: Quantity Control	Stormwater Management: Rate and Quantity	The intent of this credit is to limit disruption and pollution of natural water flows by managing

<p><b>Quantity Control</b></p> <p>Name change</p>			<p>stormwater runoff. Using pervious concrete pavements will reduce the rate and quantity of storm water runoff because they increase infiltration of stormwater. Pervious concrete contains coarse aggregate, little or no fine aggregate, and insufficient cement paste to fill the voids between the coarse aggregate. It results in concrete with a high volume of voids (20% to 35%) and a high permeability that allows water to flow through easily. On building sites where the existing imperviousness is greater than 50%, this credit requires reducing the rate and quantity of stormwater runoff by 25%. On building sites where the existing imperviousness is less than 50%, the requirement specifies that the post-development discharge rate and quantity from the site shall not exceed the pre-development rate and quantity. This credit is worth 1 point.</p>
<p><b>SS Credit 6.2 – Stormwater Design: Quality Control</b></p> <p>Name change</p> <p>New performance target</p>	<p>Stormwater Design: Quality Control</p> <p>...capture and treat the stormwater runoff from 90% of the average annual rainfall using acceptable best management practices (BMPs). BMPs used to treat runoff must be capable of removing 80% of the average annual post development total suspended solids (TSS) load based on existing monitoring reports.</p>	<p>Stormwater Management: Rate and Quantity</p> <p>...remove 80% of the average annual post-development total suspended solids (TSS) and 40% of the average annual post-development total phosphorous (TP) based on the average annual loadings from all storms less than or equal to the 2-year/24-hour storm.</p>	<p>The intent of this credit is similar to that of the one above. Using pervious pavement can contribute to earning this credit, worth 1 point.</p>

<p><b>SS Credit 7.1 – Heat Island Effect: Non-Roof</b></p> <p>New performance metric (Solar Reflectance Index)</p>	<p>Provide any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards and parking lots):</p> <ul style="list-style-type: none"> <li>• Shade (within 5 years of occupancy)</li> <li>• Paving materials with a Solar Reflectance Index (SRI) of at least 29</li> <li>• Open grid pavement system</li> </ul> <p>OR</p> <p>Place a minimum of 50% of parking spaces under cover (defined as under ground, under deck, under roof, or under a building). Any roof used to shade or cover parking must have an SRI of at least 29.</p>	<p>...for paving, landscaping (list species) and building footprint demonstrate that:</p> <ul style="list-style-type: none"> <li>• A minimum of 30% of non-roof impervious surfaces areas are constructed with high-albedo materials and/or open grid pavement and/ or will be shaded within five years</li> <li>• OR a minimum of 50% of parking spaces have been placed underground or are covered by structured parking</li> <li>• OR an open-grid pavement system (less than 50% impervious) has been used for a minimum of 50% of the parking lot area.</li> </ul>	<p>The requirement can be met by using concrete rather than asphalt for at least 50% of the impervious surfaces. Another option is to place a minimum of 50% of parking spaces under cover such as underground, under deck, under roof, or under a building. Any roof used to shade or cover parking must have an SRI of at least 29. The SRI is calculated from solar reflectance and emissivity. Solar reflectance is the ratio of the amount of solar radiation reflected from a material to the amount that shines on the material. Solar radiation includes the infrared and ultraviolet as well as the visible spectrum. Generally, light-colored surfaces have a high reflectance, but this is not always the case. Surfaces with lower reflectance absorb more solar radiation. The absorbed radiation is converted into heat and the surface gets hotter. Where paved surfaces are required, using materials with higher reflectance will reduce the heat island effect—consequently saving energy by reducing the demand for air conditioning—and improve air quality. As the temperature of urban areas increases, so does the probability of smog and pollution. Smog episodes rarely occur when the temperature is below 21°C (70°F).</p> <p>Concrete constructed using ordinary portland cement generally has an SRI of approximately 35, although it can vary. New concrete made with “white” portland cement generally has an SRI of 86. New asphalt generally has an SRI of 0, and weathered asphalt has an SRI of approximately 6. This credit is worth 1 point.</p>
<p><b>SS Credit 7.2 – Heat Island Effect: Roof</b></p> <p>New performance metric (Solar Reflectance Index)</p>	<p>Use roofing materials having a Solar Reflectance Index (SRI) equal to or greater 78 for low-sloped roof for a minimum of 75% of the roof surface.</p> <p>OR</p> <p>Install a vegetated roof for at least 50% of the roof area.</p> <p>OR</p> <p>Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria: (Area of SRI Roof / 0.75) +</p>	<p>Use ENERGY STAR® compliant (highly reflective) AND high emissivity roofing (emissivity of at least 0.9 when tested in accordance with ASTM 408) for a minimum of 75% of the roof surface.</p> <p>OR</p> <p>Install a “green” (vegetated) roof for at least 50% of the roof area. Combinations of high albedo and vegetated roof can be used providing they collectively cover 75% of the</p>	<p>One method of obtaining credit is to install a vegetated roof for at least 50% of the roof area. Concrete roof decks are often needed to provide structural support for the heavy, moist soil in a vegetated roof. Lightweight concrete topping can be used to create a sloping deck to provide drainage for the system. More information on vegetated or green roofs is available at <a href="http://www.greenroofs.org">www.greenroofs.org</a>. This credit is worth 1 point.</p>

	(Area of vegetated roof / 0.5) >= Total Roof Area	roof area.	
<p><b>EA Prerequisite 2 – Minimum Energy Performance</b></p> <p>Updated Referenced Standard (ASHRAE 90.1-2004)</p>	<p>Design the building project to comply with both—</p> <ul style="list-style-type: none"> <li>• the mandatory provisions of ASHRAE Standard 90.1-2004 (without amendments); and</li> <li>• the prescriptive requirements or performance requirements (Section 11) of ASHRAE Standard 90.1-2004 (without amendments).</li> </ul>	<p>Design the building to comply with ASHRAE Standard 90.1-1999 (without amendments) or the local energy code, whichever is more stringent.</p>	<p>The requirements of the ASHRAE standard are cost-effective and not particularly stringent for concrete. Insulating to meet or exceed the requirements of the standard is generally a wise business choice. Determining compliance for the envelope components is relatively straightforward using the tables in Chapter 5 of the ASHRAE standard. Minimum requirements are provided for mass and non-mass components such as walls and floors. Components constructed of concrete generally are considered "mass." This means the components have enough heat-storage capacity to moderate daily temperature swings. Buildings constructed of cast-in-place, tilt-up or insulating concrete forms (ICF), possess thermal mass to help moderate indoor temperature extremes and reduces peak heating and cooling loads. In many climates, these buildings use less energy than non-massive buildings with walls of similar thermal resistance. When buildings are properly designed and optimized, incorporating thermal mass can lead to a reduction in heating, ventilating, and air-conditioning equipment capacity. Reduced equipment capacity can represent energy and construction cost savings. This item is required and is not worth any points.</p>
<p><b>EA Credit 1 – Optimize Energy Performance</b></p> <p>Updated Referenced Standard (ASHRAE 90.1-2004)</p> <p>New energy modeling protocol includes plug loads</p> <p>New (lower) performance requirement</p> <p><i>Note: the two changes above may offset each other</i></p>	<p>Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE Standard 90.1-2004 (without amendments) by a whole building project simulation using the Building Performance Rating Method in Appendix G of the Standard.</p> <p>The minimum energy cost savings percentage for each point threshold is as follows:</p> <ul style="list-style-type: none"> <li>• new buildings 1 to 10 points for 10.5 to 42% energy cost savings</li> <li>• existing building renovations</li> </ul>	<p>Reduce design energy cost compared to the energy cost budget for energy systems regulated by ASHRAE Standard 90.1-1999 (without amendments), as demonstrated by a whole building simulation using the Energy Cost Budget Method described in Section 11 of the Standard.</p> <p>The minimum energy cost savings percentage for each point threshold is as follows:</p> <ul style="list-style-type: none"> <li>• new buildings 1 to 10 points for 15 to 60% energy cost savings</li> <li>• existing building renovations</li> </ul>	<p>Many engineering consulting firms have the capability to perform whole building energy simulations to determine energy savings as required using a computer based program such as DOE2 or EnergyPlus. When concrete is considered, it is important to use a program like these that calculate yearly energy use on an hourly basis. Such programs are needed to capture the beneficial thermal mass effects of concrete. Insulated concrete systems, used in conjunction with other energy savings measures, will most likely be eligible for points. The number of points awarded will depend on the building, climate, fuel costs, and minimum requirements of the standard.</p> <p>Studies show that using concrete walls that are insulated to exceed minimum code requirements by a modest amount (about the same as minimum requirements for frame walls) can contribute to</p>

<p>New prescriptive compliance paths (two)</p>	<p>1 to 10 points for 3.5 to 35% energy cost savings</p> <p>Appendix G of Standard 90.1-2004 requires that the energy analysis done for the Building Performance Rating Method include ALL of the energy costs within and associated with the building project.</p> <p>Two prescriptive compliance paths are also allowed:  <i>ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004</i> for 4 points and <i>Advanced Buildings Benchmark™ Version 1.1</i> for 1 point.</p>	<p>1 to 10 points for 5 to 50% energy cost savings</p> <p>Regulated energy systems include HVAC (heating, cooling, fans and pumps), service hot water and interior lighting. Non-regulated systems include plug loads, exterior lighting, garage ventilation and elevators (vertical transportation).</p>	<p>earning 1 to 3 points, depending on the building type, orientation, and climate.</p>
<p><b>MR Credit 1.2 – Building Reuse</b></p> <p>New (lower) performance requirement for Credit 1.2</p>	<p>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).</p>	<p>Maintain an additional 25% (100% total) of existing building structure and shell (exterior skin and framing, excluding window assemblies and nonstructural roofing material).</p>	<p>This credit should be obtainable when renovating buildings with concrete walls, since concrete in buildings generally has a long life. This is worth 1 point if 75% of the existing building structure/shell is left in place (MR 1.1) and 2 points if 95% is left in place (MR 1.2).</p>
<p><b>MR Credit 4 – Recycled Content</b></p> <p>User of recycled content of cementitious materials as the recycled content of concrete</p> <p>New (higher) performance requirement</p> <p>Updated Referenced Standard (ISO 14201)</p>	<p>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.</p> <p>An additional credit is awarded is the total above is increase to 20%.</p> <p>The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the</p>	<p>Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 5% of the total value of the materials in the project.</p> <p>An additional credit is awarded is the total above is increase to 10%.</p> <p>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</p>	<p>The requirements of this credit are for using materials with recycled content. One point is awarded if the sum of the post-consumer recycled content plus one-half of the pre-consumer recycled content constitutes at least 10% (based on cost) of the total value of the materials in the project. The value of the recycled content of a material is the weight of the recycled content in the item divided by the weight of all materials in that item, and then multiplied by the total cost of the item. Supplementary cementitious materials, such as fly ash, silica fume, and slag cement are considered pre-consumer. <b>LEED-NC v2.2 allows the recycled content of concrete to be based on the recycled content of the cementitious materials. An example calculation is provided in the LEED-NC v2.2 Reference Guide.</b> Furthermore, using recycled concrete or slag as aggregate instead of extracted aggregate would qualify as post-</p>

	assembly is then multiplied by the cost of assembly to determine the recycled content value. Recycled content shall be defined in accordance with ISO 14021—Environmental labels and declarations—Self-declared environmental claims	the total weight of all material in the item, then multiplying the resulting percentage by the total value of the item.	consumer. Although most reinforcing bars are manufactured from recycled steel, in LEED, reinforcing is not considered part of concrete. Reinforcing material should be considered as a separate item. This credit is worth 1 point for the quantities quoted above and 2 points if the quantities are doubled to 20%.
<b>MR Credit 5.1 – Regional Materials</b>  Name change  New requirements on what constitutes “regional”  New (lower) performance requirement	Regional Materials: 10% Extracted, Processed & Manufactured Regionally  Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10% (based on cost) of the total materials value.  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.	Regional Materials: 20% manufactured regionally  Use a minimum of 20% of building materials and products that are manufactured regionally within a radius of 500 miles.  Manufacturing refers to the final assembly of components into the building product that is furnished and installed by the tradesmen.	This credit supports the use of indigenous (local) materials and reduced transportation distances. Concrete will qualify if ready-mix and precast plants are within 800 km (500 miles) of a job site, and if the materials to make the concrete were extracted within 800 km (500 miles). Aggregates (sand and gravel) are usually extracted within this distance, and cement and supplementary cementitious materials are usually manufactured within this distance. Calculations can also include concrete either manufactured or extracted locally. This credit is worth 1 point for the quantities quoted above, and 2 points for double the amount, or 20%.
<b>MR Credit 5.2 – Regional Materials</b>  Name change  New requirements on what constitutes “regional”  New (lower) performance requirement	Regional Materials: 20% Extracted, Processed & Manufactured Regionally Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for an additional 10% beyond MR Credit 5.1 (total of 20%, based on cost) of the total materials value.	Regional Materials: 50% extracted regionally  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 of the project site.	