



Guide Specification for Concrete for LEED v4 Projects

LEED v4 Material and Resources (MR)

In the past versions of LEED, the focus of material impacts has been on single attributes such as recycled content, rapid renewability or regional materials. While these attributes are important, they only tell part of the story. A product could perform well in one attribute but poorly in another. The new LEED v4 MR credits attempt to take a holistic look at materials by adopting life cycle assessment (LCA) and product disclosure and optimization.

Life cycle assessment, or LCA, is the investigation and evaluation of the environmental impacts of a product, process or service. LCA evaluates all stages of a product's life to determine its environmental life cycle impacts. LCA is the most comprehensive approach to determining environmental impacts of a building. There is one credit in LEED v4 called Building Life-Cycle Impact Reduction that rewards points if the building has lower life cycle impacts than a baseline building. Companies can submit Life Cycle Inventory (LCI) data for their products or Environmental Product Declarations (EPDs) to help the design team conduct a Whole Building LCA.

Product disclosure means reporting environmental, social and health impacts through third party verified reports, including Environmental Product Declarations (EPDs), Corporate Sustainability Reports (CSRs) and Health Product Declarations (HPDs), among others. There are three Building Product Disclosure and Optimization credits and each offers two points.

The first point (Option 1), Disclosure, requires the project use 20 permanently installed products that disclose impacts using EPDs, CSRs and/or HPDs. In LEED v4, a "product" is defined by the distinct function it serves. That means concrete has the advantage of contributing significantly because of concrete's wide range of applications or functions. For example, footings, foundations walls, shear walls, bearing walls, columns, beams, slabs, sidewalks and parking areas, each with a unique mix design, would all be considered different products in LEED v4 and therefore contribute significantly to the 20 required products.

The second point (Option 2), Optimization, requires a certain minimum value of building products to demonstrate they are performing better than industry baselines for environmental, social and health impacts. The second option limits the contribution of structure and enclosure to 30% of the qualifying products on a cost basis. However, the value of products manufactured and extracted within 100 miles (160 km) of the project site is doubled, meaning concrete can contribute significantly to this option since concrete is almost always manufactured and extracted locally.

There is also a Construction Waste Management credit for diverting construction, demolition and land clearing waste from landfill and incinerator disposal. Since concrete is a relatively heavy construction material and is frequently crushed and recycled into aggregate for road bases, construction fill and new concrete, this credit should be obtainable when concrete buildings are demolished on an existing site. In addition, returned concrete that is diverted from landfills by making landscaping blocks or recycling into new concrete can contribute.

The following is proposed of LEED v4 MR submittals for concrete. Other structural materials such as structural steel, reinforcing steel, masonry, precast concrete, wood, etc. could follow a similar concept.

SECTION 033000 - CAST-IN-PLACE CONCRETE

1.4 SUBMITTALS

A. LEED v4 Submittals.

Life Cycle Assessment (LCA) and Environmental Product Declarations (EPDs)

The concrete industry leads the way in conducting LCAs and publishing EPDs for their products. Several companies have published EPDs for concrete and most would be willing to publish EPDs specifically for a project. NRMCA has published a Life Cycle Assessment report and Industry Wide EPD for concrete and Regional Benchmarks for a wide range of concrete products (mix designs). Product specific EPDs and the Industry Wide EPD and industry Benchmark impacts for concrete can be found at www.nrmca.org/sustainability/EPDProgram. In addition, NRMCA has developed an example of how to conduct a Whole Building LCA for concrete building located at www.nrmca.org/sustainability/EPDProgram/downloads/Whole_Building_LCA_Example.pdf to help specifiers understand how concrete can contribute to lowering the overall footprint of a building and help meet the intent of the Building Life-cycle Impact Reduction credit in LEED v4.

1. Building Life-cycle Impact Reduction. For each product (mix design) submit:
 - a. If available, provide an ISO 14044 compliant Life Cycle Assessment and/or Inventory for each product proposed for the project. The Life Cycle Assessment / Inventory must be at least cradle-to-gate scope. Cradle-to-grave scope is preferred.
 - b. Alternatively, submit product-specific Environmental Product Declarations (EPDs) for each product (mix design) proposed on the project.
 - c. Alternatively, submit an Industry-Wide EPD including external verification in accordance with ISO 14025 in which the manufacturer is explicitly recognized as a participant by the program operator and indicate which concrete mixes in the Industry-Wide EPD correspond to the mixes submitted for the project.

Calculating the target Global Warming Potential for Concrete

To specify a target Global Warming Potential (GWP) for concrete so a contractor and concrete producer can work together to develop mixes that lower GWP of the building, the design team must calculate the GWP for concrete of a reference building and the target GWP such that the building will meet the intent of the credit. NRMCA has developed an example of how to conduct a Whole Building LCA for concrete building located at: www.nrmca.org/sustainability/EPDProgram/downloads/Whole_Building_LCA_Example.pdf to help designers set a target for GWP. Although the WBLCA credit in LEED v4 requires reducing three impacts by at least 10 percent, GWP is mandatory and the other impacts typically are lowered by similar amounts.

- d. Submit a summary document indicating that the total Global Warming Potential (GWP) of all concrete on the project is less than or equal to X,XXX,XXX kg of CO2 equivalents as calculated using the Athena Impact Estimator for Buildings software available at www.athenasmj.org or similar whole building LCA software.

2. Materials and Resources: Product Disclosure and Optimization – Environmental Product Declarations Part 1. For each product (mix design) submit:
 - a. If available, provide a product-specific Type III EPD —third-party certified EPD including external verification in accordance with ISO 14025.
 - b. Alternatively, submit an industry-wide (generic) EPD — products with third-party certified EPD including external verification in accordance with ISO 14025 in which the manufacturer is explicitly recognized as a participant by the program operator.
 - c. Alternatively, submit product specific declaration — publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
3. Materials and Resources: Products Disclosure and Optimization – Environmental Product Declarations Part 2. If available, for each product (mix designs) with Type III EPDs, submit:
 - a. Product-specific Type III EPD — Third-party certified EPD including external verification in accordance with ISO 14025 in which the manufacturer is explicitly recognized as the participant by the program operator.
 - b. A letter that indicates for each product (mix design) if environmental impacts are below industry benchmarks, as published by the National Ready Mixed Concrete Association Benchmark report available at www.nrmca.org/sustainability/EPDprogram, in at least three of the following categories:
 1. global warming potential (greenhouse gases), in CO₂e;
 2. depletion of the stratospheric ozone layer, in kg CFC-11;
 3. acidification of land and water sources, in moles H⁺ or kg SO₂;
 4. eutrophication, in kg nitrogen or kg phosphate;
 5. formation of tropospheric ozone, in kg NO_x, kg O₃, or kg ethene; and
 6. depletion of nonrenewable energy resources, in MJ.
 - b. For products meeting the above criteria, submit a letter stating the dollar value of all products that are extracted, manufactured, and purchased (including distribution) within a 100 mile radius of the project site.

Responsible Sourcing Certification and Corporate Social Responsibility Reports (CSRs)

The concrete industry leads the way in publishing corporate social responsibility reports. Several companies have published CSRs for cement, aggregate and concrete.

In addition, the National Ready Mixed Concrete Association (NRMCA) is a certification body under the international Concrete Sustainability Council (CSC) responsible sourcing certification program. The program provides a rigorous third party verified certification and report for companies who voluntarily take into account social, environmental and economical considerations when managing their operations and their relationships with suppliers. Details of the certification can be found at: www.concretesustainabilitycouncil.org. The certification program provides 4 levels of certification including Certified, Silver, Gold and Platinum. The Certified level or higher would qualify for Option 1 of the Sourcing of Raw Materials credit in LEED v4. Silver and higher could potentially qualify for Option 2 of the credit. The certification meets the responsible sourcing frameworks identified by LEED v4. Although the certification is not a USGBC approved program, NRMCA and CSC are in discussions with USGBC to have the program approved. Currently, it is suggested that design teams request the certification and if concrete supplied on the project is certified CSC Silver or higher, apply for an Innovation in Design credit, assuming concrete is a significant cost item on the project.

4. **Materials and Resources: Product Disclosure and Optimization – Sourcing of Raw Materials Part 1.** If available, for each product (mix design) submit:
 - a. (Preferred submittal) Concrete Sustainability Council Responsibly Sourced Concrete certification at the Certified level or higher.
 - b. (Alternate submittal) Third-party verified corporate sustainability report (CSR) which includes environmental impacts of extraction operations and activities associated with the manufacturer’s product and the product’s supply chain, following one of the CSR frameworks:
 1. Global Reporting Initiative (GRI) Sustainability Report
 2. Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises
 3. U.N. Global Compact: Communication of Progress
 4. ISO 26000: 2010 Guidance on Social Responsibility
 - c. (Alternate submittal) Publicly available self-declared report that includes reports from raw material suppliers which includes raw material supplier extraction locations, a commitment to long-term ecologically responsible land use, a commitment to reducing environmental harms from extraction and/or manufacturing processes, and a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria.
5. **Materials and Resources: Product Disclosure and Optimization – Sourcing of Raw Materials Part 2.** For each product (mix design) submit:
 - a. (If available) Concrete Sustainability Council Responsibly Sourced Concrete certification at the Silver level or higher.

- b. Letter stating the dollar value of the sum of postconsumer recycled content plus one-half the preconsumer recycled content.
- c. Submit a letter stating the dollar value of all products that are extracted, manufactured, and purchased (including distribution) within a 100 mile radius of the project site.

Health Product Declarations (HPDs)

Several concrete companies are working towards published HPDs for concrete and most would be willing to publish HPDs specifically for a project. The National Ready Mixed Concrete Association is working towards publishing a guide to material ingredient disclosure and optimization for concrete. Information on concrete product HPDs can be found at www.nrmca.org/sustainability.

- 6. Product Disclosure and Optimization – Material Ingredients Part 1. If available, for each product (mix design) submit:
 - a. A chemical inventory of the product to at least 0.1% (1000 ppm) using one of the following criteria:
 - 1. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN). Materials defined as trade secret or intellectual property may withhold the name and/or CASRN but must disclose role, amount and GreenScreen benchmark, as defined in GreenScreen v1.2.
 - 2. Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.
 - 3. Cradle to Cradle v2 Basic level certification documentation.
 - 4. Cradle to Cradle v3 Bronze level certification documentation.
- 7. Product Disclosure and Optimization – Material Ingredients Part 2. If available, for each product (mix design) submit:
 - a. GreenScreen v1.2 Benchmark with chemical inventory of chemical ingredients to 100 ppm, or,
 - b. Cradle to Cradle certification documentation to one of the following levels:
 - i. Cradle to Cradle v2 Gold
 - ii. Cradle to Cradle v2 Platinum
 - iii. Cradle to Cradle v3 Silver
 - iv. Cradle to Cradle v3 Gold or Platinum
 - c. For products meeting the above criteria, submit a letter stating the dollar value of all products that are extracted, manufactured, and purchased (including distribution) within a 100 mile radius of the project site.
- 8. Construction and Demolition Waste Management. For all products (mix designs) submit:
 - a. Letter stating the total weight and volume of waste (returned or unused concrete) diverted from landfills. Provide details of how the waste was recovered, reused or recycled.