



## Environmental Declarations and Structures

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The U.S. Green Building Council (USGBC) continues to drive market transformation related to green building. Most recently, this is evidenced by the increase in the number of manufacturers and trade associations that have undertaken development of product category rules (PCRs) and environmental product declarations (EPDs) in response to a new credit in LEED v4. This article discusses the status of PCRs and EPDs in the concrete industry and how they can be used by structural engineers.

### Influence of LEED

The LEED v4 Materials and Resources Credit: Building Product Disclosure and Optimization – Environmental Product Declarations “reward[s] project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.” One of the options requires the use of 20 permanently installed products that have a:

- Product-specific declaration,
- Industry-wide (generic) environmental product declaration (EPD),
- Product-specific Type III EPD, or
- Declaration from a USGBC-approved program.

This credit rewards points to projects that use products, such as concrete, that have an EPD, but it doesn't require specific values or thresholds on environmental impacts.

This has led the concrete industry, among others, to develop PCRs and EPDs. In November 2012, the Carbon Leadership Forum (CLF) at the University of Washington released a U.S.-specific PCR for concrete, which was revised in December 2013. In February 2013, the World Business Council for Sustainable Development (WBCSD) also announced the development of a PCR for unreinforced concrete. Other concrete-related industry PCRs that have been published recently include:

- Slag cement, (August 2014),
- Portland, blended hydraulic, masonry, mortar, and plastic (stucco) cements (September 2014), and
- Manufactured concrete and concrete masonry products (December 2014).

These PCRs have been used to develop EPDs for concrete-related industries. While several individual companies have published EPDs for individual concrete-related products, a comprehensive report on the environmental impacts of concrete was published by the National Ready-Mixed Concrete Association (NRMCA) in October 2014. NRMCA's *Industry-Wide (IW) Environmental Product Declaration (EPD) and Benchmark (Industry Average) Report* discloses average environmental impacts for concrete. These data are for concretes of varying strengths, uses, and mixture proportions.

### Role in Structures

Most balanced studies show that there isn't much difference among the environmental impacts of structural materials over the life of a structure. This is good news to structural engineers, who often have factors other than environmental impact (cost, availability, timing) affecting the choice in structural materials. So how can structural engineers use EPDs in practice?

Though the temptation to compare the environmental impact of different structural materials using EPDs might be there, the ISO documents explicitly forbid it. EPDs may only be compared if products are evaluated using the same PCR (see sidebar), and in the whole-building context. If the decision to use concrete has already been made for a project, EPDs of different concretes (that use the same PCR) can be used to determine the optimum mixture to reduce environmental impact and

achieve the performance attributes that are desired for the project.

EPDs may also be used to reevaluate the performance requirements that are set for the concrete in certain applications. Perhaps the slower strength gain of a high-fly-ash concrete can be accommodated on certain parts of the structure, like the foundation.

### Knowledge is Power

Though environmental impacts don't yet have the same influence over design decisions as cost and schedule, structural engineers do have the ability to reduce environmental impacts with an increased knowledge gained from EPDs. And because structural materials are typically a large portion of the structure (by weight if not volume), structural engineers may have more influence over reducing environmental impacts of buildings than they realize. ■

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### What are PCRs and EPDs?

Environmental product declarations (EPDs) are Type III environmental labels according to International Organization for Standardization [ISO] 14025. For a given functional or declared unit, EPDs list the environmental impacts for a product. It is important to note that these labels only list environmental impacts; they do not rank the environmental impact of a product.

Product category rules (PCRs) set the rules for how a life-cycle assessment (LCA) is performed. The LCA is the analysis that is performed to determine the environmental impacts for a given product category (such as unreinforced concrete). This ensures consistency in procedures and interpretation of commonly used LCA standards. A PCR also establishes what information is reported in an EPD (such as environmental impact categories and other information), and how that information is formatted. This ensures consistency in reporting.

## References

1. U.S. Green Building Council (USGBC). 2013. *LEED Reference Guide for Building Design and Construction*. 2013 Ed., Washington, D.C.: USGBC.
2. Carbon Leadership Forum (CLF). 2013. *Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) of Concrete*, Revised Version 1.1, December 4, 2013: CLF.
3. World Business Council on Sustainable Development (WBCSD). 2013. *UN CPC 375 Concrete Product Category Rules*, version 1.0: WBCSD.
4. ASTM International. 2014. *Product Category Rules for Slag Cement*, August 2014, West Conshohocken, PA: ASTM International.
5. ASTM International. 2014. *Product Category Rules for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements*, September 2014, West Conshohocken, PA: ASTM International.
6. ASTM International. 2014. *Product Category Rules for Manufactured Concrete and Concrete Masonry Products*, December 2014, West Conshohocken, PA: ASTM International.
7. Bushi, L. and G. Finlayson. 2014. *NRMCA Member National and Regional Life Cycle Assessment Benchmark (Industry Average) Report*. Prepared for the National Ready-Mix Concrete Association (NRMCA): Athena Sustainable Materials Institute.
8. International Standards Organization (ISO). 2006. *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*. ISO 14025, ISO, Geneva, Switzerland.
9. ISO. 2006. *Environmental management – Life cycle assessment – Principles and framework*. ISO 14040, ISO, Geneva, Switzerland.
10. ISO. 2006. *Environmental management – Life cycle assessment – Requirements and guidelines*. ISO 14044, ISO, Geneva, Switzerland.