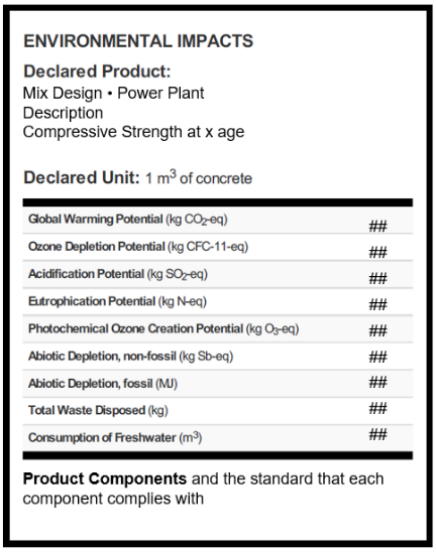
ENVIRONMENTAL PRODUCT DECLARATIONS (EPDs)
For Construction Materials: Background and Best Practices

What is an EPD? An environmental product declaration (EPD) is a report providing an estimated quantification of the environmental impacts of a specific product as determined in accordance with its corresponding standard. EPDs include the environmental impact indicators of global warming potential, ozone depletion potential, eutrophication potential, acidification potential, photochemical ozone creation potential, abiotic depletion nonfossil, and abiotic depletion fossil, as well as total waste disposed and consumption of freshwater depending on the product. These estimated environmental impacts are presented within an EPD in a format akin to nutrition facts labels typically seen on food products (Figure 1).



ENVIRONMENTAL IMPACTS

Declared Product:
Mix Design • Power Plant
Description
Compressive Strength at x age

Declared Unit: 1 m^3 of concrete

Global Warming Potential (kg CO_2-eq)	##
Ozone Depletion Potential (kg CFC-11-eq)	##
Acidification Potential (kg SO_2-eq)	##
Eutrophication Potential (kg N-eq)	##
Photochemical Ozone Creation Potential (kg O_3-eq)	##
Abiotic Depletion, non-fossil (kg Sb-eq)	##
Abiotic Depletion, fossil (MJ)	##
Total Waste Disposed (kg)	##
Consumption of Freshwater (m^3)	##

Product Components and the standard that each component complies with

Figure 1. Example EPD output.

EPDs can be facility-specific and/or product-specific or an industry-average. A facility-specific, product-specific EPD is preferrable to an industry-average because of the quality and precision of the data provided. In instances where facility-specific and/or product-specific data is not available, industry-average data can be used. However, depending on how the EPD data will be utilized, an industry average EPD may not be sufficient. EPDs can be developed using a combination of facility-specific and industry-average data for different components.

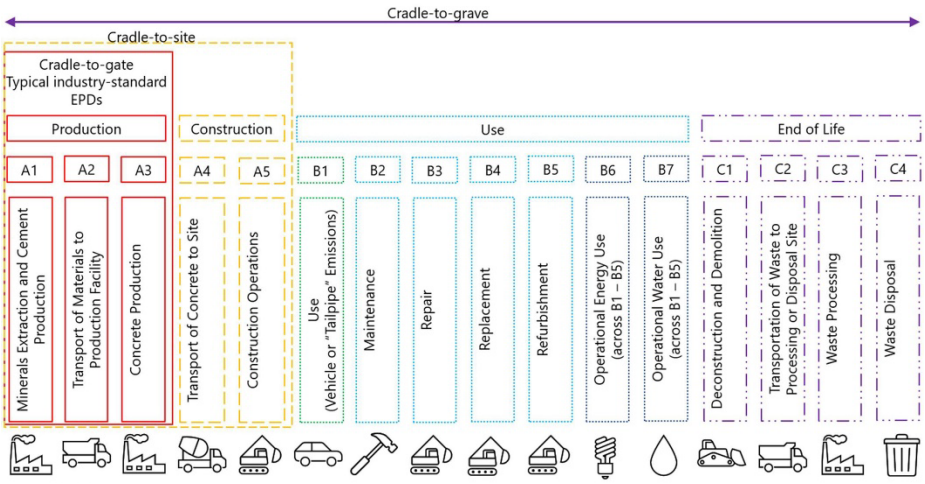


Figure 2. Life cycle stages and the scope of a current concrete EPD.

EPDs for construction materials, as prescribed in their PCRs, typically include life cycle stages from A1 to A3 (Figure 2), which include materials extraction, transportation to the production facility, and production energy. A4 (transportation from the production facility to the job site) and A5 (construction operations or installation) are currently optional life cycle stages that can be included in the EPD's scope, but often are not included.

How are EPDs developed? The first step in developing an EPD is identifying the product category rule (PCR), which is the standard for a class of products by which EPDs are developed, for the product or process and then conduct an LCA as per the requirements outlined in the PCR. These requirements may include protocols for collecting foreground data, such as concrete mixture proportions, and guidance for using background data, such as electricity. A PCR is developed for a class of products using a transparent, stakeholder consensus approach. The background datasets, scope, and method of calculations may be dictated by the PCR. All PCRs and EPDs must conform to the International Organization for Standardization (ISO) 21930 and ISO 14025. If a product category does not have a PCR, ISO 21930 can be used as the core PCR to develop an EPD.

The development of an EPD is analogous to the performance of a compressive strength test. To perform a compressive strength test, a technician first reads a standard that describes the materials, equipment, and procedure needed to perform the test. This standard was developed using a transparent, consensus-based approach from a variety of industry stakeholders to increase the consistency of the test performance within the laboratory and between laboratories, such that the results could potentially be compared with the results received on the same material in a different laboratory; the same is true for a PCR. The test is then performed using the materials, equipment, and procedure outlined in the standard; this test is analogous to an LCA. The test results are then reported, also in accordance with the standard, in specific units with notes and descriptions of the material tested, date of test, and any other relevant or required information; this reporting is analogous to an EPD, which reports the results of the LCA as performed in accordance with the governing PCR.

How do you use an EPD? EPDs can be used to:

- To **inform an LCA**. LCAs can include some or all life cycle stages of a product. EPDs can act as building blocks during the development of an LCA incorporating the same portion of the life cycle represented in the EPD.
- To **inform interested parties** (such as the owner or the public) of the estimated environmental impacts associated with a product.
- To **quantify** the environmental impacts associated with a **change to the product or supply chain**.
- To **inform the implementation of strategies** to reduce environmental impacts.
- To **compare two similar materials** with the **same function** whose EPDs were developed using the **same PCR**. For example, the compressive strengths of two concrete cylinders of the same material, conditioned in the same way, and tested using ASTM C39 at the same age can be compared. You cannot, however, compare a compressive strength result with a split tensile strength result for a concrete cylinder despite using the same equipment and receiving the same output units. Those tests apply the information differently, use different standards, and use different inputs to perform the test. The same concepts are true for EPDs. Similarly, you cannot compare the compressive strength of a concrete cylinder and asphalt cylinder because the test methods and failure mechanisms are different.

How shouldn't you use an EPD? EPDs should not be used:

- To compare two dissimilar materials or compare two materials with different functions or compare materials that use two different PCRs.
- As a replacement to materials testing or quality assurance.
- As a priority over performance or constructability.

In general, EPDs can successfully estimate the environmental impacts of a product, specifically a construction material such as concrete.

Note: PCRs are evolving documents that change at least every five years. Therefore, the information herein regarding EPDs is subject to change over time. This document was developed in *July 2023* and is accurate to the PCR and EPD process applicable at that time. Future versions of this document may be developed to account for changes in the PCR as needed.

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