



Industrial Ecology Consultants

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Verification Report: Pathways LCA/EPD Generator – Ready Mix Concrete

ASTM International commissioned Industrial Ecology Consultants to perform an external independent verification of the **Pathways Life Cycle Assessment (LCA) and Environmental Product Declaration (EPD) Generator for Ready Mix Concrete, v1.0**. The review assessed conformance in accordance with:

ASTM International. (2016). *ASTM Program Operator for Product Category Rules (PCRs) and Environmental Product Declarations (EPDs), General Program Instructions*. Version 8.0, revised April 29, 2020.

NRMCA (2024). *General Program Instructions for Environmental Product Declarations*, v 3.0, validity July 1, 2024 - June 30, 2029.

NRMCA EPD (2024). *Program Rules for Systematic EPD Verification* (updated June 24, 2024)

International Organization for Standardization. (2000). *Environmental labels and declarations -- General principles* (ISO 14020:2000).

International Organization for Standardization. (2006). *Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures* (ISO 14025:2006).

International Organization for Standardization. (2020). *Environmental management -- Life cycle assessment -- Requirements and guidelines* (ISO 14044:2006/Amd 2:2020).

International Organization for Standardization. (2014). *Environmental management -- Life cycle assessment -- Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006*. (ISO/TS 14071:2014).

International Organization for Standardization. (2017). *Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services*. (ISO 21930:2017).

NSF International (2024). *PCR for Concrete*, v2.3. February.

The independent verification was conducted by:

Thomas P. Gloria, Ph.D.
Founder, Chief Sustainability Engineer
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REVIEW SCOPE

The Pathways LCA/EPD Generator has the capacity to generate self-declared EPD results for concrete products based on user-provided technosphere and emission flows in accordance with the NSF PCR for concrete products. The scope of this review involved reviewing the Pathways LCA/EPD Generator – v.1.0, supporting LCA project report and EPD samples (fifteen total) per the requirements of the National Ready Mix Concrete Association (NRMCA) General Program Instructions v3.0, (validity July 1, 2024 - June 30, 2029) and the NRMCA EPD Program Rules for Systematic EPD Verification (updated June 24, 2024).

REVIEW PROCESS

The review involved the generation of review matrices based on the requirements set forth by the applicable standards, NSF PCRs, NRMCA GPIs, and ASTM International GPIs. A review matrix was used to assess the conformance of the update to the life cycle assessment calculation system and verify system-generated EPDs. Per the NRMCA GPIs, the tool owner or developer shall test representative samples of the latest version of the regionally specific industry average LCA and benchmark report (A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members – Version 3.2 or later) with the following minimum criteria:

- a. At least 10 concrete mixtures total with a variety of strength classes including 3,000, 4,000, 5,000, 8,000 and 4000LW psi.
- b. In at least the following regions: National, Pacific Southwest and South Central.

The review matrix served as documentation that all requirements had been identified and addressed upon completion of this review. As per ISO 14025, Clause 8.1.4, this report shall be made available to any interested party upon request.

Supporting drafts and final documents reviewed include the following:

Sample LCA Report

Test EPDs:

Mix 3000-00-FA/SL

Mix 3000-30-FA

Mix 3000-30-SL

Mix 4000-00-FA/SL

Mix 4000-30-FA

Mix 4000-30-SL

Mix 5000-00-FA/SL

Mix 5000-30-FA

Mix 5000-30-SL

Mix 5000-50-FA/SL

Mix LW 4000-40-FA

Mix 8000-20-FA

Mix D-2 4000 (Eastern)



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Mix D-6 4000 (Pacific Southwest)

Mix D-8 4000 (South Central)

The review covered more than 500 identified requirements specified by the PCR, GPIs, and applicable ISO standards. All items were checked and determined to be satisfactory. Moreover, considerable effort went into verifying that when used properly, the EPD generator system and associated databases generate consistent and plausible results for concrete products as well as conform to the applicable PCR.

VERIFICATION STATEMENT

Based on the independent verification objectives, the update to the **Pathways Life Cycle Assessment (LCA) and Environmental Product Declaration (EPD) Generator for Ready Mix Concrete, v1.0** was determined to be *in conformance* with ASTM International's General Program Instructions, core and subcategory product category rules and applicable ISO standards. The plausibility, quality, and accuracy of the LCA-based data and supporting information as captured in the generator tool are confirmed.

I confirm that I have sufficient knowledge and experience of cement and concrete products, the relevant core PCR, subcategory PCR for cement, ISO standards and the geographical areas intended to generate EPDs to carry out this verification.

Sincerely,

A handwritten signature in cursive script, appearing to read "Thomas P. Gloria".

Thomas P. Gloria, Ph.D.
Founder, Chief Sustainability Engineer
Industrial Ecology Consultants