# ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017

SmartEPD-2024-015-0093-01

## Primer 67


Dudick
A Division of Carboline

SMART EPD
CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION

**Date of Issue:**
Mar 27, 2024

**Expiration:**
Mar 27, 2029

**Last updated:**
Mar 27, 2024

## General Information

Dudick Inc.

1818 Miller Parkway, Streetsboro, OH 44241

330-562-1970

Anthony.Allegra@carboline.com dudick.com


| | |
|---|---|
| **Product Name:** | Primer 67 |
| **Functional Unit:** | 1 m2 of covered and protected flooring surface for a period of 60 years |
| **Declaration Number:** | SmartEPD-2024-015-0093-01 |
| **Date of Issue:** | March 27, 2024 |
| **Expiration:** | March 27, 2029 |
| **Last updated:** | March 27, 2024 |
| **EPD Scope:** | Cradle to grave<br>A1 - A3, A4, A5, B1 - B7, C1 - C4 |
| **Market(s) of Applicability:** | North America |

## Reference Standards

| | |
|---|---|
| **Standard(s):** | ISO 14025 and ISO 21930:2017 |
| **PCR:** | NSF International PCR for Resinous Floor Coatings v.1e<br>Date of issue: December 17, 2018<br>Valid until: December 17, 2024 |
| **PCR review panel:** | Contact Smart EPD for more information. |
| **General Program Instructions:** | Smart EPD General Program Instructions v.1.0, November 2022 |

## Verification Information

**LCA Author/Creator:** Amy Torri | amy@parqhq.com

**EPD Program Operator:** Smart EPD | info@smartepd.com | www.smartepd.com
585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

**Verification:**
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 : External
Anna Lasso | Smart EPD | anna.lasso@smartepd.com

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) : External
Anna Lasso | Smart EPD | anna.lasso@smartepd.com

## Limitations, Liability, and Ownership

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers or programs, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the construction works level per ISO 21930:2017 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

The EPD owner shall have sole ownership, liability, and responsibility for the EPD.

## Organization Information

For over fifty years, Dudick has been at the forefront of delivering cutting-edge product development alongside a wealth of technical expertise and experience, offering unparalleled chemical resistant coating solutions on a global scale. As a notable manufacturer of high performance resinous flooring and other coating products, Dudick is dedicated to showcasing its sustainability leadership while recognizing the business value in transparently reporting the comprehensive environmental impacts of its products, spanning from cradle to grave. For additional details on Dudick's product range, visit their website at https://www.dudick.com.

**Further information can be found at:** https://www.dudick.com

## Product Description

Dudick's Primer 67 is a high solids epoxy primer for steel and concrete. Designed to prevent abrasive blasted steel from developing rust bloom prior to the application of a coating or lining system.

**Further information can be found at:** https://www.dudick.com/products/primers/steri-prime/

## Product Information

| | |
|---|---|
| **Functional Unit:** | 1 m2 of covered and protected flooring surface for a period of 60 years |
| **Mass:** | 0.64 kg |
| **Reference Service Life:** | 60 Years |

**Product Specificity:**

- ✗ Product Average
- ✓ Product Specific

**Averaging:**

Averaging was not conducted for this EPD.

## Plants

Dudick - Streetsboro, OH
1818 Miller Parkway, Streetsboro, OH, USA

## Product Specifications

| | |
|---|---|
| **Product SKU(s):** | 102D0000905D, 102D0000A2HD, 102D0910B2HD |
| **Product Classification Codes:** | Masterformat - 09 67 00<br>EC3 - Finishes -> Flooring -> OtherFlooring |
| **Coating Type:** | Thin mil floor coating |
| **Options:** | ✓ Commercial |
| **Estimated market service life:** | 10 years |
| **Estimated technical service life:** | 15 years |

## Material Composition

| Material/Component Category | Origin | % Mass |
|---|---|---|
| Hardener | US | 40-75 |
| Solvent | US | 0-5 |
| Resin | US | 30-50 |
| Additive | US | 0-5 |

| Packaging Material | Origin | kg Mass |
|---|---|---|
| Steel Pail | US | 5.67E-2 |
| Plastic Pail | US | 4.78E-2 |
| Cardboard | US | 1.38E-3 |

| Biogenic Carbon Content | kg C per m2 of covered and protected flooring surface for a period of 60 years |
|---|---|
| Biogenic carbon content in product | None |
| Biogenic carbon content in accompanying packaging | 0.000691 |

| Hazardous Materials |
|---|
| Benzyl alcohol (CAS 100-51-6) |
| BISPHENOL A EPOXY RESIN (CAS 25068-38-6) |
| ALKYL GLYCIDYL ETHER (CAS 68609-97-2) |
| POLYAMIDE (CAS 68410-23-1) |
| Isophoronediamine (CAS 2855-13-2) |
| META-XYLENE (CAS 108-38-3) |
| 2-PIPERAZIN-1- YLETHYLAMINE (CAS 140-31-8) |
| TRIS-2,4,6-(DIMETHYLAMINOMETHYL)PHENOL (CAS 90-72-2) |
| PARA-XYLENE (CAS 106-42-3) |
| ETHYL BENZENE (CAS 100-41-4) |
| ORTHO-XYLENE (CAS 95-47-6) |
| Epoxy phenol novolac resin (CAS 28064-14-4) |
| 4-tert-Butylphenol (CAS 98-54-4) |

## EPD Data Specificity

**Primary Data Year:** 2022-2023

**Manufacturing Specificity:**

- ✗ Industry Average
- ✗ Manufacturer Average
- ✓ Facility Specific

## Software and LCI Data Sources

| | | | |
|---|---|---|---|
| **LCA Software:** | SimaPro v. 9.5 | | |
| **LCI Foreground Database(s):** | Ecoinvent v. 3.9.1 | North America | cut-off |
| **LCI Background Database(s):** | Ecoinvent v. 3.9.1 | North America | cut-off |

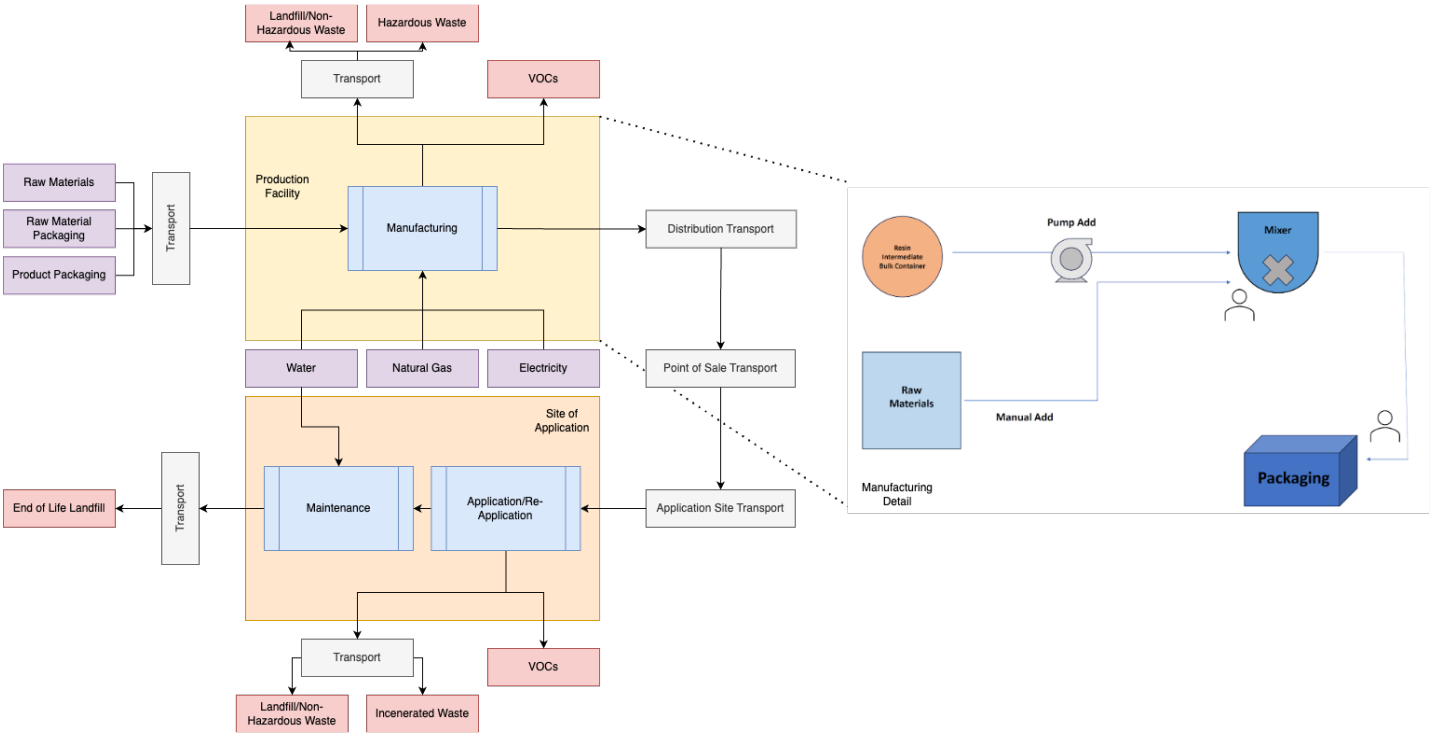
## Renewable Electricity

| | |
|---|---|
| **Renewable electricity is used:** | No |

## System Boundary

| | | | |
|---|---|---|---|
| Production | A1 | Raw material supply | ✓ |
| | A2 | Transport | ✓ |
| | A3 | Manufacturing | ✓ |
| Construction | A4 | Transport to site | ✓ |
| | A5 | Assembly / Install | ✓ |
| Use | B1 | Use | ✓ |
| | B2 | Maintenance | ✓ |
| | B3 | Repair | ✓ |
| | B4 | Replacement | ✓ |
| | B5 | Refurbishment | ✓ |
| | B6 | Operational Energy Use | ✓ |
| | B7 | Operational Water Use | ✓ |
| End of Life | C1 | Deconstruction | ✓ |
| | C2 | Transport | ✓ |
| | C3 | Waste Processing | ✓ |
| | C4 | Disposal | ✓ |
| Benefits & Loads Beyond System Boundary | D | Recycling, Reuse Recovery Potential | ND |

## Product Flow Diagram




## Life Cycle Module Descriptions

The manufacturing of this product involves the direct procurement of raw materials from suppliers in module A1. These materials are then transported in module A2 to Dudick's manufacturing facility in Streetsboro, OH, where they are stored and mixed to produce the coatings in module A3. Packaging waste associated the raw materials is recycled and/or send to landfill in Module A3. The coating is distributed and sold across North America in module A4. The product is applied to substrates to create a protective flooring surface in module A5.

Use of the product consists of daily maintenance cleaning with a mop and a cleaning solution such as Hillyard SM-1® Industrial Cleaner Degreaser in module B2. Necessary recoats (re-applications) of the product to achieve service life are modeled in module B4 per the PCR.

The plastic or steel can packaging is discarded to landfill and a 2% coating loss rate during application is assumed per the PCR (for both initial application and any recoats). End of life impacts include transport to disposal and final waste processing in modules C2 and C3, respectively, and landfilling of the substrate with applied coating in module C4, per the PCR.

## LCA Discussion

### Allocation Procedure

Product packaging was allocated by mass. Manufacturing inputs requiring allocation were electricity and natural gas as the production of multiple products is measured using a single meter for each. The allocation of each was based on the percentage of production for the product in question divided by the total site production output.

### Cut-off Procedure

The model includes over 95% of the total material mass, energy and environmental relevance throughout the product lifetime. Cut-off rules do not apply for hazardous or toxic materials, and the materials were included in the study.

## Data Quality Discussion

The quality of inventory data is evaluated based on several criteria, including precision, completeness, consistency, and representativeness.

**Precision and Completeness**

- Precision: The inventory data used in this study were either directly measured, calculated, or estimated based on primary data sources, ensuring high precision. Background data from ecoinvent v3.9.1 database also has documented precision to the extent available.
- Completeness: Each product system's mass balance and inventory completeness were thoroughly checked. Similar exclusions were made in line with the PCR requirements, as stated in the original Dudick LCA. However, no data was intentionally omitted.

**Consistency and Reproducibility**

- Consistency: Primary data were collected with a similar level of detail, while background data came from the ecoinvent v3.9.1 database. The modeling approach and other methodological choices were applied consistently throughout the model. Default values from the PCR were considered where there was unavailability of primary data, For example, the default waste transport distance was used for product disposal assessment.
- Reproducibility: This study ensures reproducibility by providing comprehensive disclosure of input-output data, dataset choices, and modeling approaches. A knowledgeable third party should be able to approximate the results using the same data and modeling methods.

**Representativeness**

- Temporal: Primary data were collected for the one-year period of October 2022 to September 2023 to ensure the representativeness of post-consumer content. Secondary data from the ecoinvent v3.9.1 database is typically representative of recent years.
- Geographical: Primary data represents Carboline's production facility in Green Bay, WI and Dudick's production facility in Streetsboro, Ohio. Where applicable, differences in electric grid mix were considered using appropriate secondary data. The use of country-specific data ensures high geographical representativeness, and proxy data were only used when country-specific data were unavailable.

# Results

## Environmental Impact Assessment Results

TRACI 2.1, IPCC AR5 GWP 100

per 1 m2 of covered and protected flooring surface for a period of 60 years.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Commercial - Market Service Life

| Impact Category | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ODP | kg CFC 11 eq | 8.09e-8 | 1.68e-9 | 1.07e-9 | 8.36e-8 | 8.04e-10 | 8.99e-12 | 0 | 1.09e-8 | 0 | 4.23e-7 | 0 | 0 | 0 | 0 | 6.43e-11 | 3.17e-10 | 2.60e-10 |
| AP | kg SO2 eq | 1.83e-3 | 6.55e-4 | 1.88e-4 | 2.67e-3 | 2.60e-4 | 3.57e-6 | 0 | 7.16e-4 | 0 | 1.47e-2 | 0 | 0 | 0 | 0 | 2.09e-5 | 3.04e-5 | 1.08e-4 |
| EP | kg N eq | 8.02e-4 | 4.96e-5 | 3.62e-5 | 8.88e-4 | 2.19e-5 | 2.38e-5 | 0 | 2.55e-4 | 0 | 4.67e-3 | 0 | 0 | 0 | 0 | 1.76e-6 | 2.86e-6 | 8.57e-4 |
| POCP | kg O3 eq | 2.39e-2 | 1.74e-2 | 2.63e-3 | 4.39e-2 | 7.29e-3 | 6.32e-5 | 0 | 7.66e-3 | 0 | 2.56e-1 | 0 | 0 | 0 | 0 | 5.85e-4 | 4.00e-4 | 1.70e-3 |
| GWP-fossil | kg CO2 eq | 4.53e-1 | 1.02e-1 | 6.49e-2 | 6.20e-1 | 4.87e-2 | 1.06e-3 | 0 | 1.31e-1 | 0 | 3.35e+0 | 0 | 0 | 0 | 0 | 3.90e-3 | 4.64e-2 | 3.45e-2 |
| GWP-total | kg CO2 eq | 4.64e-1 | 1.03e-1 | 6.95e-2 | 6.37e-1 | 4.90e-2 | 1.44e-2 | 0 | 1.45e-1 | 0 | 3.50e+0 | 0 | 0 | 0 | 0 | 3.92e-3 | 4.64e-2 | 5.17e-1 |

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Technical Service Life

| Impact Category | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ODP | kg CFC 11 eq | 8.09e-8 | 1.68e-9 | 1.07e-9 | 8.36e-8 | 8.04e-10 | 8.99e-12 | 0 | 1.09e-8 | 0 | 2.54e-7 | 0 | 0 | 0 | 0 | 4.29e-11 | 2.11e-10 | 1.73e-10 |
| AP | kg SO2 eq | 1.83e-3 | 6.55e-4 | 1.88e-4 | 2.67e-3 | 2.60e-4 | 3.57e-6 | 0 | 7.16e-4 | 0 | 8.82e-3 | 0 | 0 | 0 | 0 | 1.39e-5 | 2.03e-5 | 7.19e-5 |
| EP | kg N eq | 8.02e-4 | 4.96e-5 | 3.62e-5 | 8.88e-4 | 2.19e-5 | 2.38e-5 | 0 | 2.55e-4 | 0 | 2.80e-3 | 0 | 0 | 0 | 0 | 1.17e-6 | 1.91e-6 | 5.71e-4 |
| POCP | kg O3 eq | 2.39e-2 | 1.74e-2 | 2.63e-3 | 4.39e-2 | 7.29e-3 | 6.32e-5 | 0 | 7.66e-3 | 0 | 1.54e-1 | 0 | 0 | 0 | 0 | 3.90e-4 | 2.67e-4 | 1.13e-3 |
| GWP-fossil | kg CO2 eq | 4.53e-1 | 1.02e-1 | 6.49e-2 | 6.20e-1 | 4.87e-2 | 1.06e-3 | 0 | 1.31e-1 | 0 | 2.01e+0 | 0 | 0 | 0 | 0 | 2.60e-3 | 3.09e-2 | 2.30e-2 |
| GWP-total | kg CO2 eq | 4.64e-1 | 1.03e-1 | 6.95e-2 | 6.37e-1 | 4.90e-2 | 1.44e-2 | 0 | 1.45e-1 | 0 | 2.10e+0 | 0 | 0 | 0 | 0 | 2.61e-3 | 3.09e-2 | 3.44e-1 |

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

## Resource Use Indicators

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Market Service Life

| Indicator | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ, net calorific value | 2.02e-1 | 1.34e-2 | 4.75e-2 | 2.63e-1 | 6.28e-3 | 2.47e-4 | 0 | 8.10e-2 | 0 | 1.34e+0 | 0 | 0 | 0 | 0 | 5.02e-4 | 9.73e-4 | 8.41e-3 |
| PERM | MJ, net calorific value | 9.32e-2 | 5.41e-3 | 1.51e-2 | 1.14e-1 | 2.45e-3 | 5.39e-5 | 0 | 6.71e-1 | 0 | 5.81e-1 | 0 | 0 | 0 | 0 | 1.96e-4 | 2.48e-4 | 1.75e-3 |
| PERT | MJ, net calorific value | 2.95e-1 | 1.88e-2 | 6.25e-2 | 3.76e-1 | 8.72e-3 | 3.01e-4 | 0 | 7.52e-1 | 0 | 1.93e+0 | 0 | 0 | 0 | 0 | 6.98e-4 | 1.22e-3 | 1.02e-2 |
| PENRE | MJ, net calorific value | 9.40e+0 | 1.42e+0 | 1.17e+0 | 1.20e+1 | 6.88e-1 | 7.50e-3 | 0 | 2.02e+0 | 0 | 6.35e+1 | 0 | 0 | 0 | 0 | 5.51e-2 | 2.08e-1 | 2.15e-1 |
| PENRM | MJ, net calorific value | 8.31e-4 | 2.18e-5 | 9.43e-5 | 9.47e-4 | 1.01e-5 | 4.94e-7 | 0 | 2.83e-4 | 0 | 4.79e-3 | 0 | 0 | 0 | 0 | 7.93e-7 | 8.08e-7 | 1.70e-5 |
| PENRT | MJ, net calorific value | 9.40e+0 | 1.42e+0 | 1.17e+0 | 1.20e+1 | 6.88e-1 | 7.50e-3 | 0 | 2.02e+0 | 0 | 6.35e+1 | 0 | 0 | 0 | 0 | 5.51e-2 | 2.08e-1 | 2.15e-1 |
| ADPF | MJ, net calorific value | 1.11e+0 | 1.99e-1 | 1.39e-1 | 1.45e+0 | 9.65e-2 | 9.16e-4 | 0 | 2.16e-1 | 0 | 7.75e+0 | 0 | 0 | 0 | 0 | 7.73e-3 | 3.09e-2 | 2.53e-2 |
| SM | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RSF | MJ, net calorific value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NRSF | MJ, net calorific value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RE | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FW | m3 | 4.40e-3 | 1.62e-4 | 2.98e-4 | 4.86e-3 | 7.76e-5 | 5.47e-6 | 0 | 4.21e-3 | 0 | 2.47e-2 | 0 | 0 | 0 | 0 | 6.21e-6 | 2.05e-5 | 1.91e-4 |

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Technical Service Life

| Indicator | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ, net calorific value | 2.02e-1 | 1.34e-2 | 4.75e-2 | 2.63e-1 | 6.28e-3 | 2.47e-4 | 0 | 8.10e-2 | 0 | 8.07e-1 | 0 | 0 | 0 | 0 | 3.34e-4 | 6.49e-4 | 5.60e-3 |
| PERM | MJ, net calorific value | 9.32e-2 | 5.41e-3 | 1.51e-2 | 1.14e-1 | 2.45e-3 | 5.39e-5 | 0 | 6.71e-1 | 0 | 3.48e-1 | 0 | 0 | 0 | 0 | 1.31e-4 | 1.65e-4 | 1.16e-3 |
| PERT | MJ, net calorific value | 2.95e-1 | 1.88e-2 | 6.25e-2 | 3.76e-1 | 8.72e-3 | 3.01e-4 | 0 | 7.52e-1 | 0 | 1.16e+0 | 0 | 0 | 0 | 0 | 4.65e-4 | 8.14e-4 | 6.77e-3 |
| PENRE | MJ, net calorific value | 9.40e+0 | 1.42e+0 | 1.17e+0 | 1.20e+1 | 6.88e-1 | 7.50e-3 | 0 | 2.02e+0 | 0 | 3.81e+1 | 0 | 0 | 0 | 0 | 3.67e-2 | 1.39e-1 | 1.44e-1 |
| PENRM | MJ, net calorific value | 8.31e-4 | 2.18e-5 | 9.43e-5 | 9.47e-4 | 1.01e-5 | 4.94e-7 | 0 | 2.83e-4 | 0 | 2.87e-3 | 0 | 0 | 0 | 0 | 5.29e-7 | 5.39e-7 | 1.13e-5 |
| PENRT | MJ, net calorific value | 9.40e+0 | 1.42e+0 | 1.17e+0 | 1.20e+1 | 6.88e-1 | 7.50e-3 | 0 | 2.02e+0 | 0 | 3.81e+1 | 0 | 0 | 0 | 0 | 3.67e-2 | 1.39e-1 | 1.44e-1 |
| ADPF | MJ, net calorific value | 1.11e+0 | 1.99e-1 | 1.39e-1 | 1.45e+0 | 9.65e-2 | 9.16e-4 | 0 | 2.16e-1 | 0 | 4.65e+0 | 0 | 0 | 0 | 0 | 5.15e-3 | 2.06e-2 | 1.69e-2 |
| SM | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RSF | MJ, net calorific value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NRSF | MJ, net calorific value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RE | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FW | m3 | 4.40e-3 | 1.62e-4 | 2.98e-4 | 4.86e-3 | 7.76e-5 | 5.47e-6 | 0 | 4.21e-3 | 0 | 1.48e-2 | 0 | 0 | 0 | 0 | 4.14e-6 | 1.37e-5 | 1.27e-4 |

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

## Waste and Output Flow Indicators

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Market Service Life

| Indicator | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 1.39e-4 | 3.43e-5 | 4.49e-4 | 6.22e-4 | 1.71e-5 | 1.33e-5 | 0 | 1.08e-4 | 0 | 3.27e-3 | 0 | 0 | 0 | 0 | 1.37e-6 | 4.62e-6 | 4.78e-4 |
| NHWD | kg | 4.55e-2 | 6.37e-2 | 1.52e-2 | 1.24e-1 | 3.31e-2 | 1.75e-2 | 0 | 1.64e-2 | 0 | 8.74e-1 | 0 | 0 | 0 | 0 | 2.65e-3 | 1.13e-3 | 6.29e-1 |
| RWD | kg | 5.28e-6 | 2.96e-7 | 7.41e-7 | 6.32e-6 | 1.39e-7 | 5.68e-9 | 0 | 2.16e-6 | 0 | 3.23e-5 | 0 | 0 | 0 | 0 | 1.11e-8 | 2.03e-8 | 1.94e-7 |
| CRU | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MFR | kg | 0 | 0 | 1.76e-3 | 1.76e-3 | 0 | 0 | 0 | 0 | 0 | 8.79e-3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MER | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EEE | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EET | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Significant data limitations currently exist within the LCI data used to generate waste metrics for Life Cycle Assessments and Environmental Product Declarations. The waste metrics were calculated in a way conformant with the requirements of ISO 21930:2017, but these values represent rough estimates and are for informational purposes only. As such, no decisions regarding actual cradle-grave waste performance between products should be derived from these reported values.

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Technical Service Life

| Indicator | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 1.39e-4 | 3.43e-5 | 4.49e-4 | 6.22e-4 | 1.71e-5 | 1.33e-5 | 0 | 1.08e-4 | 0 | 1.96e-3 | 0 | 0 | 0 | 0 | 9.16e-7 | 3.08e-6 | 3.18e-4 |
| NHWD | kg | 4.55e-2 | 6.37e-2 | 1.52e-2 | 1.24e-1 | 3.31e-2 | 1.75e-2 | 0 | 1.64e-2 | 0 | 5.25e-1 | 0 | 0 | 0 | 0 | 1.77e-3 | 7.51e-4 | 4.20e-1 |
| RWD | kg | 5.28e-6 | 2.96e-7 | 7.41e-7 | 6.32e-6 | 1.39e-7 | 5.68e-9 | 0 | 2.16e-6 | 0 | 1.94e-5 | 0 | 0 | 0 | 0 | 7.39e-9 | 1.36e-8 | 1.29e-7 |
| CRU | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MFR | kg | 0 | 0 | 1.76e-3 | 1.76e-3 | 0 | 0 | 0 | 0 | 0 | 5.27e-3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MER | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EEE | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EET | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Significant data limitations currently exist within the LCI data used to generate waste metrics for Life Cycle Assessments and Environmental Product Declarations. The waste metrics were calculated in a way conformant with the requirements of ISO 21930:2017, but these values represent rough estimates and are for informational purposes only. As such, no decisions regarding actual cradle-grave waste performance between products should be derived from these reported values.

## Carbon Emissions and Removals

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Market Service Life

| Indicator | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BCRP | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCEP | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCRK | kg CO2 | 0 | 0 | -5.48e-4 | -5.48e-4 | 0 | 0 | 0 | 0 | 0 | -2.74e-3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCEK | kg CO2 | 0 | 0 | 5.48e-4 | 5.48e-4 | 0 | 0 | 0 | 0 | 0 | 2.74e-3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCEW | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CCE | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CCR | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CWNR | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

per 1 m2 of covered and protected flooring surface for a period of 60 years.

Commercial - Technical Service Life

| Indicator | Unit | A1 | A2 | A3 | A1A2A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BCRP | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCEP | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCRK | kg CO2 | 0 | 0 | -5.48e-4 | -5.48e-4 | 0 | 0 | 0 | 0 | 0 | -1.64e-3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCEK | kg CO2 | 0 | 0 | 5.48e-4 | 5.48e-4 | 0 | 0 | 0 | 0 | 0 | 1.64e-3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BCEW | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CCE | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CCR | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CWNR | kg CO2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

# Scenarios

## Transport to the building/construction site (A4)

A4 Module

| | |
|---|---|
| **Fuel Type:** | Diesel |
| **Vehicle Type:** | Truck and Trailer |
| **Transport Distance:** | 1552 km |
| **Capacity Utilization:** | 33 % |
| **Packaging Mass:** | 0.106 kg |
| **Gross density of products transported:** | 1019 kg/m3 |
| **Weight of products transported:** | 0.64 kg |
| **Volume of products transported:** | 0.001 m3 |
| **Capacity utilization volume factor:** | 1 |
| **Assumptions for scenario development:** | Transport distance includes finished product to distribution center and distribution center to point of sale.- Passenger van assumed for point of sale to application site, with a distance of 8km using same packaging and capacity assumptions. |

## Installation in to the building/construction site (A5)

A5 Module

| | |
|---|---|
| **Product Lost per Functional Unit:** | 0.013 kg |
| **Mass of Packaging Waste Specified by Type:** | 0.106 kg |
| **Biogenic Carbon Contained in Packaging:** | 0.000691 kg |
| **VOC Emissions:** | 120000000000 ug/m3 |
| **VOC Test Method:** | ASTM D-2369 |

## Reference Service Life
B1 Module

**RSL:** 60 Cycles

**Declared Product Properties:**

Designed to increase adhesion and reduce the potential for outgassing in high performance flooring or containment systems. It provides tolerance to moisture vapor transmission. This product is available as a two component system.

**Design Application Parameters:**

Brush-rolling is the preferred method of application. Substrate temperature for metal must be between 50°F and 100°F. Relative humidity must not exceed 90%. Substrate temperature must be 5°F above the dew point. Application of the product in direct sunlight may lead to blistering, pinholes, or wrinkling due to outgassing of air in the concrete and high substrate temperatures. This product requires slow mixing of two components at the site of application. Cure cycle is temperature-dependent. Consult product technical data sheet for detailed application parameters. Consult a Dudick representative.

**An Assumed Quality of Work, When Installed in Accordance with The Manufacturer's Instructions:**

Long term protection is achieved when installed in accordance with manufacturer's instructions. Theoretical coverage is 1363 ft2/gal at 3-4 mils.

**Maintenance:**

## Maintenance (B2)
B2 Module

| | |
|---|---|
| **Maintenance Cycle:** | 60 Cycles/RSL<br>60 Cycles/ESL |
| **Maintenance Process Information:** | Daily mopping with a cleaning solution such as Hillyard SM-1® Industrial Cleaner Degreaser, at a ratio of 1/2 cup cleaning solution to 1 gallon of mop water, is included as a required maintenance activity per the PCR. |

## Replacement (B4)
B4 Module

| | |
|---|---|
| **Reference Service Life:** | 10 Years |
| **Replacement Cycle:** | 5 (ESL/RSL)-1 |
| **Further assumptions for scenario development:** | Product is assumed to be applied in an industrial environment. A 10 year market service lifetime and a 15 year technical service lifetime was adopted in the LCA model. For the market service-based lifetime, one initial coating application and 5 recoats are required to maintain the average lifespan of a building, assumed to be 60 years. For the technical service-based lifetime, one initial coating application and 3 recoats are required to maintain the 60 year building lifespan. |

## End of Life
C1 - C4 Modules

### Collection Process

| | |
|---|---|
| **Collected Separately:** | 0.013 kg |
| **Collected with Mixed Construction Waste:** | 0.627 kg |

### Recovery

| | |
|---|---|
| **Landfill:** | 0.627 kg |
| **Incineration:** | 0.013 kg |

### Disposal

| | |
|---|---|
| **Product or Material for Final Disposal:** | 0.64 kg |

**Assumptions for scenario development:**

The US EPA WARM model was used to determine the processes used to dispose of waste materials (coatings at the end of life in demolition waste) and unused product.

## Interpretation

Data was collected for 12 month periods spanning calendar years 2022 and 2023 to ensure the representativeness of business activities and post-consumer materials. Manufacturing data represents Dudick's production facility in Streetsboro, Ohio. Secondary data was obtained from ecoinvent v3.9.1, representing the most recent years available. The overall quality of the data used is considered representative of the product systems.

The system boundary is cradle to grave, excluding: construction of major capital equipment; research and development activities; point of sale infrastructure; coating applicator and its maintenance and operation; human labor and employee transport; raw material, forming, and disposal impacts from secondary/tertiary packaging; disposal of packaging materials not associated with final product; impacts associated with tool (mop) required for maintenance cleaning; building operational energy and water use; deconstruction and demolition.

Overall, the replacement module of the use stage (B4), has the highest impact across all impact categories followed by the production stage, specifically module A1. Use stage accounts for approximately 60% to 90% of the total impact in all the impact categories depending on the design life. Note that the B4 module includes the A1-A5 modules for each recoat required for the product's lifetime. The upstream raw material phase (A1) is the primary contributor to all impact categories. This is largely due to the number of different raw material processes required to produce the product. The production stage (A1-A3) contributes to around 10% to 25% of the total emissions in all the impact categories, where the major impact is from raw material extraction and processing of secondary input materials stage (A1).

The construction stage (A4-A5), includes the transportation of the product from manufacturing to the customer. They account for less than 3% of the total emissions in almost all the impact categories. The transportation miles from the point of sale to the application site (A4) account for low impacts across all impact categories. Installation (A5) is the primary driver in this stage for environmental impacts due to disposal of product packaging waste.

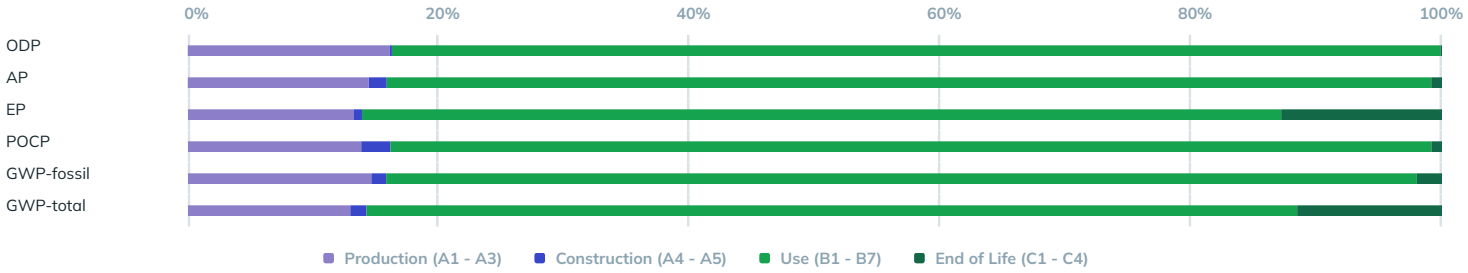
The use phase includes maintenance cleaning and recoats of the product. Product maintenance provides marginal contribution to the overall impact categories. As mentioned above, the replacement module (B4) is the primary impact driver for all the products.

In end-of-life phase (C2-C4), disposal contributes the highest to eutrophication and global warming with biogenic carbon. Transportation to the disposal point phase (C2) has a relatively small contribution to all product life cycle impacts.

Limitations are as follows:

- The study is only applicable to the defined scenarios.
- Environmental declarations from different programs may not be comparable (ISO 14025:2006). Even when the same PCR is followed, different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.
- With the current availability of data, it is nearly impossible to follow the entire supply chain associated with the product in a company-specific way. Many of the processes within the supply chains are modeled using average industry data with varying amounts of specificity (e.g., data on a more-or-less specific technology or region). This makes it difficult to accurately determine how well the unit process data represents the actual factors in the products' life cycle.
- Primary data was modeled based on information provided by Carboline, supplemented by data from technical and safety data sheets. Proxy materials were used when suitable secondary data sets were not available.
- Material input and transportation distances are presented as averages and may not account for variations in material efficiency and supplier locations.
- While generic data sets used for material inputs, transport, and waste processing are of good quality, actual impacts from material suppliers, transport carriers, and local waste processing may differ.
- Datasets used in some instances were older than 10 years, but were judged best representation available.
- The impact assessment methodology categories do not encompass all potential environmental impact categories.
- Characterization factors used within the impact assessment methodology may entail varying levels of uncertainty.
- LCA results are expressed relatively and should not be interpreted as predicting impacts on specific environmental categories, exceeding thresholds, safety margins, or risks.

The overall data quality assessment score is judged to be "good". This judgement includes an assessment of "good" for the modeling of technology (primary drivers of model emissions are modeled using the same or similar but different technology), "fair" for time representation (dominant emissions sources are primarily within 10 years of age), and "good" for geography, completeness, and reliability, which are based on comprehensive primary data collection.




## Additional Environmental Information

Before using this product, it is recommended that the operator read and follow all caution statements on the product data sheet and on the SDS for this product, and personal protective equipment must be used as directed.

## References

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