

# Series 1094, 1095, 1096 Endura-Shield

Program Operator: Smart EPD®  
[www.smartepd.com](http://www.smartepd.com)



SmartEPD-2026-151-1018-02

Date of Issue

Sep 24, 2026

Expiration Date

Sep 24, 2031

Last Updated

Sep 24, 2026

Refer to the EPD Library at [www.smartepd.com](http://www.smartepd.com) for the latest EPD listing information



## General Information

### Tnemec

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✉ environmentalgroup@tnemec.com

🌐 [www.tnemec.com](http://www.tnemec.com)



|                             |                                                                  |
|-----------------------------|------------------------------------------------------------------|
| Product Name:               | Series 1094, 1095, 1096 Endura-Shield                            |
| Functional Unit:            | 1 m2 of covered and protected substrate for a period of 60 years |
| Declaration Number:         | SmartEPD-2026-151-1018-02                                        |
| Date of Issue:              | September 24, 2026                                               |
| Expiration:                 | September 24, 2031                                               |
| Last updated:               | September 24, 2026                                               |
| EPD Scope:                  | Cradle to grave<br>A1 - A3, A4, A5, B1 - B7, C1 - C4             |
| Market(s) of Applicability: | North America                                                    |

## General Organization Information

Tnemec Company, Inc. is a privately held manufacturer of high-performance protective coatings and linings, founded in 1921. The company specializes in coatings that protect surfaces and structures from corrosion, serving critical infrastructure, industrial, water, wastewater, architectural, and other demanding markets. It is headquartered in North Kansas City, MO, with manufacturing facilities in North Kansas City, MO, Baltimore, MD, and Shanghai, China, and distribution facilities across North America.

Further information can be found at: <https://tnemec.com/>

## Limitations, Liability and Ownership

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. The EPD owner has sole ownership, liability, and responsibility for the EPD.

## Reference Standards

|                                |                                                                                                          |
|--------------------------------|----------------------------------------------------------------------------------------------------------|
| Standard(s):                   | ISO 14025:2006 and ISO 21930:2007                                                                        |
| Core PCR:                      | NSF PCR for Architectural Coatings v.1<br>Date of issue: June 18, 2015<br>Valid until: December 30, 2026 |
| Sub-category PCR review panel: | 📄 Contact Smart EPD for more information.                                                                |

General Program Instructions:

 Smart EPD General Program Instructions v.2.0, March 2025

## Verification Information

LCA Author/Creator:

 Seth Rogers  
 PARQ  
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EPD Program Operator:

 Smart EPD  
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Verification:

Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071:

External

 Rifat Karim |  Independent Consultant |  rifat.chimique@gmail.com

Independent external verification of EPD, according to ISO 14025 and reference PCR(s):

External

 Rifat Karim |  Independent Consultant |  rifat.chimique@gmail.com

## Product Information

Functional Unit:

1 m2 of covered and protected substrate for a period of 60 years

Mass:

0.144 kg

Reference Service Life:

10 Years

Product Specificity:

-  Product Average
-  Product Specific
-  Representative Product EPD

## Product Description

A user friendly, low VOC, aliphatic polyurethane coating that provides excellent color and gloss retention for exterior applications to steel, concrete and other substrates in commercial, industrial, and marine environments. Direct-to-Metal capability allows for a labor-saving, high-build, single coat application.

Further information can be found at: <https://production.tnemec.com/resources/product/PDS/1094.pdf>  
<https://production.tnemec.com/resources/product/PDS/1095.pdf>  
<https://production.tnemec.com/resources/product/PDS/1096.pdf>

## Product Specifications

Product SKU(s):

Series 1094, 1095, 1096 Endura-Shield

Product Classification Codes:

EC3 - Finishes -> PaintingAndCoating

Architectural Coating Subcategory:

Exterior Architectural Coating



Quality Designation: High Quality  
Design Life: 20 years  
Market-Based Lifetime: 10 years

## Material Composition

| Material/Component Category | Origin  | % Mass  |
|-----------------------------|---------|---------|
| Additive                    | US      | < 10    |
| Pigment                     | US, CA  | 33 - 49 |
| Resin                       | US      | 29 - 44 |
| Solvent                     | US, CN, | 13 - 20 |

| Packaging Material | Origin | kg Mass |
|--------------------|--------|---------|
| Steel generic      | US     | 0.01    |

| Hazardous Materials                                 |
|-----------------------------------------------------|
| Titanium dioxide (total dust) (13463-67-7)          |
| tert-Butyl acetate (540-88-5)                       |
| p-Chlorobenzotrifluoride (98-56-6)                  |
| Methyl n-amyl ketone (110-43-0)                     |
| 2-Ethylhexyl 3,5,5-trimethylhexanoate (70969-70-9)  |
| Acetone (67-64-1)                                   |
| 2,4-Pentanedione (123-54-6)                         |
| Diisobutyl ketone (108-83-8)                        |
| Bis(pentamethylpiperidyl) sebacate (41556-26-7)     |
| n-Butyl acetate (123-86-4)                          |
| 4,6-Dimethyl-2-heptanone (19549-80-5)               |
| Polyamine polyester polymer (Not disclosed)         |
| Dibutyltin dilaurylmercaptide (1185-81-5)           |
| Ethylene glycol monobutyl ether (111-76-2)          |
| Hexamethylene diisocyanate homopolymer (28182-81-2) |
| Hexamethylene diisocyanate (HDI) monomer (822-06-0) |
| Petroleum solvent (naphtha) (64742-95-6)            |



#### Hazardous Materials

Oleyl alcohol ethoxylated, phosphated, fatty amine ethoxylated salt (120968-16-3)

If product is in liquid form health hazards related to dust are not considered significant.

## EPD Data Specificity

Primary Data Year:

January 1, 2025 - December 31, 2025

Manufacturing Specificity:

✗ Industry Average

✓ Manufacturer Average

✗ Facility Specific

Averaging:

Products of the same composition and properties are manufactured at different facilities. A weighted average of production volume at each facility has been utilized for calculation purposes.

## 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               | ✓ |



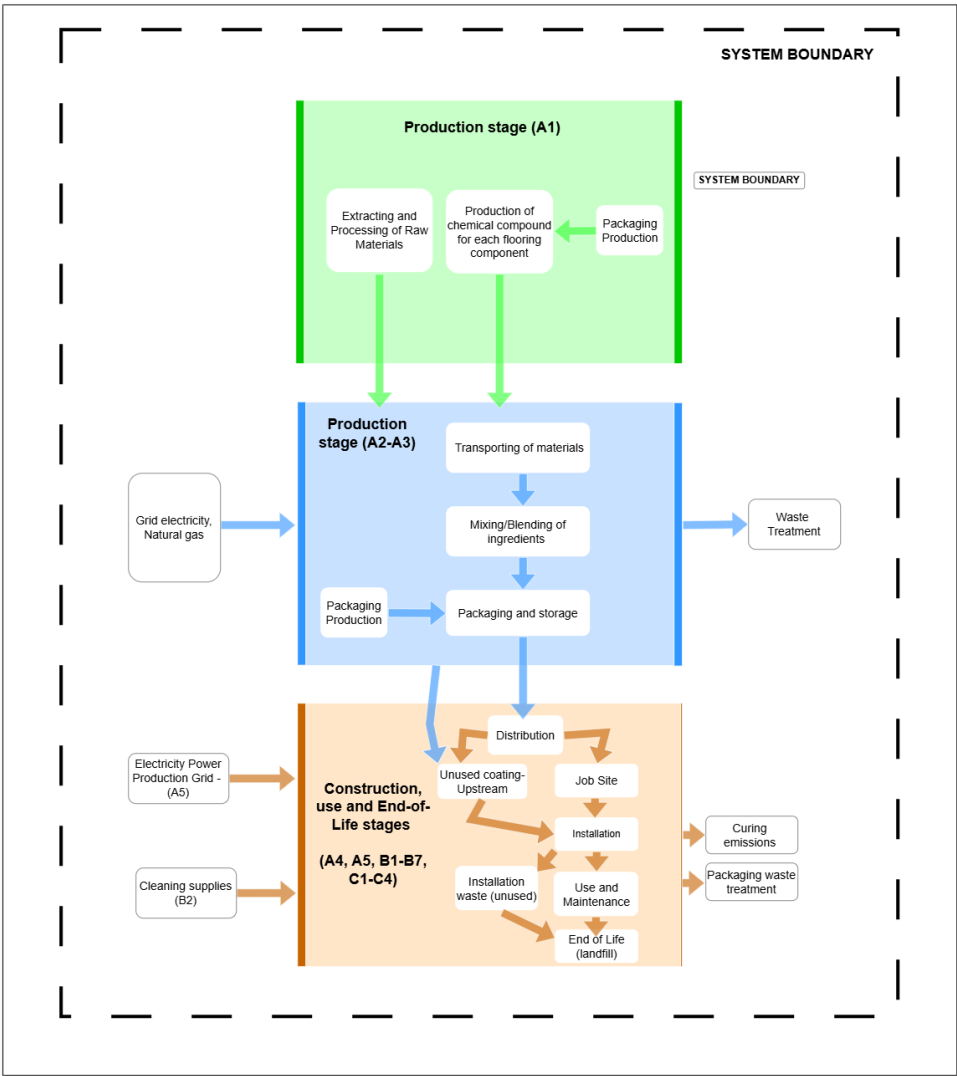
|                                         |   |                                     |    |
|-----------------------------------------|---|-------------------------------------|----|
| Benefits & Loads Beyond System Boundary | D | Recycling, Reuse Recovery Potential | ND |
|-----------------------------------------|---|-------------------------------------|----|

Note:  
ND = Module not declared

Plants

- Themec 123 West 23rd Avenue, North Kansas City, Missouri 64116, USA
- Themec 2300 Edgewater Avenue, Baltimore, MD, USA

Product Flow Diagram



## Software And Database

### LCA Software:

☰ SimaPro v. 10.2

### LCI Foreground Database(s):

☰ Ecoinvent v. 3.9.1 | ✎ Cut-off by Classification

### LCI Background Database(s):

☰ Ecoinvent v. 3.9.1 | ✎ Cut-off by Classification

A foreground LCI database is the database used to model the primary, site-specific data collected for this EPD. A background LCI database is the database used to model generic or non-specific data.

## Data Quality

The quality of inventory data is evaluated based on several criteria, including precision, completeness, consistency, and representativeness. The analysis follows the data quality level and criteria of the UN Environment Global Guidance on LCA database development. Based on these factors, the overall data quality is rated as "Good".

### Precision and completeness:

- Precision (Very Good): 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 database also has documented precision to the extent available.
- Completeness (Very Good): The product system's mass balance and inventory completeness were thoroughly checked. Some exclusions were made in line with the PCR requirements, such as personnel impacts, R&D activities, business travel, secondary packaging, point of sale infrastructure, and the coating applicator. However, no data was intentionally omitted.

### Consistency and reproducibility:

- Consistency (Good): Primary data were collected with a similar level of detail, while background data primarily came from the ecoinvent database, with other databases used only if necessary or more representative. The modeling approach and other methodological choices were applied consistently throughout the model.
- Reproducibility (Very Good): 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 (Good):

- Temporal: Primary data were collected for the totality of the reference study period to ensure the representativeness. Secondary data from the ecoinvent v3.9.1 database is typically representative of recent years, a detailed data quality analysis following ISO 21930 was performed on the background database and is available at request.
- Geographical: Primary data represents Tnemec's production facility in North Kansas City, MO and Baltimore, MD. We considered regional differences in electric grid mix using appropriate secondary data. Country-specific data ensures high geographical representativeness, with proxy data used only when necessary.
- Technological (Good): Both primary and secondary data were tailored to the specific technologies studied, ensuring high technological representativeness.

## Life Cycle Module Description

The product stage (Modules A1-A3) starts with raw material extraction and upstream processing, and continues through coating manufacture and packaging. Raw materials and intermediates are processed into the finished coating product, and manufacturing wastes and co-products are accounted for in this stage.



The design and construction stage (Modules A4-A5) starts when the packaged coating leaves the production site and ends when it reaches the application site. It includes distribution to warehouses, retail or point of sale and final transport to the application location for the product, including unused coating at the site. The use and maintenance stage (Modules B1-B7) begins with application of the coating to the substrate and continues through drying, maintenance, and any required repainting events over the 60-year functional unit. Impacts include drying emissions and repainting. The PCR assumes 10% of the wet coating mass remains unused. Manufacturing waste of 2% is considered. Production scrap and other applicable scrap rates are considered negligible and do not materially affect the overall results.

The end-of-life stage (Modules C1-C4) includes disposal or recovery of unused coating, applied coating, and packaging. Waste water-based coatings are sent to landfill, while waste solvent-based coatings are incinerated with energy recovery. Benefits beyond the system boundary may include avoided burdens from energy recovery and recycling, where applicable.

## LCA Discussion

### Allocation Procedure

Allocation of co-products was avoided, to the extent it was possible, based on the guidance given in ISO 14044:2006, 4.3., in ISO 21930:2017. Energy use, water consumption, wastewater treatment and VOC emissions at the North Kansas City, MO and Baltimore, MD were allocated by mass. Solid waste was estimated using packaging masses and material losses and allocated following the polluter pays principle.

### Cut-off Procedure

The system boundary was defined based on relevance to the goal of the study. For the raw material (A1) and process related inputs (A3), all available energy and material flow data have been included in the model. Exclusions allowed by the PCR such as secondary and tertiary packaging, were implemented.

## Renewable Electricity

Energy Attribute Certificates (EACs) such as ✗ No  
Renewable Energy Certificates (RECs) or Power  
Purchase Agreements (PPAs) are included in the  
baseline reported results:

## Scenarios

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

A4 Module

|                                        |                   |
|----------------------------------------|-------------------|
| Fuel Type:                             | Diesel            |
| Vehicle Type:                          | Truck and Trailer |
| Transport Distance:                    | 1.00e+03 km       |
| Capacity Utilization:                  | 33 %              |
| Packaging Mass:                        | 1.48e-02 kg       |
| Gross density of products transported: | 1.41e+03 kg/m3    |
| Weight of products transported:        | 1.59e-01 kg       |

|                                       |                                                                                                                                                                                    |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Volume of products transported:       | 1.12e-07 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. Transportation was modeled using a 32-tonne Euro 5 heavy-duty truck. |

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

### A5 Module

|                                            |                                                                    |
|--------------------------------------------|--------------------------------------------------------------------|
| Installation Scrap Rate Assumed:           | 10 %                                                               |
| Product Lost per Declared/Functional Unit: | 0.0144 kg                                                          |
| Mass of Packaging Waste Specified by Type: | 1.48e-02 kg                                                        |
| Assumptions for scenario development:      | 10% in installation scrap rate assumed in accordance with the PCR. |

## Use (B1)

### B1 Module

#### Declared Product Properties:

VOC value (249g/l) corresponds to South Coast Air Quality Management District (SCAQMD) Rule 1113 regulatory limit, and therefore is a conservative value representing a low VOC content coating.

|                  |             |
|------------------|-------------|
| VOC Assumptions: | 2.54e-02 kg |
|------------------|-------------|

## Maintenance (B2)

### B2 Module

|                                               |                                                                   |
|-----------------------------------------------|-------------------------------------------------------------------|
| Further assumptions for scenario development: | Maintenance is not required, hence Module B2 is reported as zero. |
|-----------------------------------------------|-------------------------------------------------------------------|

## Repair (B3)

### B3 Module

|                                               |                                               |
|-----------------------------------------------|-----------------------------------------------|
| Further assumptions for scenario development: | No repair impacts assumed as per PCR guidance |
|-----------------------------------------------|-----------------------------------------------|

## Replacement (B4)

### B4 Module

|                                               |                                   |
|-----------------------------------------------|-----------------------------------|
| Reference Service Life:                       | 10 Years                          |
| Replacement Cycle:                            | 5 (ESL/RS�)-1                     |
| Replacement of Worn Parts:                    | 0.72 kg                           |
| Further assumptions for scenario development: | Values assume market service life |

## Refurbishment (B5)

### B5 Module

|                                               |                                                       |
|-----------------------------------------------|-------------------------------------------------------|
| Further assumptions for scenario development: | No refurbishment impacts assumed as per PCR guidance. |
|-----------------------------------------------|-------------------------------------------------------|



Operational Energy Use (B6) & Operational Water Use (B7)

B6 & B7 Modules

Further assumptions for scenario development:  
No operational energy and water use as per PCR guidance.

End of Life (C1 - C4)

C1 - C4 Modules

Collection Process

|                                          |             |
|------------------------------------------|-------------|
| Collected Separately:                    | 8.64e-02 kg |
| Collected with Mixed Construction Waste: | 7.12e-01 kg |

Recovery

|               |             |
|---------------|-------------|
| Landfill:     | 7.12e-01 kg |
| Incineration: | 8.64e-02 kg |

Assumptions for scenario development:  
Applied product is assumed as being landfilled and unused product is assumed as being incinerated at the end of life, following PCR prescriptions.



Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, TRACI 2.1

per 1 m2 of product of covered and protected substrate 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.

Market service lifetime

| Impact Category | Unit         | Method              | A1 - A3 | A4       | A5      | B1 | B2 | B3 | B4      | B5 | B6 | B7 | C1 | C2       | C3      | C4      |
|-----------------|--------------|---------------------|---------|----------|---------|----|----|----|---------|----|----|----|----|----------|---------|---------|
| GWP-total       | kg CO2-eq    | IPCC AR5<br>GWP 100 | 6.35e-1 | 1.68e-2  | 6.52e-2 | 0  | 0  | 0  | 3.58e+0 | 0  | 0  | 0  | 0  | 2.70e-3  | 3.13e-1 | 1.45e-1 |
| ODP             | kg CFC-11 eq | TRACI 2.1           | 3.55e-5 | 2.88e-10 | 3.55e-6 | 0  | 0  | 0  | 1.96e-4 | 0  | 0  | 0  | 0  | 4.63e-11 | 2.14e-9 | 3.96e-9 |
| AP              | kg SO2 eq    | TRACI 2.1           | 2.75e-3 | 5.36e-5  | 2.81e-4 | 0  | 0  | 0  | 1.54e-2 | 0  | 0  | 0  | 0  | 8.62e-6  | 2.05e-4 | 5.00e-4 |
| EP              | kg N eq      | TRACI 2.1           | 2.45e-3 | 1.48e-5  | 2.47e-4 | 0  | 0  | 0  | 1.36e-2 | 0  | 0  | 0  | 0  | 2.38e-6  | 1.33e-4 | 4.99e-4 |
| POCP            | kg O3 eq     | TRACI 2.1           | 3.60e-2 | 1.23e-3  | 3.73e-3 | 0  | 0  | 0  | 2.05e-1 | 0  | 0  | 0  | 0  | 1.97e-4  | 2.70e-3 | 8.12e-3 |

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

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.

The estimated service life under this scenario is 10.0 years.



Design service lifetime

| Impact Category | Unit         | Method              | A1 - A3 | A4       | A5      | B1 | B2 | B3 | B4      | B5 | B6 | B7 | C1 | C2       | C3      | C4      |
|-----------------|--------------|---------------------|---------|----------|---------|----|----|----|---------|----|----|----|----|----------|---------|---------|
| GWP-total       | kg CO2-eq    | IPCC AR5<br>GWP 100 | 6.35e-1 | 1.68e-2  | 6.52e-2 | 0  | 0  | 0  | 1.43e+0 | 0  | 0  | 0  | 0  | 1.35e-3  | 1.57e-1 | 7.23e-2 |
| ODP             | kg CFC-11 eq | TRACI 2.1           | 3.55e-5 | 2.88e-10 | 3.55e-6 | 0  | 0  | 0  | 7.82e-5 | 0  | 0  | 0  | 0  | 2.32e-11 | 1.07e-9 | 1.98e-9 |
| AP              | kg SO2 eq    | TRACI 2.1           | 2.75e-3 | 5.36e-5  | 2.81e-4 | 0  | 0  | 0  | 6.18e-3 | 0  | 0  | 0  | 0  | 4.31e-6  | 1.03e-4 | 2.50e-4 |
| EP              | kg N eq      | TRACI 2.1           | 2.45e-3 | 1.48e-5  | 2.47e-4 | 0  | 0  | 0  | 5.43e-3 | 0  | 0  | 0  | 0  | 1.19e-6  | 6.63e-5 | 2.49e-4 |
| POCP            | kg O3 eq     | TRACI 2.1           | 3.60e-2 | 1.23e-3  | 3.73e-3 | 0  | 0  | 0  | 8.18e-2 | 0  | 0  | 0  | 0  | 9.87e-5  | 1.35e-3 | 4.06e-3 |

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

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.

The estimated service life under this scenario is 20.0 years.



## Resource Use Indicator

per 1 m2 of product of covered and protected substrate for a period of 60 years.

Market service lifetime

| Indicator | Unit | A1 - A3 | A4      | A5      | B1 | B2 | B3 | B4      | B5 | B6 | B7 | C1 | C2      | C3      | C4      |
|-----------|------|---------|---------|---------|----|----|----|---------|----|----|----|----|---------|---------|---------|
| RPRE      | MJ   | 3.35e-1 | 2.32e-3 | 3.37e-2 | 0  | 0  | 0  | 1.85e+0 | 0  | 0  | 0  | 0  | 3.74e-4 | 6.57e-3 | 3.68e-2 |
| RPRM      | MJ   | 2.79e-1 | 7.68e-4 | 2.80e-2 | 0  | 0  | 0  | 1.54e+0 | 0  | 0  | 0  | 0  | 1.23e-4 | 1.67e-3 | 5.27e-1 |
| RPRT      | MJ   | 6.13e-1 | 3.09e-3 | 6.17e-2 | 0  | 0  | 0  | 3.39e+0 | 0  | 0  | 0  | 0  | 4.97e-4 | 8.24e-3 | 5.64e-1 |
| NRPRE     | MJ   | 9.96e+0 | 2.44e-1 | 1.02e+0 | 0  | 0  | 0  | 5.61e+1 | 0  | 0  | 0  | 0  | 3.92e-2 | 1.40e+0 | 1.62e+0 |
| NRPRM     | MJ   | 7.71e-4 | 4.20e-6 | 7.75e-5 | 0  | 0  | 0  | 4.26e-3 | 0  | 0  | 0  | 0  | 6.76e-7 | 5.45e-6 | 7.64e-5 |
| NRPRT     | MJ   | 9.96e+0 | 2.44e-1 | 1.02e+0 | 0  | 0  | 0  | 5.61e+1 | 0  | 0  | 0  | 0  | 3.92e-2 | 1.40e+0 | 1.62e+0 |
| ADPF      | MJ   | 1.09e+0 | 3.42e-2 | 1.13e-1 | 0  | 0  | 0  | 6.21e+0 | 0  | 0  | 0  | 0  | 5.51e-3 | 2.09e-1 | 9.94e-2 |
| FW        | m3   | 6.51e-3 | 3.19e-5 | 6.54e-4 | 0  | 0  | 0  | 3.60e-2 | 0  | 0  | 0  | 0  | 5.12e-6 | 1.39e-4 | 6.95e-4 |
| RE        | MJ   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |
| NRSF      | MJ   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |
| RSF       | MJ   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |
| SM        | kg   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |

### Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

### 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.

The estimated service life under this scenario is 10.0 years.



## Design service lifetime

| Indicator | Unit | A1 - A3 | A4      | A5      | B1 | B2 | B3 | B4      | B5 | B6 | B7 | C1 | C2      | C3      | C4      |
|-----------|------|---------|---------|---------|----|----|----|---------|----|----|----|----|---------|---------|---------|
| RPRE      | MJ   | 3.35e-1 | 2.32e-3 | 3.37e-2 | 0  | 0  | 0  | 7.41e-1 | 0  | 0  | 0  | 0  | 1.87e-4 | 3.28e-3 | 1.84e-2 |
| RPRM      | MJ   | 2.79e-1 | 7.68e-4 | 2.80e-2 | 0  | 0  | 0  | 6.15e-1 | 0  | 0  | 0  | 0  | 6.17e-5 | 8.36e-4 | 2.63e-1 |
| RPRT      | MJ   | 6.13e-1 | 3.09e-3 | 6.17e-2 | 0  | 0  | 0  | 1.36e+0 | 0  | 0  | 0  | 0  | 2.49e-4 | 4.12e-3 | 2.82e-1 |
| NRPRE     | MJ   | 9.96e+0 | 2.44e-1 | 1.02e+0 | 0  | 0  | 0  | 2.24e+1 | 0  | 0  | 0  | 0  | 1.96e-2 | 7.01e-1 | 8.08e-1 |
| NRPRM     | MJ   | 7.71e-4 | 4.20e-6 | 7.75e-5 | 0  | 0  | 0  | 1.71e-3 | 0  | 0  | 0  | 0  | 3.38e-7 | 2.73e-6 | 3.82e-5 |
| NRPRT     | MJ   | 9.96e+0 | 2.44e-1 | 1.02e+0 | 0  | 0  | 0  | 2.24e+1 | 0  | 0  | 0  | 0  | 1.96e-2 | 7.01e-1 | 8.08e-1 |
| ADPF      | MJ   | 1.09e+0 | 3.42e-2 | 1.13e-1 | 0  | 0  | 0  | 2.48e+0 | 0  | 0  | 0  | 0  | 2.75e-3 | 1.04e-1 | 4.97e-2 |
| FW        | m3   | 6.51e-3 | 3.19e-5 | 6.54e-4 | 0  | 0  | 0  | 1.44e-2 | 0  | 0  | 0  | 0  | 2.56e-6 | 6.93e-5 | 3.47e-4 |
| RE        | MJ   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |
| NRSF      | MJ   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |
| RSF       | MJ   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |
| SM        | kg   | 0       | 0       | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0       | 0       | 0       |

### Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

### 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, NRPT 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.

The estimated service life under this scenario is 20.0 years.

## Waste and Output Flow Indicators

per 1 m2 of product of covered and protected substrate for a period of 60 years.

### Market service lifetime

| Indicator | Unit | A1 - A3 | A4 | A5      | B1 | B2 | B3 | B4      | B5 | B6 | B7 | C1 | C2 | C3      | C4      |
|-----------|------|---------|----|---------|----|----|----|---------|----|----|----|----|----|---------|---------|
| HWD       | kg   | 1.44e-2 | 0  | 1.44e-3 | 0  | 0  | 0  | 7.92e-2 | 0  | 0  | 0  | 0  | 0  | 8.64e-2 | 7.12e-1 |
| NHWD      | kg   | 5.49e-3 | 0  | 6.91e-3 | 0  | 0  | 0  | 6.20e-2 | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| MR        | kg   | 5.21e-3 | 0  | 8.96e-3 | 0  | 0  | 0  | 7.09e-2 | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| MER       | kg   | 6.25e-3 | 0  | 6.25e-4 | 0  | 0  | 0  | 3.43e-2 | 0  | 0  | 0  | 0  | 0  | 8.64e-2 | 0       |
| ILLRW     | m3   | 0       | 0  | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| HLRW      | m3   | 0       | 0  | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0  | 0       | 0       |

#### Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

#### 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.

The estimated service life under this scenario is 10.0 years. 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.

### Design service lifetime

| Indicator | Unit | A1 - A3 | A4 | A5      | B1 | B2 | B3 | B4      | B5 | B6 | B7 | C1 | C2 | C3      | C4      |
|-----------|------|---------|----|---------|----|----|----|---------|----|----|----|----|----|---------|---------|
| HWD       | kg   | 1.44e-2 | 0  | 1.44e-3 | 0  | 0  | 0  | 3.17e-2 | 0  | 0  | 0  | 0  | 0  | 4.32e-2 | 3.56e-1 |
| NHWD      | kg   | 5.49e-3 | 0  | 6.91e-3 | 0  | 0  | 0  | 2.48e-2 | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| MR        | kg   | 5.21e-3 | 0  | 8.96e-3 | 0  | 0  | 0  | 2.83e-2 | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| MER       | kg   | 6.25e-3 | 0  | 6.25e-4 | 0  | 0  | 0  | 1.37e-2 | 0  | 0  | 0  | 0  | 0  | 4.32e-2 | 0       |
| ILLRW     | m3   | 0       | 0  | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| HLRW      | m3   | 0       | 0  | 0       | 0  | 0  | 0  | 0       | 0  | 0  | 0  | 0  | 0  | 0       | 0       |

#### Note:



Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

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.

The estimated service life under this scenario is 20.0 years. 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 product of covered and protected substrate for a period of 60 years.

Market service lifetime

| Indicator                                                              | Unit   | A1 - A3  | A4 | A5       | B1 | B2 | B3 | B4       | B5 | B6 | B7 | C1 | C2 | C3      | C4      |
|------------------------------------------------------------------------|--------|----------|----|----------|----|----|----|----------|----|----|----|----|----|---------|---------|
| Bio Carbon Removal from Product                                        | kg CO2 | -2.54e-3 | 0  | -2.31e-4 | 0  | 0  | 0  | -1.27e-2 | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Bio Carbon Emission from Product                                       | kg CO2 | 2.31e-4  | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 1.39e-3 | 1.39e-2 |
| Bio Carbon Removal from Packaging                                      | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Bio Carbon Emission from Packaging                                     | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Bio Carbon Emission from Waste during Manufacturing (renewable source) | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Calcination Carbon Removal                                             | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Carbonation Carbon Emission                                            | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Carbon Emission from Waste during Manufacturing (non-renewable source) | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

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.



The estimated service life under this scenario is 10.0 years.

#### Design service lifetime

| Indicator                                                              | Unit   | A1 - A3  | A4 | A5       | B1 | B2 | B3 | B4       | B5 | B6 | B7 | C1 | C2 | C3      | C4      |
|------------------------------------------------------------------------|--------|----------|----|----------|----|----|----|----------|----|----|----|----|----|---------|---------|
| Bio Carbon Removal from Product                                        | kg CO2 | -2.54e-3 | 0  | -2.31e-4 | 0  | 0  | 0  | -5.09e-3 | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Bio Carbon Emission from Product                                       | kg CO2 | 2.31e-4  | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 6.94e-4 | 6.94e-3 |
| Bio Carbon Removal from Packaging                                      | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Bio Carbon Emission from Packaging                                     | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Bio Carbon Emission from Waste during Manufacturing (renewable source) | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Calcination Carbon Removal                                             | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Carbonation Carbon Emission                                            | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |
| Carbon Emission from Waste during Manufacturing (non-renewable source) | kg CO2 | 0        | 0  | 0        | 0  | 0  | 0  | 0        | 0  | 0  | 0  | 0  | 0  | 0       | 0       |

#### Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

#### Abbreviations:

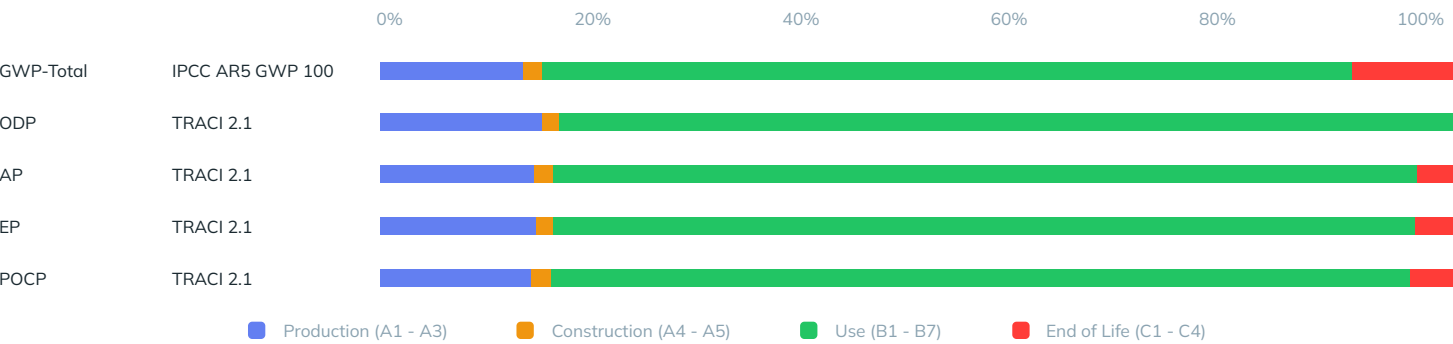
BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = 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.

The estimated service life under this scenario is 20.0 years.



Interpretation

Raw materials are sourced from suppliers, transported to manufacturing facilities, and mixed to produce products. The product stage (A1-A3) drives the environmental impact, due to raw material production and energy use. This impacts is amplified in the use phase due to recoatings, making B4 the largest contributor to the overall impact. Market and Design service life scenarios differ depending on assumed estimated service life (ESL), with lower impacts for longer-lived products. Those scenarios are constructed using PCR prescriptions that are highly conservative, as they assumed the replacement of the full coating system. End-of-life impacts are relatively low, as products are assumed to be landfilled with building demolition waste. Switching to renewable energy is advised for products with high manufacturing energy demands. The manufacturer should explore lower-impact raw materials and work with suppliers using sustainable methods or renewable energy to enhance product sustainability.



Additional Environmental Information

None

References

PARQ. (2025). PARQ Core Life Cycle Assessment Model – Internal Report: Version 1.0.

NSF International & American Coatings Association. (2025). Product category rule for environmental product declarations: Architectural coatings (NSF-1110-2025ext). NSF International, National Center for Sustainability Standards. <https://d2evkimvhatqav.cloudfront.net/documents/PCR-Product-Category-Rules/NSF-1110-2025ext-ACA-PCR-for-Architectural-Coatings.pdf>

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

IPCC. (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland: IPCC. (Methodology for 100-year GWP factors in AR5)

PARQ. (2025). Adaptation of Generic Core LCA Model for Architectural Coatings (Aligned with NSF 111-2025 PCR): Version 1.0.

International Organization for Standardization (ISO). (2006). ISO 14040:2006 – Environmental management – Life cycle assessment – Principles and framework. Geneva: ISO. (Amendment 1:2020; confirmed current 2022)

International Organization for Standardization (ISO). (2006). ISO 14044:2006 – Environmental management – Life cycle assessment – Requirements and guidelines. Geneva: ISO. (Amendments 1:2017 and 2:2020 included; confirmed current 2022)

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

PARQ. (2025). Verifier Dashboard v3.0.0 Manual.

EPA Materials Management 2014 Fact Sheet, Table 2: [https://www.epa.gov/sites/production/files/2016-11/documents/2014\\_smmfactsheet\\_508.pdf](https://www.epa.gov/sites/production/files/2016-11/documents/2014_smmfactsheet_508.pdf) (Accessed May 2023)



Plastics and pulp rates from EPA National Overview: Facts and Figures on Materials, Wastes and Recycling <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#recycling> (Accessed May 2023)

American Center for Life Cycle Assessment. (2019). ACLCA guidance to calculating non-LCIA inventory metrics in accordance with ISO 21930:2017. [<https://aclca.org/aclca-iso-21930-guidance/>](<https://cacenter.org/products/iso-21930-guidance>)

Smart EPD. (2025). General Program Instructions: Smart EPD® Program (Version 2.0). [[https://smartepd.com/assets/SmartEPD\\_GPIs\\_v2.0\\_03-11-2025.4d2a6ff1.pdf](https://smartepd.com/assets/SmartEPD_GPIs_v2.0_03-11-2025.4d2a6ff1.pdf)]([https://smartepd.com/assets/SmartEPD\\_GPIs\\_v2.0\\_03-11-2025.4d2a6ff1.pdf?utm\\_source=chatgpt.com](https://smartepd.com/assets/SmartEPD_GPIs_v2.0_03-11-2025.4d2a6ff1.pdf?utm_source=chatgpt.com))

UNEP (2011). GLOBAL GUIDANCE PRINCIPLES FOR LIFE CYCLE ASSESSMENT DATABASES. A basis for greener processes and products, 'Shonan Guidance Principles' United Nations Environment Programme, 2011; ISBN: 978-92-807-3174-3 [<https://www.lifecycleinitiative.org/wp-content/uploads/2012/12/2011-Global-Guidance-Principles.pdf>](<https://www.lifecycleinitiative.org/wp-content/uploads/2012/12/2011%20-%20Global%20Guidance%20Principles.pdf>)