Environmental Product Declaration

EPD of multiple products, based on the worst-case result of the product group in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Armatherm FRR

from

ARMATHERM

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB, as provided by EPD North America
Licensee	EPD North America
Type of EPD	EPD of a single product from a manufacturer/service provider
EPD registration number:	EPD-IES-0026743
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	An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System As provided by EPD North America
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products (v2.0)
PCR review was conducted by: Rob Rouwette (chair), Noa Meron (co-chair), support@environdec.com
Life Cycle Assessment (LCA)
LCA accountability: WAP Sustainability Consulting, LLC
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ Individual EPD verification without a pre-verified LCA/EPD tool Third-party verifier: *Jim Mellentine, Thrive ESG* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

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

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.
For further information about comparability, see EN 15804 and ISO 14025.

Company information

EPD Owner: Armatherm

Contact: Neal Lojek, neal@armatherm.com

Address: 1 Titleist Drive, Acushnet, MA 02743

Description of the organization: Armatherm is one of the leading suppliers of structural thermal break materials for the construction industry. Their goal is to provide architects, structural engineers, and building design professionals with effective solutions to prevent thermal bridging.

Product information

Product name: Armatherm FRR
UN CPC Classification: UN CPC 3712
Product description: Armatherm™ FRR is a reinforced thermoset resin structural thermal break material with low thermal conductivity and high compressive strength. FRR is used for transitional thermal bridging details that require structural integrity. It supports loads up to 43,000 psi and has an R-value of 0.95 per inch. Its limited combustibility and low creep under load make it well-suited for structural steel and façade thermal break applications. It has been used in thousands of moment and shear connections.
Further information can be found on Armatherm's website here: https://www.armatherm.com/
Geographical scope: Manufactured in Pinglaj (District-Kheda) region, Gujarat (India), and Acushnet, Massachusetts (United States), and sold in the United States.
Multiple product justification: This EPD is an EPD of multiple products where the worst-case result of the included products is declared for each indicator according to the third option in section 4.10.1 of the Construction Products PCR v2.0.1. All the products are manufactured at the same location, are manufactured by the same company, and have the same major steps in core processes.

LCA information

Declared unit	0.092903 square meter (1 square foot) of installed Armatherm FRR
Reference service life	Not declared as use phase is not included in the study
Description of the system boundaries	Cradle to Gate with Options, including A1-A3, A4, A5, C1-C4, and D
Geographical representativeness	A1, A2, A3: India and United States, A4-A5: United States, C1-C4, D: United States
Time representativeness	Primary data collected for calendar year 2024
Cut-off rules	All flows for which data were provided are included in the assessment, accounting for at least 99% of the energy or mass flows and at least 99% of the environmental impacts from the product system. Production of capital equipment is excluded from this assessment.
Database and LCA software used	LCA FE 10.7 (formerly GaBi) MLC Database 2025.1 (formerly GaBi Database)
LCA Report	LCA of Armatherm FRR, WAP Sustainability, June 2025
Scenario Description: A2	Primary data of transportation from suppliers Fuel Efficiency Truck (full vehicle): 42 L/100km, Capacity Utilization: 61%
Scenario Description: A3	Electricity Source: country-specific residual mix located in US region power grid. GWP-GHG = 0.352 kg CO_2e/kWh Energy mix (Cove Mills, MA): Natural gas: 66%, Nuclear:33%, Hard coal: 0.7%, HFO: 0.,3% Energy mix (India): Hard coal:93%, Lignite:2.3%, Natural gas:2.3%, Nuclear: 2.3%
Scenario Description: A4 Transport to Building Site	Distance of products sold into US Market: 1699 km truck Fuel Efficiency (full vehicle): Truck = 42 L Diesel/100km, Bulk density = 1525 kg/m^3 Capacity Utilization Factor: 67% Truck
Scenario Description: A5 Installation	Steel Bolt, Nut, Washer
Scenario Description: C1-C4 End-of-Life	Total waste collected with mixed construction waste and sent 80km by truck to end-of-life (100% landfilled). Fuel Efficiency (full vehicle): 42 L/100km, Capacity Utilization: 61%
Scenario Description: D	The recycling potential benefits during the manufacturing stage have been calculated in module D.

Note: The use stage is omitted due to the lack of a specific c-PCR for this product

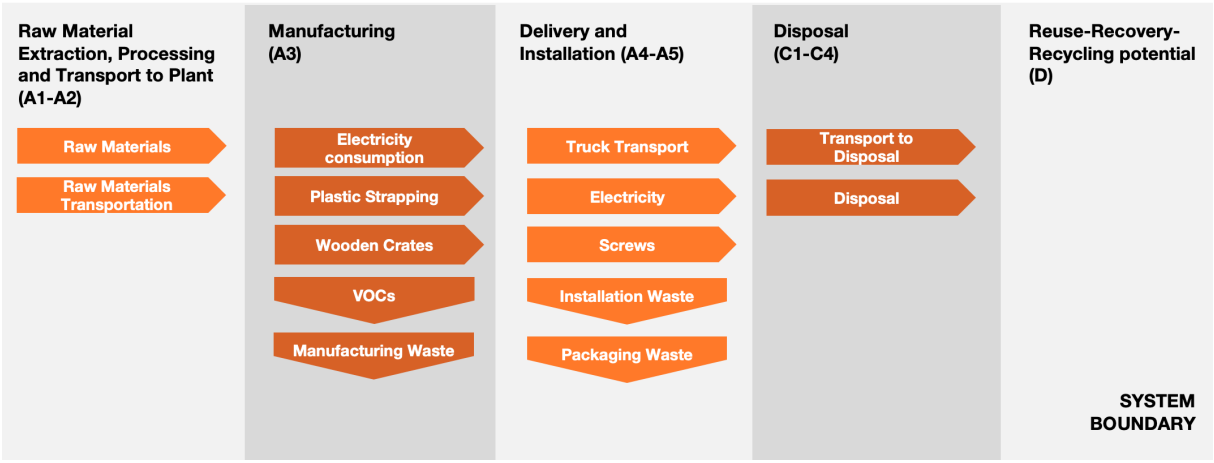
Declaration of data sources, reference years, data categories, and the share of primary data, contributing more than 10% to GWP-GHG of A1-A3

Process	Source type	Source	Reference year	Data category	Total share	Share of primary data
Thermal energy	Database	LCA fE V10.9	<5 years old	Primary data	13.42%	13.42%
Production of cotton fabric	Database	LCA fE V10.9	<5 years old	Secondary data	48.86%	0%
Production of phenol	Database	LCA fE V10.9	<5 years old	Secondary data	21.18%	0%
Electricity	Database	LCA fE V10.9	<5 years old	Primary data	2.92%	2.92%
Production of packaging	Database	LCA fE V10.9	<5 years old	Secondary data	0.64%	0%
Transportation	Database	LCA fE V10.9	<5 years old	Secondary data	2.72%	0%
Other	Database	LCA fE V10.9	<5 years old	Secondary data	10.26%	0%
Total share of primary data of GWP-GHG results for A1-A3						**16.34%**

The EPD is based on data collected by Armatherm over one year, from October 2023 to September 2024. The raw materials are procured from different regions across India, and the product is manufactured at the Pinglaj (District-Kheda) region of Gujarat, India, and Cove Mills, Acushnet,

Massachusetts, US, with 3 different dimensions of ½", 1", and 2". Sites were selected to ensure a mix of geography, and the site data were weighted to represent the overall Armatherm production in terms of technology. There is 75% variation in GWP-GHG of the product up to the manufacturing phase, between the least and highest impact due to the difference in composition of the materials. The EPD uses background data from the MLC Database 2025.1, and primary data for electricity and thermal energy. The quality of the relevant data used for the EPD in terms of its time, geography, and technology representativeness using EN 15804:2012+A2:2019, Annex E, E2 is mostly very good, and good in terms of geography for the manufacturing of pre-products.

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG results), and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	India		India, US	US	US	ND	ND	ND	ND	ND	ND	ND	US	US	US	US	US
Specific data used	16.34%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variance-products	75%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

Content information

Product components	Range in weight across products (kg per declared unit)	Post-consumer material, weight-%	Biogenic carbon content (kg C per kg)
Product			
Paper	0.05 - 0.20	0%	0.43
Cloth	0.43 - 1.7	0%	0.50
Methanol	0.19 - 0.74	0%	0.00
Formal	0.50 - 2.0	0%	0.00
Phenol	0.44 - 1.8	0%	0.00
Total	**1.6 - 6.4**	**0%**	
Packaging			
HDPE woven bag	0.01-0.05	0%	0.00

No substances in the product are on the Candidate List of Substances of Very High Concern (SVHC), which exceed the limits for registration with the European Chemicals Agency

Indicator Abbreviations

Abbreviation	Parameter	Unit
GWP - GHG	Global warming potential (100 years, excludes biogenic CO_2)	kg CO_2 eq
GWP-total	Climate Change – total	kg CO_2 eq
GWP-fossil	Climate Change, fossil	kg CO_2 eq
GWP-biogenic	Climate Change, biogenic	kg CO_2 eq
GWP-luluc	Climate Change, land use and land use change	kg CO_2 eq
ODP	Ozone depletion	kg CFC-11 eq.
AP	Acidification	Mole of H+ eq.
EP-freshwater	Eutrophication, freshwater	kg P eq.
EP-marine	Eutrophication, marine	kg N eq.
EP-terrestrial	Eutrophication, terrestrial	Mole of N eq.
POCP	Photochemical ozone formation, human health	kg NMVOC eq.
ADP-minerals**	Resource use, mineral and metals	kg Sb eq.
ADP-fossil**	Resource use, fossils	MJ
WDP**	Water use	m^3 world equiv.
Resource Use Parameters		
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value (LHV)
PERM	Use of renewable primary energy resources used as raw materials	MJ, net calorific value
PERT	Total use of renewable primary energy resources	MJ, net calorific value
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value
PENRM	Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value
PENRT	Total use of non-renewable primary energy resources	MJ, net calorific value
SM	Use of secondary materials	kg
RSF	Use of renewable secondary fuels	MJ, net calorific value
NRSF	Use of non-renewable secondary fuels	MJ, net calorific value
FW	Net use of fresh water	m^3

Waste Parameters and Output Flows		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
RWD	Radioactive waste disposed	kg
CRU	Components for reuse	kg
MR	Materials for recycling	kg
MER	Materials for energy recovery	kg
EEE	Exported electrical energy	MJ
EET	Exported thermal energy	MJ
PM	Potential incidence of disease due to PM emissions	Disease incidence
IRP*	Potential Human exposure efficiency relative to US 35 (	kBq U235 eq.
ETP-fw**	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	CTUe
HTP-c**	Potential Comparative Toxic Unit for humans (HTP-c)	CTUh
HTP-nc**	Potential Comparative Toxic Unit for humans (HTP-nc)	CTUh
SQP quality**	Potential Soil quality index (SQP)	dimensionless

*This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

**The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Results of the environmental performance indicators

The results presented here are for 1 declared unit, which is 0.092903 square meter (1 square foot) of Armatherm FRR, and these are based on the worst-case results of the product group.

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Core Environmental Impact Indicators										
GWP-GHG	kg CO_2 eq.	3.23E+01	9.04E-01	9.38E-01	ND	2.76E-03	7.14E-02	0.00E+00	1.53E-01	-5.72E-01
GWP-total	kg CO_2 eq.	2.54E+01	1.34E+00	9.38E-01	ND	2.76E-03	7.22E-02	0.00E+00	1.52E-01	-3.74E-01
GWP-fossil	kg CO_2 eq.	2.99E+01	9.03E-01	9.35E-01	ND	2.76E-03	7.13E-02	0.00E+00	1.52E-01	-5.71E-01
GWP-biogenic	kg CO_2 eq.	-1.61E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	6.45E+00	1.97E-01
GWP-luluc	kg CO_2 eq.	2.37E+00	5.89E-01	4.92E-04	ND	1.46E-06	3.87E-05	0.00E+00	1.00E-04	-5.04E-04
ODP	kg CFC 11 eq.	6.41E-11	1.61E-12	5.81E-12	ND	6.53E-16	1.73E-14	0.00E+00	3.82E-13	-1.71E-12
AP	mol H^+ eq.	3.38E-01	3.37E-02	2.18E-03	ND	2.56E-05	4.47E-04	0.00E+00	9.17E-04	-6.14E-03
EP-freshwater	kg P eq.	3.62E-03	1.04E-04	2.18E-06	ND	5.01E-09	1.32E-07	0.00E+00	1.48E-07	-1.07E-04
EP-marine	kg N eq.	1.28E-01	1.04E-02	5.36E-04	ND	1.32E-05	2.26E-04	0.00E+00	2.38E-04	-2.69E-03
EP-terrestrial	mol N eq.	1.37E+00	1.20E-01	5.81E-03	ND	1.44E-04	2.47E-03	0.00E+00	2.60E-03	-2.74E-02
POCP	kg NMVOC eq.	1.77E-01	2.54E-02	1.70E-03	ND	3.55E-05	4.30E-04	0.00E+00	7.20E-04	-1.79E-03
ADP-minerals & metals	kg Sb eq.	2.00E-05	2.74E-06	1.81E-05	ND	4.25E-10	1.12E-08	0.00E+00	1.82E-08	-2.22E-07
ADP-fossil	MJ	5.69E+02	1.23E+01	9.05E+00	ND	3.56E-02	9.41E-01	0.00E+00	2.30E+00	-7.07E+00
WDP	m^3	2.21E+02	8.41E-02	2.80E-02	ND	3.90E-05	1.03E-03	0.00E+00	6.55E-03	-7.39E+00
Resource Use Indicators										
PERE	MJ	5.38E+02	8.56E+01	1.88E+00	ND	4.87E-01	3.91E-02	0.00E+00	3.21E-01	8.04E-02
PERM	MJ	6.34E+01	1.02E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	6.02E+02	8.66E+01	1.88E+00	ND	4.87E-01	3.91E-02	0.00E+00	3.21E-01	8.04E-02
PENRE	MJ	4.10E+02	1.16E+01	9.05E+00	ND	2.34E+00	9.41E-01	0.00E+00	2.30E+00	5.75E-01
PENRM	MJ	1.60E+02	1.24E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	5.69E+02	1.23E+01	9.05E+00	ND	2.34E+00	9.41E-01	0.00E+00	2.30E+00	5.75E-01
SM	kg	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	6.61E+00	1.59E-02	1.81E-03	ND	4.69E-04	4.22E-05	0.00E+00	2.47E-04	6.18E-05
Waste and Output Flow Indicators										
Hazardous waste disposed	kg	3.05E+00	1.19E-03	7.11E-02	ND	3.64E-06	9.62E-05	0.00E+00	6.72E+00	-7.54E-02
Non-hazardous waste disposed	kg	1.27E-02	3.99E-05	1.98E-04	ND	1.22E-07	3.23E-06	0.00E+00	2.49E-05	-3.59E-04
Radioactive waste disposed	kg	4.54E-01	0.00E+00	6.80E-03	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	4.60E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	1.85E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Optional indicators										
PM	Disease incidence	2.78E-06	4.57E-08	2.92E-08	ND	2.14E-10	1.65E-09	0.00E+00	1.03E-08	-5.15E-08
IRP	kBq U235	1.08E+00	3.34E-03	1.94E-02	ND	1.02E-05	2.71E-04	0.00E+00	2.29E-03	-2.98E-02
ETP-fw	CTUe	9.27E+02	8.38E+00	1.67E+00	ND	2.57E-02	6.78E-01	0.00E+00	1.16E+00	-2.73E+01
HTP-c	CTUh	2.54E-08	2.04E-10	1.02E-09	ND	4.80E-13	1.08E-11	0.00E+00	2.32E-11	-5.92E-10
HTP-nc	CTUh	2.44E-06	4.27E-09	5.29E-09	ND	1.30E-11	3.41E-10	0.00E+00	5.29E-10	-6.35E-08
SQP	dimensionless	5.33E+03	1.72E+00	1.37E+00	ND	5.27E-03	1.39E-01	0.00E+00	1.72E-01	-1.35E+02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption, PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

EN 15804+A2 with reference package EF3.1 was used to calculate results. The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. The results of modules A1-A3 shouldn't be used without considering the results of module C. A1-A3 results include the "balancing-out reporting" of biogenic CO_2 of packaging, traditionally released in A5. Additional optional indicators per EN 15804+A2 are declared, including: particulate matter emissions; ionizing radiation, human health; eco-toxicity (freshwater); human toxicity, cancer effects; human toxicity, non-cancer effects; land use related impacts/soil quality.

The primary energy resources used as raw materials were calculated by multiplying the mass of each material of the product and packaging content with the lower calorific value (MJ/kg) of the material. Specifically, option B within Annex 3 of the PCR was utilized for these calculations, whereby the energy used as raw material is declared as an input to the module, where it enters the product system and as an output from the product system if it exits the product system as useful energy.

Additional environmental information

No additional environmental, social, or economic information is declared in this EPD.

References

- General Programme Instructions of the International EPD® System. Version 5.0.
- PCR 2019:14. Construction Products. Version 2.0.
- EN 15804:2012+A2:2019/AC:2021. European Committee for Standardization.
- Life Cycle Assessment for Armatherm FRR produced by Armatherm. WAP Sustainability. June 2025

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