Environmental Product Declaration

GAF Acrylic Top Coat

GAF, a Standard Industries company, is the leading roofing and waterproofing manufacturer in North America. For more than 135 years, GAF has been trusted to protect what matters most for families, communities and business owners with its innovative solutions and focus on customer service. GAF's leadership extends to its commitment to making a positive impact on its communities, industry, and planet. Learn more at www.GAF.com.

GAF Acrylic Top Coat forms a waterproof elastomeric seal, uniformly covering the substrate to form a monolithic coating.

NSF Certified Environmental Product Declaration www.nsf.org

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930-2017. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g., Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	NSF International, 789 N. Dixboro Rd, Ann Arbor, MI 48105,www.nsf.org
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	NSF Certification Policies for Environmental Product Declarations (EPD): November 1, 2022
MANUFACTURER NAME AND ADDRESS	GAF 1 Campus Drive Parsippany, NJ 07054
DECLARATION NUMBER	EPD10918
DECLARED PRODUCT & FUNCTIONAL UNIT OF DECLARED UNIT	GAF Acrylic Top Coat Functional Unit = 1 m² of covered and protected roofing membrane for a period of 20 years over a 20 year roof system lifetime
REFERENCE PCR AND VERSION NUMBER	NSF International: Product Category Rule for Environmental Product Declarations for Roof Coating Valid through 2023
DESCRIPTION OF PRODUCT APPLICATION/USE	Acrylic Roof Coatings
PRODUCT RSL DESCRIPTION	15 Years
MARKETS OF APPLICABILITY	Global
DATE OF ISSUE	02/19/2024 - 02/19/2029
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product Specific
DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-Grave
YEAR(S) OF REPORTED PRIMARY DATA	2021
LCA SOFTWARE & VERSION NUMBER	LCA for Experts v.10.6
LCI DATABASE(S) & VERSION NUMBER	Sphera database 2022.1 & USLCI v2.0
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1; CML 4.1
The sub-category PCR review was conducted by:	
This declaration was independently verified in accordance with ISO 21930:2017, Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services, serves as the core PCR, with additional considerations from ISO 21930:2007 and CEN Norm EN 15804 (2012). ☐ INTERNAL ☒ EXTERNAL	Jack Geibig, EcoForm, LLC jgeibig@ecoform.com
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sustainable Solutions Corporation
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig, EcoForm, LLC jgeibig@ecoform.com

Environmental declarations from different programs (ISO 14025) may not be comparable.

Comparison of the environmental performance using EPD information shall consider all relevant information modules over the full life cycle of the products within the building.

This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 §5.5 are met. It should be noted that different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

General Information

Description of Company/Organization

Founded in 1886, GAF is the leading roofing manufacturer in North America. As a member of the Standard Industries family of companies, GAF is part of the largest roofing and waterproofing business in the world. The company's products include a comprehensive portfolio of roofing and waterproofing solutions for residential and commercial properties as well as for civil engineering applications. The full GAF portfolio of solutions is supported by an extensive national network of factory-certified contractors. GAF continues to be the leader in quality and offers comprehensive warranty protection on its products and systems. The company's success is driven by a commitment to empowering its people to deliver advanced quality and purposeful innovation. For more information about GAF, visit www.gaf.com.

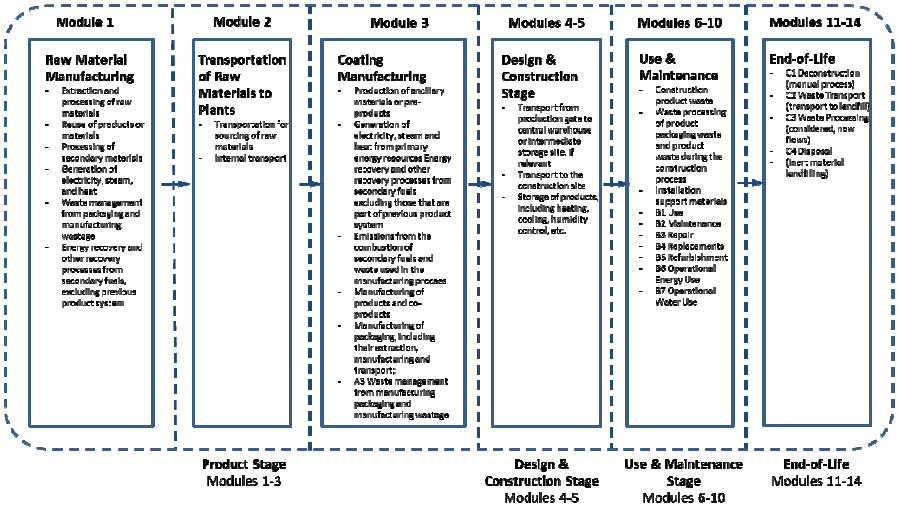
Environmental Activities and Certifications

N/A

Product Description

Product Name: GAF Acrylic Top Coat
Product Characteristic: GAF Acrylic Top Coat forms a elastomeric seal, uniformly covering the substrate to form a monolithic coating that helps protect the substrate from normal weathering, water infiltration, and ultraviolet exposure. GAF Acrylic Top Coat can be used in isolation and does not require a substrate or base coat.
Additional features include:
- Protects against harmful UV rays
- High reflectivity (white only)

Flow Diagram



Manufacturer Specific EPD

This product-specific EPD was developed based on the cradle-to-grave (modules A1-A5, B1-B7, C1-C4) Life Cycle Assessment. The EPD accounts for raw material extraction and processing, transport, product manufacturing, distribution, installation, use phase, and disposal. Manufacturing data were gathered directly from company personnel. For any product group EPDs, an impact assessment was completed for each product. Product grouping was considered appropriate if the individual product impacts differed by no more than ±10% in any impact category.

Application

Product Applications:
Used on new and existing metal, structural concrete, TPO, PVC, Hypalon®, SPF, EPDM, and asphaltic roofs. New TPO and asphaltic roofs should be weathered for at least 30 days. Do not use on gravel-surfaced roofs or shingle roofs.

Material Composition

The primary product components and/or materials must be indicated as a percentage mass to enable the user of the EPD to understand the composition of the product in delivery status.

The composition of a Acrylic Top Coat is as follows:

	Percentage in mass (%)
Material	**Value**
Water	10-15%
Glycol	0-3%
Resin	30-40%
Defoamer	0-0.7%
Dispersant/Wetting Agent/Surfactant	1-2%
pH adjuster	0-0.5%
Additive	0-1%
Pigment	0.4-0.7%
Filler	40-50%
Biocide	0-0.2%
Rheology Modifier	0-1%
Coalescent	0-1%
Total	**100%**

Placing on the Market / Application Rules

The standards that can be applied to this product are:

PHYSICAL PROPERTIES (ASTM D 6083-21)

Table 1 : Liquid Physical Property Requirements

Type	ASTM Test Method	ASTM Minimum Values	Test Values[1]
		Type I	
Volume Solids	ASTM D 2697	≥50%	53%
Weight Solids	ASTM D 1644	≥60%	66%

Table 2 : Cured Film Physical Property Requirements

Type	ASTM Test Method	ASTM Minimum Values	Test Values[1]
		Type I	
Initial Percent Elongation	ASTM D 2370	Min. 100% @73°F	258%
Initial Tensile Strength	ASTM D 2370	Min. 200 psi @73°F	284 PSI
Final Percent Elongation	ASTM D 2370	Min. 100% @73°F	Pass
Permeance	ASTM D 1653	Max. 50 perms	Meets ASTM D6083
Accelerated Weathering	ASTM D 4798	No cracking/checking	1,000 hours: Pass
Low Temperature Flexibility	ASTM D 522	Min. Pass 0.5 in. mandrel -15°F	Passes Type 1

Table 3: Additional Physical Properties

Type	ASTM Test Method	Test Values[1]
Weight per Gallon/Liter	-	11.8 lb. (1.41 kg)
VOC	-	<25 g/L
Hardness	ASTM D2240	55-65 Shore A
Bond Strength	ASTM C 297	Exceeds cohesive strength of coating
Dry Time	ASTM D 5895	3 hours @ 70°F (21°C), 50% R.H. White @ 16 wet mils (406 microns) *Required time will increase at higher humidity and/or lower temperatures
High-Temperature Stability	ASTM D794	No age hardening up to 250°F (121°C)
Resistance to Wind-Driven Rain	Federal Specification TTC-555B	0.3% moisture result
Service Temperature Limits (Installed Coating)	-	-30°F to 200°F (-35°C to 93°C)
Standard Colors	-	White, Light Gray, Dove Gray, Gray, Cotton, Light Tan, Desert Sand , plus nine other colors. See GAF Roof Coatings Solution Guide. *Customized tinting available

1. Values are approximate and subject to normal manufacturing variations. These values are not guaranteed and are provided solely as a guide. For specific physical property information on GAF Premium Acrylic HydroStop® Base Coat and Fabric components or information on GAF Premium Acrylic HydroStop® System, please refer to individual Technical Data Sheets.

Ratings and Listings

ANSI/UL 790 Class A	UL Listed*		
Factory Mutual (FM 4470)	FM Approved** Passes FM Severe Hail**		
State of Florida Approved (FBC)	FL620		
Miami-Dade County NOA	20-0130.07***		
Title 24	Rated by the Cool Roof Rating Council (CRRC) for use in Title 24 Projects		
CRRC (Cool Roof Rating Council) Coolroofs.org	WHITE - Smooth (Product ID 0614-0004a)		
	Solar Reflectance Initial: 0.83 Aged: 0.71	Thermal Emittance Initial: 0.92 Aged: 0.90	Solar Reflectance Index (SRI) Initial: 105 Aged: 87

*Refer to UL Product iQ for actual assemblies
**Refer to FM RoofNav for actual assemblies.
***Formerly known as Roofmate Top Coat

Properties of Declared Product as Shipped

GAF Roof Coating products can be delivered in various packaging options, including:
5-gallon (18.9 liter) pail
55-gallon (208 liter) drum
275-gallon (1040 liter) tote

Methodological Framework

Functional Unit

The declaration refers to the functional unit of 1 m² of covered and protected roofing membrane for a period of 20 years as specified in the PCR. Note: Product was tested in alignment with ASTM D 6083 and determined to qualify as a High Performance coating system. The service life listed aligns with the prescribed service life in the PCR.

Name	Value	Unit
Declared unit	1 m² of covered and protected roofing membrane for a period of 20 years	
Gallons per functional unit	0.53	gallons
Dry film thickness	34	mils
Typical Service Life*	15	years
*Note: Product was tested in alignment with ASTM D6083		

System Boundary

This is a cradle-to-grave Environmental Product Declaration. The following life cycle phases were considered:

Product Stage			Design & Construction Stage		Use & Maintenance Stage							End-of-Life Stage*				Benefits and Loads Beyond the System Boundaries
Raw material supply	Transport	Manufacturing	Transport from gate to the site	Construction/ installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction /demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

Description of the System Boundary Stages Corresponding to the PCR
(X = Included; MND = Module Not Declared)

*This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues.

Reference Service Life

When installed properly the GAF Acrylic Top Coat is expected to have a lifespan of 20 years. However, for this analysis, the reference service life used is 15 years in accordance with the values provided by the PCR for a high performance coating. Note: Product was tested in alignment with ASTM D 6083 and determined to qualify as a High Performance coating system. The service life listed aligns with the prescribed service life in the PCR.

Allocation

Allocation was determined on a mass basis.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances the following requirements apply:
- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

All future products evaluated in the tool will at a minimum meet this requirement.

This EPD is in compliance with the cut-off criteria. No processes were neglected or excluded. Capital items for the production processes (machine, buildings, etc.) were not taken into consideration.

Data Sources

Primary data were collected for every process in the product system under the control of GAF. Secondary data from the Sphera and USLCI databases were utilized when necessary. These data were evaluated and have temporal, geographic, and technical coverage appropriate to the scope of the product category.When a material is not available in the available LCI databases, another chemical which has similar manufacturing and environmental impacts may be used as a proxy, representing the actual chemical. Overall, less than 16% of the product composition was represented by proxy data.

Data Quality

The data sources used are complete and representative of global systems in terms of the geographic and technological coverage and are a recent vintage (i.e., less than ten years old). The data used for primary data are based on direct information sources of the manufacturers. Secondary data sets were used for raw materials extraction and processing, end of life, transportation, and energy production flows. Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty. When a material is not available in the available LCI databases, another chemical which has similar manufacturing and environmental impacts may be used as a proxy, representing the actual chemical. Please see Appendix A in the LCA report for the full breakdown of the data sources.

Important data quality factors include precision (measured, calculated, or estimated), completeness (e.g., unreported emissions or excluded flows), consistency (uniformity of the applied methodology throughout the study), and reproducibility (ability for another researcher reproduce the results based on the methodological information provided). Each dataset has an overall rating from one to four, one being “very good” and four being “poor.” The individual datasets were scored and aggregated to determine the data has an overall average rating of 2.1.

Period Under Review

The period under review is the full calendar year of 2021.

Treatment of Biogenic Carbon

The uptake and release of biogenic carbon throughout the product life cycle follows ISO 21930:2017 Section 7.2.7.

Comparability and Benchmarking

A comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to ISO 21930 and the building context, respectively the product-specific characteristics of performance, are taken into account. Environmental declarations from different programs may not be comparable. Full conformance with the PCR allows for EPD comparability only when all stages a product's life cycle have been considered. However, variations and deviations are possible. 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 as the EPD results may.

Units

The LCA results within this EPD are reported in SI units.

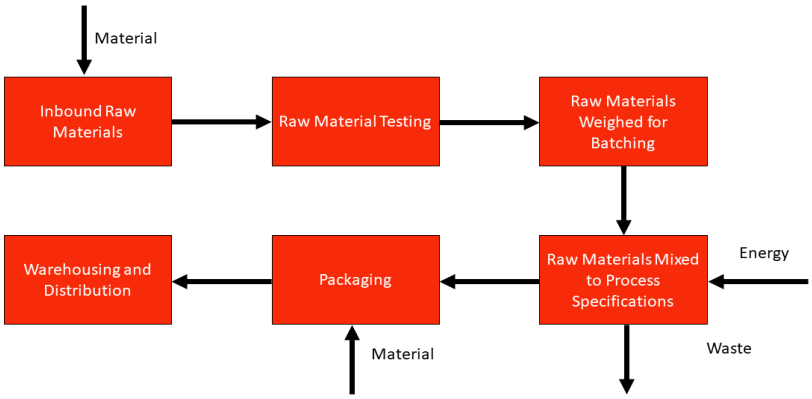
Life Cycle Inventory and Scenarios

Background data

For life cycle modeling of the considered products, the LCA for Experts Software System for Life Cycle Engineering, developed by Sphera, is used. The Sphera and USLCI databases contain consistent and documented datasets which are documented online. To ensure comparability of results in the LCA, the basic data of the Sphera database were used for energy, transportation, and auxiliary materials.

Manufacturing

Roof coating products are manufactured at Charleston, SC; Gum Springs, Arkansas; Phoenix, AZ; and Walpole, Massachusetts. Manufacturing begins with the inbound reception of raw materials. The materials are tested for quality assurance before they are weighed for batching. The materials are then mixed according to process specifications to generate the product. The product is then packaged in plastic pails and palletized.



Packaging

The packaging material is composed primarily of plastic materials. Roof coating products are shipped on pallets and wrapped in plastic film.

	Quantity (% By Weight)
Material	**Value**
Cardboard	1.39%
Wood	3.58%
Paper	3.16%
Plastic	91.88%
Total	**100.00%**

Transportation

Transport to Building Site (A4)		
Name	**Value**	**Unit**
Fuel type	Diesel	
Liters of fuel	38	l/100km
Transport distance	1662	km
Capacity utilization (including empty runs)	90	%
Gross density of products transported	0	kg/m^3
Weight of products transported	-	kg
Volume of products transported	-	m^3
Capacity utilization volume factor	-	-

Product Installation

Apply by brush, roller, or airless sprayer evenly at the specified rates. Apply additional coats perpendicular to the previous coat once it is dry enough to walk on. Total coverage is dependent on the substrate. Note: Compliance with model building codes does not always ensure compliance with state or local building codes, which may be amended versions of these model codes. Always check with local building code officials to confirm compliance. Dispose of any leftover paint in accordance with local regulations.

Installation Into the Building (A5)		
Name	**Value**	**Unit**
Auxiliary materials	-	kg
Water consumption	-	m^3
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Product loss per functional unit	-	kg
Waste materials at construction site	-	kg
Output substance (recycle)	-	kg
Output substance (landfill)	0.09	kg
Output substance (incineration)	-	kg
Packaging waste (recycle)	0.03	kg
Packaging waste (landfill)	0.15	kg
Packaging waste (incineration)	0.03	kg
Direct emissions to ambient air*, soil, and water	0	kg CO_2
VOC emissions**	< 25	$\mu g/m^3$

*CO_2 emissions to air from disposal of packaging
** VOC emissions tested according to ASTM D5201

Reference Service Life		
Name	**Value**	**Unit**
Reference Service Life	15	years
Estimated Building Service Life	20	years
Number of Replacements	0.4	number

Product Use

Use (B1-B7)		
Name	**Value**	**Unit**
Water consumption (from tap, to sewer)	-	m^3
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Equipment output	-	kW
Direct emissions to ambient air, soil, and water	-	kg

Disposal

The product is assumed to be 100% landfilled in the end-of-life disposal, in accordance with the PCR.

End of life (C1-C4)		
Name	**Value**	**Unit**
Collected separately	0.00	kg
Collected as mixed construction waste	0.94	kg
Reuse	0.00	kg
Recycling	0.00	kg
Landfilling	0.94	kg
Incineration with energy recovery	0.00	kg
Energy conversion	-	%
Removals of biogenic carbon	-	kg

Re-use Phase

Re-use of the product is not common due to the nature of installation of the product into the building envelope.

Re-Use, recovery, And/Or Recycling Potential (D)		
Name	**Value**	**Unit**
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	0.00	MJ
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	0.00	MJ
Net energy benefit from material flow declared in C3 for energy recovery	0.00	MJ
Process and conversion efficiencies		
Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors);		

LCA Results - PCR Compliant

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

Results are reported by life cycle stages. For breakdown of stages, please see the System Boundary section on page 6.

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment

Parameter	Parameter	Unit	Product Stage Modules 1-3	Installation Stage Modules 4-5	Use Stage Modules 6-10	End-of-Life Modules 11-14	Total
GWP	Global warming potential	kg CO_2-Eq.	1.01E+00	1.32E-01	7.03E-01	3.10E-01	2.16E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	3.26E-09	4.98E-12	1.31E-09	4.85E-13	4.57E-09
AP	Acidification potential for air emissions	kg SO_2-Eq.	2.06E-03	7.91E-04	2.13E-03	2.24E-03	7.22E-03
EP	Eutrophication potential	kg N-Eq.	1.80E-04	4.38E-05	4.82E-04	8.31E-04	1.54E-03
SP	Smog formation potential	kg O_3-Eq.	3.14E-02	2.18E-02	2.54E-02	7.92E-03	8.65E-02
FFD	Fossil Fuel Depletion	MJ-surplus	2.54E+00	2.33E-01	1.17E+00	9.12E-02	4.04E+00

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results shown below were calculated using CML 2001 - April 2013 Methodology.

CML 4.1 Impact Assessment

Parameter	Parameter	Unit	Product Stage Modules 1-3	Installation Stage Modules 4-5	Use Stage Modules 6-10	End-of-Life Modules 11-14	Total
GWP	Global warming potential	kg CO_2-Eq.	9.95E-01	1.32E-01	7.46E-01	4.23E-01	2.30E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	3.25E-09	4.97E-12	1.30E-09	5.50E-13	4.56E-09
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	1.93E-03	6.50E-04	1.45E-03	8.67E-04	4.89E-03
EP	Eutrophication potential	kg$(PO_4)^3$-Eq.	2.51E-04	1.16E-04	6.15E-04	1.01E-03	1.99E-03
POCP	Formation potential of tropospheric ozone photochemical oxidants	kg ethane-Eq.	2.16E-04	7.59E-05	2.03E-04	2.05E-04	7.00E-04
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	1.96E-06	5.47E-11	8.02E-07	1.61E-08	2.78E-06
ADPF	Abiotic depletion potential for fossil resources	MJ	2.01E+01	1.68E+00	9.15E+00	6.93E-01	3.16E+01

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain the resource use throughout the life cycle of the product.

Resource Use

Parameter	Parameter	Unit	Product Stage Modules 1-3	Installation Stage Modules 4-5	Use Stage Modules 6-10	End-of-Life Modules 11-14	Total
RPR_E	Renewable primary energy as energy carrier	MJ	2.22E+00	0.00E+00	1.04E+00	3.31E+00	0.00E+00
RPR_M	Renewable primary energy resources as material utilization	MJ	2.77E-01	0.00E+00	1.04E+00	1.32E+00	0.00E+00
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	2.13E+01	1.69E+00	1.10E+01	3.47E+01	0.00E+00
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	3.33E+00	0.00E+00	1.10E+01	1.43E+01	0.00E+00
SM	Use of secondary material	kg	0.00E+00	0.00E+00	2.91E-03	2.91E-03	0.00E+00
RSF	Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	6.47E-03	0.00E+00	0.00E+00	6.59E-03	0.00E+00

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories

Parameter	Parameter	Unit	Product Stage Modules 1-3	Installation Stage Modules 4-5	Use Stage Modules 6-10	End-of-Life Modules 11-14	Total
HWD	Hazardous waste disposed	kg	1.75E-04	0.00E+00	3.10E+00	2.02E-11	3.10E+00
		%	0.01%	0.00%	99.99%	0.00%	100.00%
NHWD	Non-hazardous waste disposed	kg	6.01E-02	0.00E+00	1.08E+00	7.45E-01	1.88E+00
		%	3.20%	0.00%	57.18%	39.62%	100.00%
HLRW	High-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	1.12E-01	0.00E+00	1.12E-01
ILLRW	Intermediate- and low-level radioactive waste	kg or m^3	1.80E-03	0.00E+00	2.32E+00	4.74E-06	2.32E+00
CRU	Components for re-use	kg	0.00E+00	0.00E+00	1.02E-04	0.00E+00	1.02E-04
MR	Materials for recycling	kg	3.06E-04	0.00E+00	2.88E-10	0.00E+00	3.06E-04
MER	Materials for energy recovery	kg	0.00E+00	0.00E+00	6.60E+00	0.00E+00	6.60E+00
EE	Recovered energy exported from system	MJ	0.00E+00	0.00E+00	6.60E+00	0.00E+00	6.60E+00

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Carbon Emissions and Removals

Parameter	Parameter	Unit	Product Stage Modules 1-3	Installation Stage Modules 4-5	Use Stage Modules 6-10	End-of-Life Modules 11-14	Total
BCRP	Biogenic Carbon Removal from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2	2.51E-02	0.00E+00	0.00E+00	0.00E+00	2.51E-02
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2	0.00E+00	0.00E+00	2.51E-02	0.00E+00	2.51E-02
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	Calcination Carbon Emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	Carbonation Carbon Removal	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain the material and energy resource use throughout the life cycle of the product.

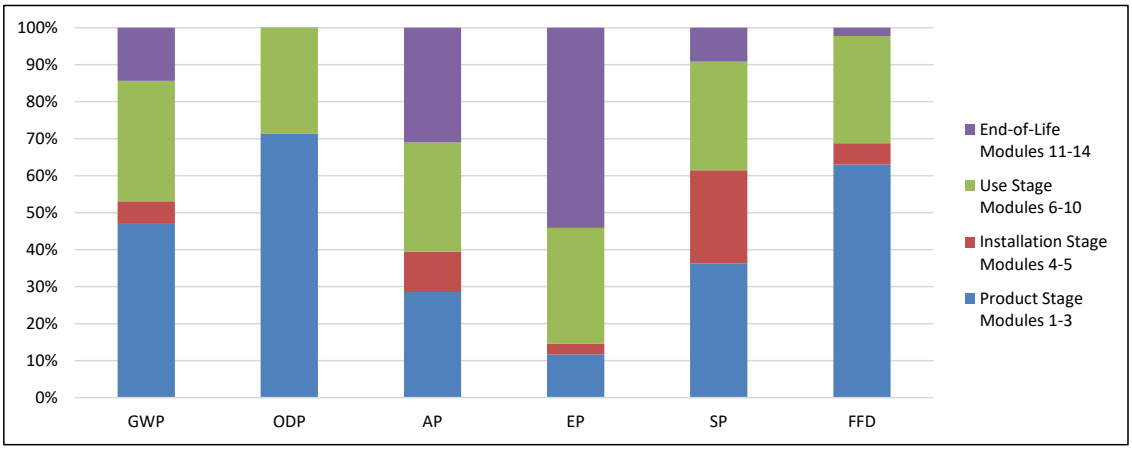
Differentiation Of Use Of Material And Energy Resources

Parameter	Parameter	Unit	Product Stage Modules 1-3	Installation Stage Modules 4-5	Use Stage Modules 6-10	End-of-Life Modules 11-14	Total
Hydro/Wind	Hydro/Wind	MJ	4.8E-01	0.0E+00	2.1E-01	2.5E-02	7.2E-01
Fossil Energy	Fossil Energy	MJ	1.6E+01	0.0E+00	6.6E+00	4.1E-01	2.3E+01
Bio-energy	Bio-energy	MJ	3.0E-08	0.0E+00	1.2E-08	3.7E-10	4.3E-08
Nuclear Energy	Nuclear Energy	MJ	7.0E-10	0.0E+00	2.9E-10	1.3E-11	1.0E-09
Other Renewable Energy	Other Renewable Energy	MJ	7.3E+00	1.7E+00	3.8E+00	3.2E-01	1.3E+01

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

LCA Interpretation

The production life cycle modules (A1-A3) dominate the impacts across all impact categories. This is due to the upstream production of materials used in the product, along with natural gas use in the manufacturing of the product. The end-of-life modules (11-16) have a significant impact in acidification and eutrophication due to the 100% landfill assumption.



Emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories:
— renewable primary energy resources as energy (fuel), (RPRE);
— renewable primary resources as material, (RPRM);
— non-renewable primary resources as energy (fuel) ,(NRPRE);
— non-renewable primary resources as material (NRPRM);
— secondary materials (SM);
— renewable secondary fuels (RSF);
— non-renewable secondary fuels (NRSF);
— recovered energy (RE);
— abiotic depletion potential for non-fossil mineral resources (ADPelements).
— land use related impacts, for example on biodiversity and/or soil fertility;
— toxicological aspects;
— emissions from land use change [GWP 100 (land-use change)];
— hazardous waste disposed;
— non-hazardous waste disposed;
— high-level radioactive waste;
— intermediate and low-level radioactive waste;
— components for reuse;
— materials for recycling;
— materials for energy recovery; and
— recovered energy exported from the product system.

LCA Results - ISO 21930:2017 Compliant

Results are reported by life cycle stages. For breakdown of stages, please see the System Boundary section on page 6.

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B4**	**C1**	**C2**	**C3**	**C4**
GWP	Global warming potential	kg CO_2-Eq.	1.01E+00	1.32E-01	8.63E-02	6.17E-01	0.00E+00	1.28E-02	0.00E+00	2.97E-01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	0.00E+00	4.98E-12	4.79E-16	2.19E-12	0.00E+00	4.84E-13	0.00E+00	1.15E-15
AP	Acidification potential for air emissions	kg SO_2-Eq.	0.00E+00	7.91E-04	6.72E-05	1.24E-03	0.00E+00	7.69E-05	0.00E+00	2.16E-03
EP	Eutrophication potential	kg N-Eq.	0.00E+00	4.38E-05	4.32E-05	3.67E-04	0.00E+00	4.26E-06	0.00E+00	8.27E-04
SP	Smog formation potential	kg O_3-Eq.	1.13E+00	2.18E-02	6.89E-04	4.63E-01	0.00E+00	2.12E-03	0.00E+00	5.80E-03
FFD	Fossil Fuel Depletion	MJ-surplus	3.26E-09	2.33E-01	1.42E-02	1.35E-01	0.00E+00	2.26E-02	0.00E+00	6.86E-02

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results shown below were calculated using CML 2001 - April 2013 Methodology.

CML 4.1 Impact Assessment										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B4**	**C1**	**C2**	**C3**	**C4**
GWP	Global warming potential	kg CO_2-Eq.	9.95E-01	1.32E-01	8.99E-02	6.56E-01	0.00E+00	1.28E-02	0.00E+00	4.10E-01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	3.25E-09	4.97E-12	2.79E-14	1.30E-09	0.00E+00	4.83E-13	0.00E+00	6.69E-14
AP	Acidification potential for air emissions	kg SO_2-Eq.	1.93E-03	6.50E-04	5.06E-05	1.40E-03	0.00E+00	6.31E-05	0.00E+00	8.04E-04
EP	Eutrophication potential	kg$(PO_4)^3$-Eq.	2.51E-04	1.16E-04	4.57E-05	5.69E-04	0.00E+00	1.12E-05	0.00E+00	1.00E-03
POCP	Formation potential of tropospheric ozone photochemical oxidants	kg ethane-Eq.	2.16E-04	7.59E-05	3.23E-06	2.00E-04	0.00E+00	7.37E-06	0.00E+00	1.98E-04
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	1.96E-06	5.47E-11	7.02E-09	7.95E-07	0.00E+00	5.32E-12	0.00E+00	1.61E-08
ADPF	Abiotic depletion potential for fossil resources	MJ	2.01E+01	1.68E+00	1.18E-01	9.04E+00	0.00E+00	1.63E-01	0.00E+00	5.30E-01

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain the resource use throughout the life cycle of the product.

Resource Use										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B4**	**C1**	**C2**	**C3**	**C4**
RPR_E	Renewable primary energy as energy carrier	MJ	2.22E+00	0.00E+00	1.62E-02	9.13E-01	0.00E+00	0.00E+00	0.00E+00	5.12E-02
RPR_M	Renewable primary energy resources as material utilization	MJ	2.77E-01	0.00E+00	0.00E+00	1.11E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	2.13E+01	1.69E+00	1.23E-01	9.53E+00	0.00E+00	1.65E-01	0.00E+00	5.42E-01
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	3.33E+00	0.00E+00	0.00E+00	1.33E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	Use of nonrenewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	6.47E-03	0.00E+00	1.92E-04	2.71E-03	0.00E+00	0.00E+00	0.00E+00	1.21E-04

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain the output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B4**	**C1**	**C2**	**C3**	**C4**
HWD	Hazardous waste disposed	kg	1.75E-04	0.00E+00	5.95E-12	6.99E-05	0.00E+00	0.00E+00	0.00E+00	2.02E-11
NHWD	Non-hazardous waste disposed	kg	6.01E-02	0.00E+00	1.52E-01	3.83E-01	0.00E+00	0.00E+00	0.00E+00	7.45E-01
HLRW	High-level radioactive waste	kg or m^3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ILLRW	Intermediate- and low-level radioactive waste	kg or m^3	1.80E-03	0.00E+00	2.04E-06	7.23E-04	0.00E+00	0.00E+00	0.00E+00	4.74E-06
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	Materials for recycling	kg	3.06E-04	0.00E+00	0.00E+00	1.22E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	Recovered energy exported from system	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Results below contain direct greenhouse gas emissions and removals throughout the life cycle of the product.

Carbon Emissions and Removals										
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**	**A5**	**B4**	**C1**	**C2**	**C3**	**C4**
BCRP	Biogenic Carbon Removal from Product	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
BCEP	Biogenic Carbon Emissions from Product	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2	2.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2	0.0E+00	0.0E+00	2.5E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
BCEW	Biogenic Carbon Emissions from Combustion of Waste from Renewable Sources Used in Production Process	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CCE	Calcination Carbon Emissions	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CCR	Carbonation Carbon Removal	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
CWNR	Carbon Emissions from Combustion of Waste from Non-renewable Sources Used in Production Process	kg CO_2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Additional Environmental Information

Environmental and Health During Manufacturing

During the manufacturing of Acrylic Top Coat, all legal regulations regarding emissions to air, wastewater discharge, solid waste disposal and noise emissions are followed.

Environmental and Health During Installation

There is no harmful emissive potential. No damage to health or impairment is expected under normal use corresponding to the intended use of the product.

Extraordinary Effects

Fire
UL listed to ANSI / UL 790

Water
N/A

Mechanical Destruction
N/A

Delayed Emissions

Global warming potential is calculated using the TRACI 2.1 and CML 4.1 impact assessment methodologies. Delayed emissions are not considered.

Further Information

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