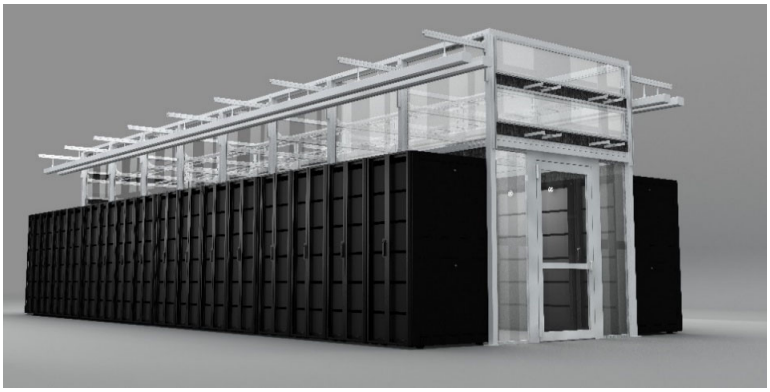
Environmental Product Declaration

SubZero Engineering Essential Series Data Center Containment

The foundational containment line with a flexible, standards-based approach to design and installation



Data center containment solutions separate the hot exhaust air from the cold intake air preventing mixing and allows for optimal resource management

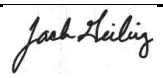
SubZero Engineering stands at the forefront of critical infrastructure solutions, trusted by the world's most influential technology companies across diverse market verticals, including Colo, Web, Social Media, and Enterprise Customers. Renowned as an industry leader, our unique portfolio of critical infrastructure optimization technology, products, and services positions us as the unmatched partner for large-scale projects globally.

Our commitment to sustainability is a cornerstone of our offerings, empowering our clients to enhance the sustainability and performance of their critical infrastructure environments. With a focus on speed, we deliver standard or bespoke containment solutions with unparalleled efficiency, ensuring rapid design, manufacture, installation, and commissioning for optimum infrastructure flexibility.

Cost savings are ingrained in our approach, as we confidently provide substantial economic benefits compared to alternative solutions. SubZero Engineering serves as a singular, trusted vendor, offering global support throughout every project phase—from initial consultation and concept to design, installation, commissioning, long-term service, maintenance, and project lifecycle optimization.

Embracing the philosophy of simplification, we begin by understanding our clients' goals, delivering the simplest, most comprehensive solutions while minimizing unnecessary complexity, costs, and time delays. Our technology solutions prioritize optimized performance efficiency, embodying the vision that has driven our company since its inception. SubZero Engineering is not just a provider; we are a strategic partner committed to pushing the boundaries of innovation and excellence in critical infrastructure solutions.

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930. 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 2415 Eisenhower Avenue, Alexandria, Virginia 22314 USA
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	ISO 21930:2017, Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
MANUFACTURER NAME AND ADDRESS	SubZero Engineering 805 South 3600 West Suite 100 Salt Lake City, UT 84104
DECLARATION NUMBER	EPD10950
DECLARED PRODUCT & FUNCTIONAL UNIT OF DECLARED UNIT	SubZero Engineering Essential Series Data Center Containment Declared Unit = 1 cubic meter of Essential Series Data Center Containment
REFERENCE PCR AND VERSION NUMBER	N/A
DESCRIPTION OF PRODUCT(S) APPLICATION/USE	Essential Series Data Center Containment is a configurable system of products designed to separate hot exhaust air from cold intake air in a data center environment.
MARKETS OF APPLICABILITY	Global
DATE OF ISSUE	7/17/2024
PERIOD OF VALIDITY	5 years
EPD TYPE	Product Specific
DATASET VARIABILITY	N/A
EPD SCOPE	cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2022
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.4
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.5 & USLCI v2.0
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1; CML 4.1
The sub-category PCR review was conducted by:	 Jack Geibig, EcoForm, LLC jgeibig@ecoform.com
This declaration was independently verified in accordance with ISO 14025: 2006. The study was completed to follow ISO 21930:2017. ☐ INTERNAL ☒ EXTERNAL	
This life cycle assessment was independently verified in accordance with ISO 14044 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 §5.5 are met. It should be noted that different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.

General Information

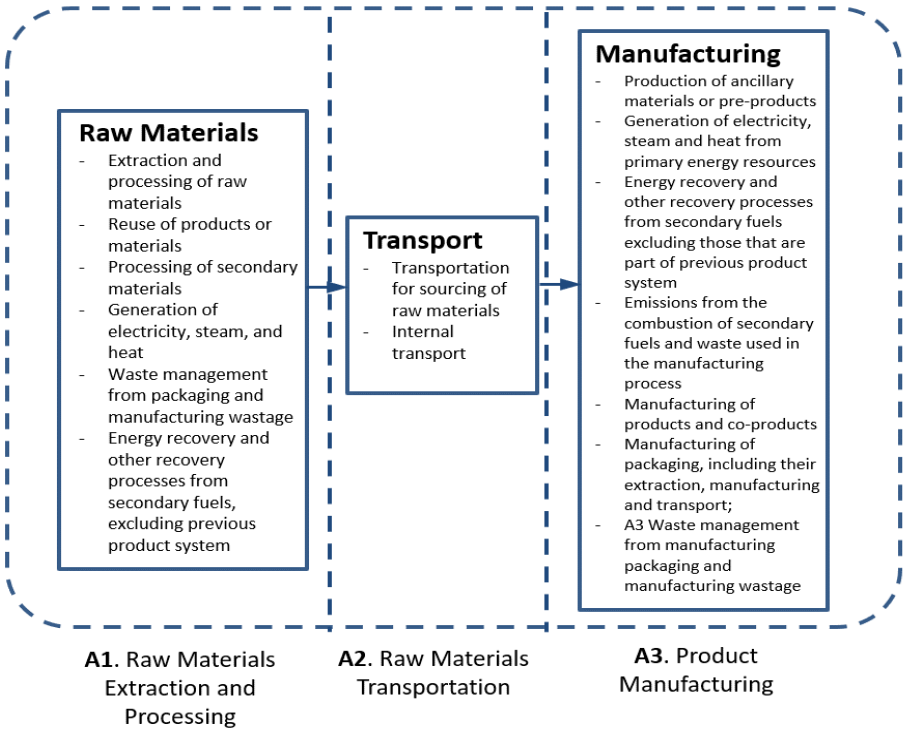
Description of Company/Organization

SubZero Engineering stands unrivaled as the global leader in turnkey engineering solutions for data centers, industrial cleanrooms, and mission-critical environments. With an unyielding focus on advancing data center CFD consulting and hot and cold aisle containment expertise, we have expanded our capabilities to include cutting-edge Micro Data Center infrastructure and bespoke Simplex modular cleanroom solutions, demonstrating an unparalleled commitment to addressing diverse and intricate isolation challenges. Our unmatched portfolio seamlessly combines critical infrastructure optimization technology and services, setting us apart as the foremost authority in the industry.

Product Description

Product Name: Essential Series Data Center Containment
Product Characteristic:
Essential Series Data Center Containment is a configurable system of products designed to separate hot exhaust air from cold intake air in a data center environment. Additional features include:
- Standard Sizes
- Modular design
- Rigid Design
- Clear Panels

Flow Diagram



Manufacturer Specific EPD

This product-specific EPD was developed based on the cradle-to-gate Life Cycle Assessment. The EPD accounts for raw material extraction and processing, transport, and product manufacturing. Manufacturing data were gathered directly from company personnel. All data used within this study is representative of the 2022 calendar year.

Application

Applicable to use in data centers.

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 average composition of Essential Series Data Center Containment is as follows:

Material	Essential Series Data Center Containment
Steel	4.34%
Polycarbonate	21.86%
Aluminum	72.72%
Stainless Steel	0.02%
SBS Rubber	0.09%
Polypropylene	0.97%
Total	**100.00%**

Components	Weight (kg/m^3)	Percentage of Product
Panel to Panel Clips	4.43E-03	0.08%
RRP 24"	2.70E+00	49.81%
RRP-16AW	3.82E-01	7.04%
FBMFT-4	1.93E-01	3.55%
FB Door	2.15E+00	39.53%
Total	**5.43E+00**	**100.00%**

Placing on the Market / Application Rules

The Essential Series Data Center Containment Hot Aisle Containment conforms to the certifications and sustainability regulations below:
- Smoke Dev. ASTM E84 - 40
- Flame Spread ASTM E84 - 5

Properties of Declared Product as Shipped

Products are loaded onto wood pallets and are loaded by unit.

Methodological Framework

Declared Unit

The declaration refers to the declared unit of 1 cubic meter of SubZero Engineering Essential Series Data Center Containment as specified in the PCR.

	Essential Series Data Center Containment	
Name	**Value**	**Unit**
Declared unit	One cubic meter of Essential Series Data Center Containment	
Mass	5.43	kg/Declared Unit
Density	13.24	kg/m^2

System Boundary

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

Product Stage			**Construction Process Stage**		**Use 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	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	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.

This system boundary follows the modularity principle, all environmental aspects and potential impacts are declared in the life cycle stage where they can be attributed. All manufacturing specific impacts including energy use, water use, and waste generated have been accounted for within the A3 manufacturing module. Electricity is generated at local power plants and used at SubZero's manufacturing site. The EPA's (Environmental Protection Agency) data for the NWPP (North West Power Pool) region was assumed based off of the facilities location in Salt Lake City, Utah. This system boundary also follows the polluter pays principle, the processes relevant to waste processing are assigned to the product system that generates the waste until the system boundary between product systems is reached.

Allocation

Allocation was determined on a per kilogram basis for primary data. For secondary data, cut-off methodology was used. No co-product allocation was performed since all provided manufacturing data was specific to HACS production.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass or energy 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 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 its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

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 SubZero Engineering. Secondary data from the SimaPro Ecoinvent v3.5 & USLCI v2.0 databases were utilized. These data were evaluated and have temporal, geographic, and technical coverage appropriate to the scope of the Hot Aisle Containment product category.

Data Quality

The data sources used are complete and representative of North America 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 manufacturer. 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.

Period Under Review

The period under review is the full calendar year of 2022.

Treatment of Biogenic Carbon

The uptake and release of biogenic carbon throughout the product life cycle follows ISO 21930 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 and allows EPD comparability only when all stages of the product's life cycle have been considered. However, variations and deviations are possible. See the disclaimer on the second page of this EPD for further detail.

Units

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

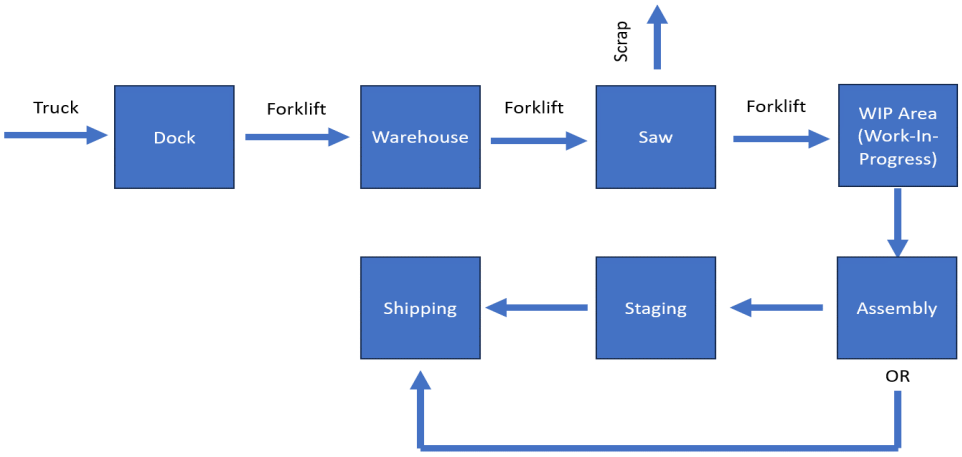
Additional Environmental Information

Background data

For life cycle modeling of the considered products, SimaPro is used. The SimaPro-database contains consistent and documented datasets which are documented in the online SimaPro-documentation. To ensure comparability of results in the LCA, the basic data of the SimaPro database were used for energy, transportation and auxiliary materials.

Manufacturing

Manufacturing at the Salt Lake City plant begins when trucks bring all the materials to the loading docks. From the loading docks, forklifts bring the materials to a warehouse to be stored until an order is made. Once an order is made, forklifts are used to transport the materials to the cutting stage, where extrusions and polycarbonate are cut into their proper lengths. After being cut, they're placed on pallets and forklifts take the materials to the work-in-progress (WIP) stage. At the WIP stage, the assembly is put together, wrapped in shrink wrap, and loaded into a crate. The packaged unit goes either to shipping or placed in staging then sent to shipping.



Packaging

All packaging is fully recyclable. The packaging material is composed of cardboard and wood.

	Essential Series Data Center Containment
Material	**Quantity (% By Weight)**
Wood	99.83%
Cardboard	0.17%
Total	**100.00%**

Essential Series Data Center Containment Results per Declared Unit

Results shown below were calculated using TRACI 2.1 Methodology.

TRACI 2.1 Impact Assessment

Parameter	Parameter	Unit	A1	A2	A3
GWP	Global warming potential	kg CO_2-Eq.	4.67E+01	1.21E-01	2.69E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	1.10E-06	4.61E-12	1.02E-08
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	2.35E-01	7.21E-04	2.41E-02
EP	Eutrophication potential	kg N-Eq.	6.67E-02	4.02E-05	6.09E-04
SP	Smog formation potential	kg O_3-Eq.	2.36E+00	1.97E-02	2.67E-01
FFD	Fossil Fuel Depletion	MJ-surplus	4.66E+01	2.31E-01	3.46E+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	A1	A2	A3
GWP	Global warming potential	kg CO_2-Eq.	4.71E+01	1.21E-01	2.71E+00
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 Eq.	8.18E-07	4.56E-12	7.65E-09
AP Air	Acidification potential for air emissions	kg SO_2-Eq.	2.40E-01	5.95E-04	2.50E-02
EP	Eutrophication potential	kg$(PO_4)^3$-Eq.	3.83E-02	1.05E-04	1.37E-03
POCP	Formation potential of tropospheric ozone	kg ethane-Eq.	1.49E-02	2.74E-05	2.75E-03
ADPE	Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	1.09E-04	0.00E+00	1.18E-07
ADPF	Abiotic depletion potential for fossil resources	MJ	4.92E+02	1.55E+00	3.81E+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	A2	A3
RPR_E	Renewable primary energy as energy carrier	MJ	1.25E+02	0.00E+00	0.00E+00
RPR_M	Renewable primary energy resources as material utilization	MJ	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	Nonrenewable primary energy as energy carrier	MJ	5.04E+02	0.00E+00	0.00E+00
$NRPR_M$	Nonrenewable primary energy as material utilization	MJ	5.41E+01	0.00E+00	0.00E+00
SM	Use of secondary material	kg	0.00E+00	0.00E+00	3.80E+01
RSF	Use of renewable secondary fuels	MJ	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
RE	Energy recovered from disposed waste	MJ	0.00E+00	0.00E+00	0.00E+00
FW	Use of net fresh water	m^3	2.18E+02	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 output flows and wastes throughout the life cycle of the product.

Output Flows and Waste Categories					
Parameter	**Parameter**	**Unit**	**A1**	**A2**	**A3**
HWD	Hazardous waste disposed	kg	3.10E-04	0.00E+00	0.00E+00
NHWD	Non-hazardous waste disposed	kg	1.21E+00	0.00E+00	0.00E+00
HLRW	High-level radioactive waste	kg	0.00E+00	0.00E+00	0.00E+00
ILLRW	Intermediate- and low-level radioactive waste	kg	8.60E-05	0.00E+00	0.00E+00
CRU	Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00
MR	Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00
MER	Materials for energy recovery	kg	0.00E+00	0.00E+00	2.22E-03
EE	Recovered energy exported from system	MJ	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**	**A2**	**A3**
BCRP	Biogenic Carbon Removal from Product	kg CO_2	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
BCRK	Biogenic Carbon Removal from Packaging	kg CO_2	0.00E+00	0.00E+00	4.42E-01
BCEK	Biogenic Carbon Emissions from Packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00
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
CCE	Calcination Carbon Emissions	kg CO_2	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
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

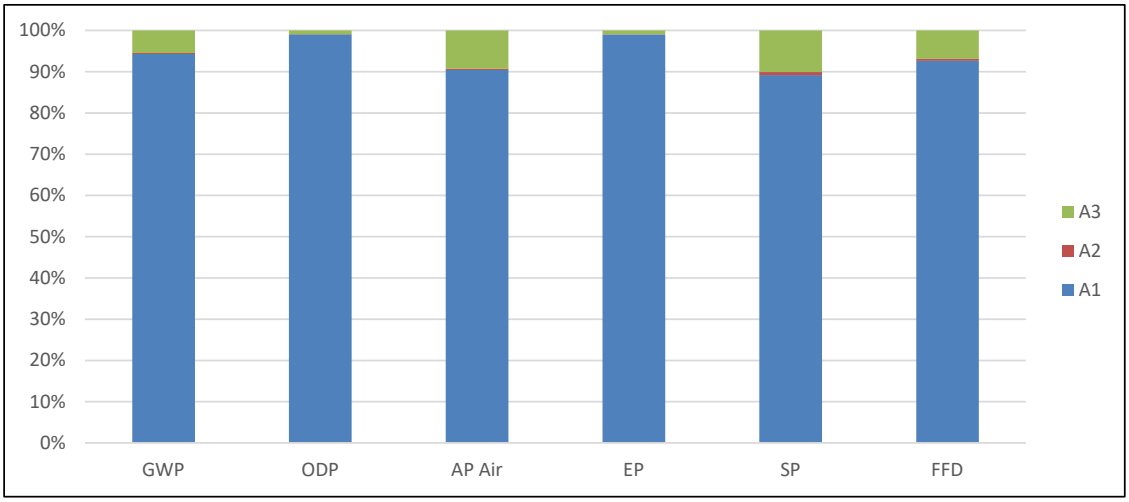
**All use phase and disposal stages have been considered and only those with non-zero values have been reported*

Installation Impact (A5)	Value	Unit
Packaging waste (recycle)	1.81E-01	kg
Packaging waste (landfill)	4.82E-02	kg
Packaging waste (incineration)	1.20E-02	kg
Direct emissions to ambient air*, soil, and water	4.42E-01	kg CO_2 eq

**CO_2 emissions to air from disposal of packaging*

Essential Series Data Center Containment LCA Interpretation

The raw materials dominate the impacts across all impact categories. This is due to the use of aluminum, which makes up the majority of this product.



Additional Environmental Information

Environmental and Health During Manufacturing

No known substances with hazardous or toxic properties that pose a concern to human health and/or the environment were identified as being used in the production of the HACS.

Environmental and Health During Installation

No known substances with hazardous or toxic properties that pose a concern to human health and/or the environment were identified as being used during installation of the HACS.

Extraordinary Effects

Fire
ASTM E84 rated.
Water
None.
Mechanical Destruction
None.

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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References

- SimaPro 9.4 — PRe Sustainability. SimaPro Life Cycle Assessment version 9.4 (software).
- ISO 14025 — ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
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- Characterization Method — Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers- version 1.2, January 2017.

Contact Information

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