AeroBarrier X1

Aerosol-Applied Waterborne Acrylic Sealant

Environmental Product Declaration

Date of Issue: 11/15/2024
Date of Expiration: 11/15/2029

PRODUCT CATEGORY RULE
ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services

DECLARED UNIT
1 kg of product

ASTM INTERNATIONAL

Program Operator	ASTM International 100 Barr Harbor Dr., West Conshohocken, PA 19428 cert@astm.org
General Program Instructions and Version Number	ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20
Manufacturer Name and Address	Aeroseal® 225 Byers Rd. Miamisburg, OH 45342 techinfo@aeroseal.com
Declaration Number	ASTM-EPD 828
Declared Product and Declared Unit	AeroBarrier X1 aerosol-applied, waterborne acrylic sealant Declared Unit: 1 kg of product
Reference PCR and Version Number	ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
Product's intended Application and Use	Commercial and residential
Intended Audience	Business-to-Business
Product RSL	N/A
Markets of Applicability	Manufactured in North America, distributed globally.
Date of Issue	11/15/2024
Period of Validity	5 years from date of issue
EPD Type	Manufacturer Specific
EPD Scope	Cradle-to-Gate (A1 to A3 modules)
Year of reported manufacturer primary data	2023
LCA Software and Version Number	Sphera LCA for Experts (fka GaBi) 10.8.0.14
LCI Database and Version Number	Sphera Managed LCA Content (fka GaBi) 2024.1
LCIA Methodology and Version Number	TRACI 2.1 + IPCC AR5
The sub-category PCR review was conducted by:	N/A
Independent verification of the declaration and data, according to ISO 21930:2017 **☐ Internal ☒ External**	Tim Brooke, ASTM International
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Lindita Bushi, PhD, Athena Sustainable Materials Institute

Limitations:

- Environmental declarations from different programs (ISO 14025) may not be comparable.
- Comparison of the environmental performance of the product 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 building energy use phase as instructed under this PCR.
- Full conformance with this PCR allows EPD comparability only 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 in results for upstream or downstream of the life cycle stages declared.

General Information

Company Description

Aeroseal® provides proven air sealing solutions for building envelopes and HVAC ductwork, improving building and home energy efficiency, indoor air quality, resilience, HVAC system performance, and durability. Aeroseal® produces AeroBarrier for building envelope air sealing and Aeroseal® for HVAC duct sealing, providing air sealing guaranteed to meet any requirements and immediately verified on the job site. Having sealed over 250,000 buildings globally, use of our products spans single family homes, multifamily buildings, and commercial/institutional buildings.

Figure 1: Aeroseal® headquarters

Product Descriptions

AeroBarrier X1 is a stable, non-toxic, aerosol-applied, waterborne acrylic sealant that, after application from the inside of a home or building, dries like a caulk. When AeroBarrier is applied, the sealant begins as a liquid. During installation, the home or building interior is pressurized higher than the exterior, and the sealant is then atomized and sprayed into the pressurized interior of a home or building by the automated, computer controlled AeroBarrier system. The higher pressure inside naturally moves the interior air to the exterior by escaping through leaks in the envelope, carrying the sealant to those leaks and sealing them as it passes through. The sealant particles deposit only at the leak locations and build to form a complete and tight seal, remaining firmly in place for years while staying completely pliable and flexible. For additional information on how the AeroBarrier X1 is used please see the website: https://aeroseal.com/how/.

CSI Division: 07 27 00[1]

AeroBarrier X1 is intended for use of air sealing to stop hidden air leaks up to ½" and as small as a human hair in both residential and commercial buildings. It requires approximately four gallons of AeroBarrier X1 to achieve a common code required air leakage level of 3 ACH50 for an average sized single family house in the United States (2,500 ft^2).

Product Composition

No substances required to be reported, per RCRA, Subtitle 3, as hazardous are associated with the production of this product.

[1] AeroBarrier X1 is typically included under this CSI Division and section; however, Aeroseal® is currently developing a proposal to reclassify their product under a new and more representative section of division 7 f the CSI MasterFormat.

Table 1: Product composition

Component	Composition of Product
Water	50-70%
Acrylic Polymer	20-40%
Silica, amorphous	1-5%
Propylene Glycol	1-5%
Other Additives (Proprietary Materials)	0.1-1%

Technical Requirements

AeroBarrier X1 has been tested to the following industry standards:

Table 2: Technical requirements

	AeroBarrier X1
ASTM	C719, D543, E2357
NFPA	285
CAN/ULC-S	102

LCA Methodology

Declared Unit

Table 3: Declared unit details

	AeroBarrier X1
Declared Unit	1 kg of product
Declared Unit Weight [kg]	1
Density [kg/gal]	3.96
Density [kg/m^3]	1,046
Note: Aeroseal® often speaks about AeroBarrier X1 in terms of Gallons. To this end, cradle-to-gate results per 1 gallon of AeroBarrier X1 are provided in the Embodied Carbon and LCA Results for Alternative Units section of this document.	

System Boundary

Table 4. Description of the system boundary modules

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

X = Module Included in LCA, MND = Module not Declared

Figure 2: System boundary diagram

Allocation

General principles of allocation were based on ISO 14040/44. To derive a per-unit value for manufacturing electricity, allocation was avoided by calculating electricity consumption specific to the AeroBarrier X1 production line using engineering specifications for the relevant machinery. For the allocation of manufacturing water and waste allocation via production mass was adopted, as this is the basis on which products are processed and sold. As a default, secondary GaBi datasets use a physical basis for allocation. No burdens are allocated across the system boundary with secondary material, secondary fuel, or recovered energy flows arising from waste.

Cut-off Rules

Input and output flows of mass and energy greater than 1% (based on total mass final product and total energy usage of the product system) or greater than 1% of environmental impacts were included within the scope of analysis. Flows less than 1% were included if sufficient data were available to warrant inclusion and/or the flow was thought to have significant environmental impact. Cumulative excluded flows and environmental impacts are less than 5% per module based on total mass, energy usage, and impacts of the product system. Where data gaps were identified, they are filled by conservative assumptions with average, generic, or proxy data and assumptions are documented. No known flows relevant to the product system are deliberately excluded from this LCA and EPD. Overhead consumption of electricity and natural gas were excluded from this LCA and EPD as they were deemed irrelevant to the product system and were excluded via use of engineering specifications to determine production process-specific energy consumption requirements relevant to AeroBarrier X1.

Some material inputs may have been excluded within the Sphera MLC datasets used for this project. All Sphera MLC datasets have been critically reviewed and conform to the exclusion requirement of ISO 21930:2017.

Period Under Review

Data were obtained from Aeroseal® and its manufacturing partner for calendar year 2023.

Technical Information and Scenarios

Manufacturing

In AeroBarrier X1 manufacturing all ingredients are staged and added. First the acrylic polymer is added, the mixer starts, and then the rest of the raw materials are added. The batch is mixed, and the product is distributed into 5-gallon pails. Buckets are palletized and shipped to distribution center or customer.

Packaging

Packaging requirements are presented in Table 5, per declared unit.

Table 5: Packaging per kg of product

Packaging Material	Quantity (kg/gal)
HDPE Pail	0.0642
Wooden Skid	0.0276
Paper Label	0.00302

Results

Environmental impacts were calculated using the GaBi software platform. Impact results have been calculated using IPCC AR5, TRACI 2.1, and ISO 21930 characterization factors. Results presented in this report are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Table 6: LCIA, Biogenic Carbon, ,Resource Use, Waste, and Output Flow Indicators

Abbreviation	Parameter	Unit
IPCC AR5 Impact Categories		
GWP, exc.	Global Warming Potential (100 years, excludes biogenic CO2)	kg CO_2 eq
TRACI 2.1 Impact Categories		
AP	Acidification potential of soil and water	kg SO_2 eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential (100 years, includes biogenic CO2)	kg CO_2 eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
FFD	Depletion of non-renewable fossil fuels	MJ, surplus energy
SFP	Smog formation potential	kg O^3 eq
Resource Use Indicators		
RPRE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value (LHV)
RPRM	Use of renewable primary energy resources used as raw materials	MJ, net calorific value
RPRT	Total use of renewable primary energy resources	MJ, net calorific value
NRPRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value
NRPRM	Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value
NRPRT	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
RE	Recovered energy	MJ, net calorific value
FW	Net use of fresh water	m^3
Output Flows and Waste Categories		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
HLRW	High-level radioactive waste, conditioned, to final repository	kg
ILLRW	Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
CRU	Components for reuse	kg
MR	Materials for recycling	kg
MER	Materials for energy recovery	kg
EEE	Exported electrical energy	MJ

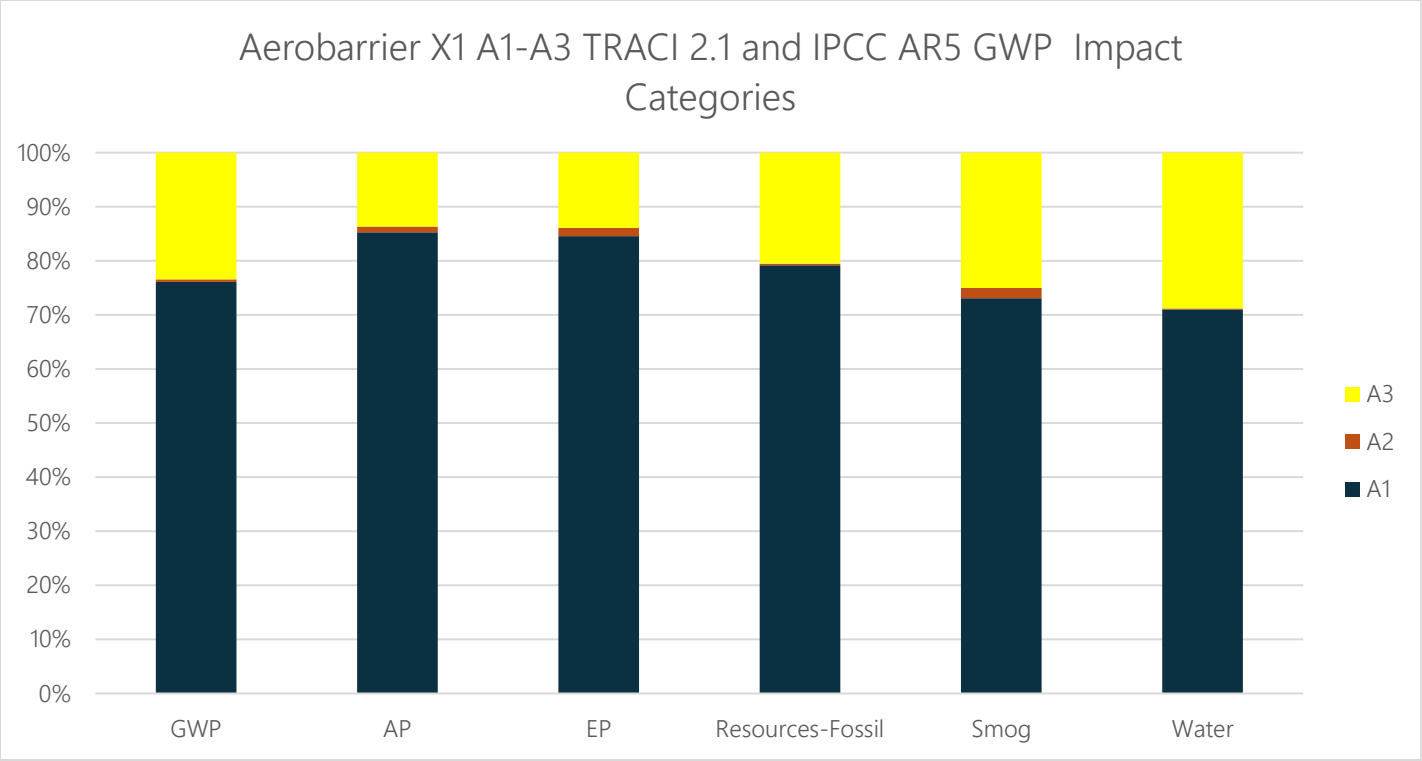
LCA Results

Table 7: LCA Results, per 1 kg of AeroBarrier X1 (A1 to A3)

	A1	A2	A3	Total (A1-A3)
IPCC AR5				
GWP, exc. [kg CO_2 eq]	9.12E-01	5.81E-03	2.81E-01	1.20E+00
TRACI 2.1 Impact Categories				
AP [kg SO_2 eq.]	2.06E-03	2.53E-05	3.30E-04	2.42E-03
EP [kg N eq.]	1.24E-04	2.28E-06	2.05E-05	1.47E-04
GWP [kg CO_2 eq.]	8.44E-01	5.67E-03	2.63E-01	1.11E+00
ODP [kg CFC 11 eq.]	2.59E-14	1.69E-17	2.14E-13	2.40E-13
FFD [MJ, Surplus]	2.77E+00	1.08E-02	7.18E-01	3.50E+00
SFP [kg O^3 eq.]	2.23E-02	5.82E-04	7.64E-03	3.05E-02
Resource Use Parameters				
RPRE [MJ]	7.95E-01	3.35E-03	3.74E-01	1.17E+00
RPRM [MJ]	0.00E+00	0.00E+00	2.92E-01	2.92E-01
RPRT [MJ]	7.95E-01	3.35E-03	6.66E-01	1.46E+00
NRPRE [MJ]	7.85E+00	7.57E-02	2.64E+00	1.06E+01
NRPRM [MJ]	1.21E+01	0.00E+00	2.57E+00	1.47E+01
NRPRT [MJ]	1.99E+01	7.57E-02	5.21E+00	2.52E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	3.97E-03	1.11E-05	1.61E-03	5.60E-03
Waste Parameters and Output Flows				
HWD [kg]	3.50E-09	1.02E-11	9.19E-10	4.43E-09
NHWD [kg]	1.10E-02	7.54E-06	1.52E-02	2.63E-02
HLRW [kg]	2.12E-07	2.70E-10	9.16E-08	3.04E-07
ILLRW [kg]	1.81E-04	2.28E-07	7.65E-05	2.58E-04
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	0.00E+00	0.00E+00	5.38E-03	5.38E-03
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	2.37E-01	2.37E-01

Interpretation

A dominance analysis was performed for AeroBarrier X1 to show which of the life cycle modules contributes to the majority of the impacts.Upstream raw material extraction and processing (A1) was found to be the largest contributor to all impact categories, followed by packaging. Specifically, within upstream raw material extraction and processing, the acrylic polymer used in the product formulation is the primary contributor to most impact categories. It should be noted that due to the proprietary nature of this material, it was modeled using a proxy. Supplier outreach regarding the composition of this material has been undertaken, the results of which may be used to update this LCA/EPD in the future. The majority of packaging impacts stem from the 5-gallon HDPE pail (15.82 kg). Given that the declared unit of this study is 1 kg, ~1/16th of total pail impacts are allocated to each declared unit.



Embodied Carbon and LCA Results for Alternative Units

As noted in the body of this document, AeroBarrier X1 is a unique product that is currently not well classified in traditional systems From an LCA perspective, this led to the use of ISO 21930:2017 as the core PCR for this study with a 1 kg declared unit based on an expired PCR. However, this unit is not commonly used by AeroSeal® in internal nor external communication concerning AeroBarrier X1. To increase the utility of this LCA, cradle-to-gate GWP results (also known as embodied carbon) are presented here in relation to units other than 1 kg. Note that the values shown below are cradle-to-gate and do not account for any product loss or energy consumption during installation. Values below are extrapolated from GWP results shown in the body of this EPD. Additionally, full LCA results utilizing a declared unit of 1 gallon are reported in this section as this is a more common unit for Aeroseal® to communicate about the AeroBarrier X1 product..

Table 8: Embodied carbon and conversion factors for alternative units

Unit	Conversion Factor from 1 Gallon	Embodied Carbon (kg CO_2-eq)
1 ounce (oz)	0.00716	0.0339
1 liter (l)	0.316	1.25

Table 9: LCA Results, per 1 gallon of AeroBarrier X1 (A1 to A3)

	A1	A2	A3	Total (A1-A3)
IPCC AR5				
GWP, exc. [kg CO_2 eq]	3.61E+00	2.30E-02	1.11E+00	4.74E+00
TRACI 2.1 Impact Categories				
AP [kg SO_2 eq.]	8.15E-03	1.00E-04	1.31E-03	9.56E-03
EP [kg N eq.]	4.92E-04	9.02E-06	8.09E-05	5.82E-04
GWP [kg CO_2 eq.]	3.34E+00	2.24E-02	1.02E+00	4.40E+00
ODP [kg CFC 11 eq.]	1.02E-13	6.68E-17	8.47E-13	9.49E-13
FFD [MJ, Surplus]	1.10E+01	4.26E-02	2.84E+00	1.38E+01
SFP [kg O^3 eq.]	8.82E-02	2.30E-03	3.02E-02	1.21E-01
Resource Use Parameters				
RPRE [MJ]	3.14E+00	1.32E-02	1.48E+00	4.64E+00
RPRM [MJ]	0.00E+00	0.00E+00	1.16E+00	1.16E+00
RPRT [MJ]	3.14E+00	1.32E-02	2.63E+00	5.79E+00
NRPRE [MJ]	3.10E+01	2.99E-01	1.04E+00	4.18E+01
NRPRM [MJ]	4.79E+01	0.00E+00	1.02E+01	5.80E+01
NRPRT [MJ]	7.89E+01	2.99E-01	2.06E+01	9.98E+01
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	1.57E-02	4.40E-05	6.38E-03	2.21E-02
Waste Parameters and Output Flows				
HWD [kg]	1.38E-08	4.04E-11	3.63E-09	1.75E-08
NHWD [kg]	4.37E-02	2.98E-05	6.02E-02	1.04E-01
HLRW [kg]	8.37E-07	1.07E-09	3.62E-07	1.20E-06
ILLRW [kg]	7.16E-04	9.01E-07	3.03E-04	1.02E-03
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	0.00E+00	0.00E+00	2.13E-02	2.13E-02
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE [MJ]	0.00E+00	0.00E+00	9.36E-01	9.36E-01

Additional Environmental Information

Benefits provided by AeroBarrier X1 throughout building and home operation:

There are multiple benefits that result from using AeroBarrier to air seal the building envelope and reduce air leakage to any requirement needed. Less air leakage through the building envelope provides energy savings and reduces operational carbon emissions, while also providing improved comfort, indoor air quality, protection from moisture intrusion, and resilience.

- Reduced energy use – less heat loss and gain, requiring less energy to maintain the desired temperature and humidity.
- Less carbon emissions – reducing energy use yields less operational carbon emissions into the atmosphere.
- Improved comfort – fewer drafts and more consistent interior temperatures and humidity.
- Better indoor air quality – pollutants, allergens, dust, other contaminants, and humid air can't get inside the building or home.
- Prevent moisture issues – reduces moisture intrusion and condensation in the exterior wall cavity, protecting from mold and mildew while increasing the durability of exterior wall materials.
- Increased resilience – reduced air leakage and moisture enable homes and buildings to better withstand storms and weather events.

Environment and Health During Installation

All recommendations shall be utilized as indicated by SDS and installation guidelines. Specific product SDS and installation instructions can be requested directly from Aeroseal®.

Environmental Activities and Certifications

AeroBarrier X1 has the following green building certifications:

- GREENGUARD Gold
- Home Innovation National Green Building Standard

For additional documentation concerning AeroBarrier X1, please visit Aeroseal's® website.

References

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