Environmental Product Declaration

According to ISO 14025 and ISO 21930:2017

ThermalStar Expanded Polystyrene

Atlas Molded Products is dedicated to manufacturing ThermalStar Expanded Polystyrene (EPS) insulations in a sustainable manner. The ThermalStar blowing agents have zero ozone-depleting potential, low global warming potential, and is 100% reusable or recyclable at the end of its life. Atlas collects and recycles ThermalStar products at all our locations.

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ATLAS

ENVIRONMENTAL PRODUCT DECLARATION

THERMALSTAR EXPANDED POLYSTYRENE
ROOF, WALL & BELOW GRADE INSULATION

According to ISO 14025, ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions www.ul.com 333 Pfingsten Rd, Northbrook IL, 60062 www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	Atlas Molded Products, Division of Atlas Roofing Corporation 2100 Riveredge Pkwy Ste 600, Atlanta, GA 30328
DECLARATION NUMBER	4791288083.101.2
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	ThermalStar molded expanded polystyrene insulation. 1 m^2 of insulation material with a thickness that gives an average thermal resistance of RSI = 1 m^2 K/W and with a building service life of 75 years.
REFERENCE PCR AND VERSION NUMBER	Part A: Product Category Rules for Building Related Products and Services, UL 10010, Version 3.1 Part B: Building Envelope Thermal Insulation EPD Requirements UL 10010 -1, Edition 2
DESCRIPTION OF PRODUCT APPLICATION/USE	Roof, Wall, and Below Grade Insulation.
PRODUCT RSL DESCRIPTION (IF APPL.)	75 Years
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	December 11th 2024
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	Manufacturers' average
EPD SCOPE	Cradle to grave
YEAR(S) OF REPORTED PRIMARY DATA	2021
LCA SOFTWARE & VERSION NUMBER	SimaPro v9.4
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent v3.8 LCI
LCIA METHODOLOGY & VERSION NUMBER	CML-IA baseline V4.7 and TRACI 2.1

The PCR review was conducted by:	UL Solutions PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Intertek
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

LIMITATIONS

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; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a 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 results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1 Description of Company/Organization

Atlas Molded Products specializes in the development and manufacture of innovative, high performance molded polystyrene for a variety of insulation applications:

- Below Grade
- Walls
- Roofing
- Geofoam lightweight fill

ThermalStar Expanded Polystyrene (EPS) is produced at 14 Atlas locations located coast to coast. Atlas has a national presence but provides local service. Representative data collected for this EPD is from a selection of 9 out of 15 Atlas facilities(Byron Center MI, Kansas City KS, Fredericktown MO, Perryville VA, Denver CO, Murray UT, Kingman AZ, Anthony TX, and Arlington TX)

1.2 Product Description

Product Identification

ThermalStar Insulation Board is made of expanded polystyrene (EPS). It is a closed-cell foam plastic with 98% air. ThermalStar is manufactured from a polystyrene resin containing a pentane-blowing agent that is replaced by air after processing.

ThermalStar insulation boards provide a lifetime stable R-value. Due to the closed cell structure containing 98% air, ThermalStar's 75-year (RSI/R-value) thermal resistance is the same as the initial RSI/R-value. The stable R-value of ThermalStar insulation boards allows the products to be used in building designs without any age adjustment.

1.3 Application

Below Grade

ThermalStar insulation offers reliable, long-lasting performance for foundation walls, under slabs, cold storage, plaza decks, and general insulation use. Its closed-cell structure minimizes water absorption. Available in a range of compressive resistances from 10-60 psi.

Walls

ThermalStar insulation offers reliable, long-lasting performance for cavity walls, precast elements, EIFS, and general insulation use. Its closed-cell structure minimizes water absorption. Available in a range of compressive resistances from 10-60 psi.

Roofing

ThermalStar insulation suits all commercial roofing systems and can be used in ballasted, mechanically fastened, or fully adhered systems.

1.4 Declaration of Methodological Framework

This EPD is considered a Cradle-to-Grave based on data gathered from Atlas LCA. Atlas LCA has been created following the requirements given in ISO 14025 for Type III EPD and the Building Envelope Thermal Insulation Products Category rule (PCR) for preparing an Environmental Declaration (EPD), version 2.0 by Underwriters Laboratory Inc. (UL). The methodology used in Atlas LCA are from ISO 14040:2006/AMD 1:2020 and ISO 14044:2006+A1+A2:2020

1.5 Technical Requirements

This EPD was developed on ThermalStar ASTM Type I insulation.

Table 1. ThermalStar ASTM C578 Type I Properties

Property	Test Method	Value	Unit
Thermal Resistance	ASTM C518	3.6	F•ft^2•h/Btu•in, min
Compressive Resistance	ASTM C165/D1621	10.0	psi, min
Water Vapor Permeance	ASTM E96	5.0	perm/in, max
Water Absorption	ASTM C272	4.0	volume %, max
Flexural Strength	ASTM C203	25	psi, min
Dimensional Stability	ASTM D2126	2.0	% change, max
Density	ASTM C303/D1622	0.90	lb/ft^3, min
Flame Spread Index	ASTM E84	< 25	
Smoke Developed Index	ASTM E84	< 450	

1.6 Properties of Declared Product as Delivered

Thermalstar insulation products are delivered as bundles of stacked insulation boards of the customer's required thickness and dimensions. The most common dimensions for insulation boards are 4 ft wide by 8 ft long.

1.7 Material Composition

Ingredients contained at a concentration of 0.1% (1,000 ppm) or greater.

Table 2. ThermalStar Composition

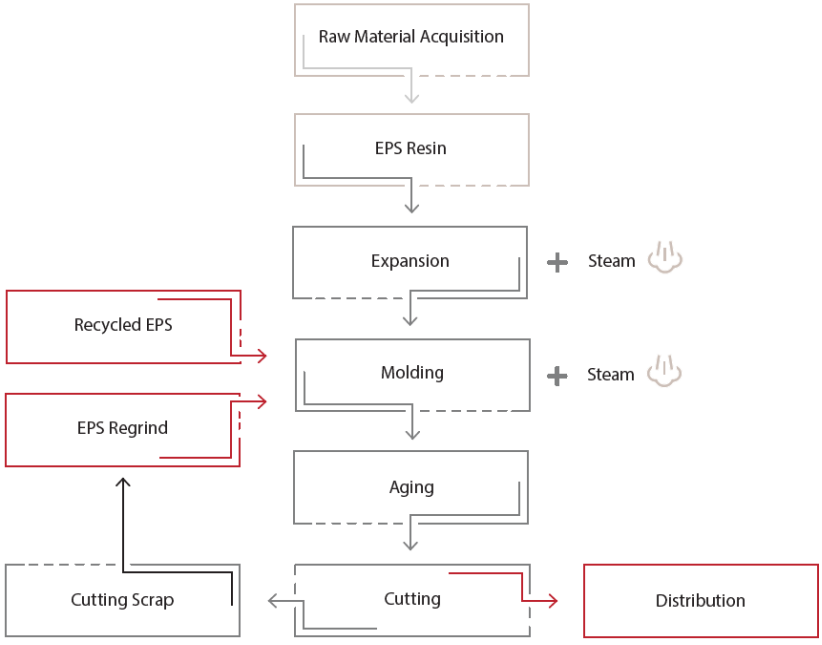
Ingredient	% by weight	CAS#
Polystyrene	>97%	9003-53-6
Pentanes	<1%	109-66-0,78-78-4,287-92-3
Flame Retardant	<1%	Proprietary/Non-Hazardous[1]
Additives	<1%	Proprietary/Non-Hazardous

[1]Does not contain hexabromocyclododecane (HBCD)

1.8 Manufacturing

ThermalStar Insulation boards are created in a two-stage process. EPS resin is loaded into an expander and exposed to steam, which causes it to expand. After aging, the expanded material is transferred into a block mold where, once again, steam is used to expand further and fuse the material into a solid, homogeneous block. Recycled EPS may be incorporated into the molded product. Following a short aging process, the EPS block is cut into sheets or various shapes to suit all ThermalStar insulation applications.

Table 3. ThermalStar Manufacturing Process



1.9 Packaging

ThermalStar is packed in bundles that may vary but include stretch wraps, bags, or shrouds.

Table 4. Packaging Materials per 1,000 kg of product

Packaging Materials	Quantity (kg)
Bags/shrouds	4.63
Stretch Wrap	3.16
Pallets	1.26E-01

1.10 Transportation

ThermalStar insulation products can be transported directly to customers or distribution centers and then to the end user. Shipping is by road.

1.11 Product Installation

ThermalStar insulation boards are installed manually by installers, who cut and shape the insulation as necessary. No special installation equipment is required. ThermalStar's packaging waste management involves sending 18% to waste-to-energy (WTE) incineration and 82% of its municipal solid waste (MSW) to landfills.

1.12 Use

The insulation is expected to remain in place with no replacement during the projected life of the building.

1.13 Reference Service Life and Estimated Building Service Life

75 Years.

1.14 Reuse, Recycling, and Energy Recovery

Less than 1% of ThermalStar's production is recycled.

1.15 Disposal

This EPD assumes ThermalStar's insulation boards are disposed of in Construction and Demolition landfills; the average transportation distance is assumed to be 100km from the building to a landfill site.

2. Life Cycle Assessment Background Information

2.1 Functional or Declared Unit

ThermalStar insulation board's cradle to grave life cycle is covered and quantified with the functional unit defined based on PCR "Part B: Building Envelope Thermal Insulation EPD Requirements" as: 1 m² of installed insulation material with a thickness that gives an average thermal resistance RSI = 1 m²K/W and with a building service life of 75 years (packaging included).

The functional unit mass is expressed in kilograms (kg) and the functional unit service life is expressed in years (yr). For this study using ASTM C578 Type I, the functional unit is expressed as:

FU = RSI * A * p * A where

RSI = 1 m²°K/W

A, thermal conductivity = 0.0401 W/m°K

p, density = 14.4 kg/m^3

A, area = 1 m^2

The functional unit mass for this analysis is calculated above as 0.578 kg.

The thickness (d) of the insulation using the above functional unit was calculated using the following equation:

d = RSI * A

The thickness of the insulation required for the functional unit is 0.0401 meters or 4.01 centimeters.

2.2 System Boundary

The system boundary was defined as cradle-to-grave, which comprised the extraction of raw materials, transportation of raw materials to the manufacturing plant, and the manufacturing of the product itself.

- Production A1 - A3
- Construction Process A4 – A5
- Use B1 – B7
- End of Life C1 – C4
- Recycling at the end-of-life stage was not considered D

Table 5. Cradle to Grave Modules

Module name	Stages	Description
A1	Production	Raw Material Supply
A2		Transport of raw materials
A3		Manufacturing of insulation boards
A4	Construction	Transport to construction site
A5		Installation
B1	Use	Use
B2		Maintenance
B3		Repair
B4		Replacement
B5		Refurbishment
B6		Energy Use
B7		Water Use
C1	END-OF-LIFE	Deconstruction
C2		Transport to waste treatment site
C3		Waste treatment
C4		Disposal
D	Beyond System Boundary	Benefits associated with reuse /recycling / energy recovery

2.3 Estimates and Assumptions

Assumptions in this EPD are as follows:

The study represents the horizontally weighted average production of EPS Insulation manufacturing from Atlas Molded Products, who provided data for 9 sites from U.S. Weighted average of LCI flows is used to populate the final LCA inventory for the study.

Installation of insulation board is performed manually and maintaining the product does not require additional energy or resources.

EPS insulation is cut into board stock by the insulation manufacturer for the specific requirements and dimensions of the installation. Therefore, it is assumed that there is no wastage generation during the installation.

Pentane is lost throughout the manufacturing process; primary data is collected from the sites about the pentane lost directly or through thermal oxidation process. The balance pentane is assumed to be lost during installation & use phase.

The average transport distance from the building to landfill site for insulation disposal is assumed to be 100 km.

2.4 Cut-off Criteria

The following items are considered to have a negligible contribution to results. These items are excluded from the scope of the study:

Human and animal energy inputs to processes.

Production and disposal of infrastructure (machines, transport vehicles, roads, etc.) and their maintenance.

Transport of employees to and from their normal place of work and business travel; and

Environmental impacts associated with support functions (e.g., R&D, marketing, finance, management etc.).

The geographic scope of the analysis is insulation manufactured, used, and disposed in North America. The EPS insulation evaluated is not designed or intended for reuse, so the insulation was modeled as being disposed after the 75-year service life. End-of-life management of insulation was modeled based on all insulation being taken to a construction and demolition (C&D) landfill. This includes transport and landfill machinery.

2.5 Data Sources

This study relied on a combination of primary data supplied by Atlas molded products and secondary data obtained from Ecoinvent V3.8 (2021) datasets. An EPS resin study served as the primary raw material data input for the insulation manufacturing. Where available, the Ecoinvet datasets relied upon were for the United states or the Rest of the world (ROW). If unavailable, Global or European Ecoinvent datasets were used.

2.6 Data Quality

To ensure the quality of data were sufficient, data quality checks were completed on the following data quality criteria: reliability of the source, completeness, temporal correlation, geographical correlation and technological correlation through the use of data quality indicators (DQIs).

2.7 Period under Review

Data are representative of manufacturing during 2021

2.8 Allocation

In terms of the specific data, some sites have used the mass allocation to calculate the energy and emission related flows which is according to the basic rules from ISO 14044.

In terms of generic data, the main database used, Ecoinvent v3.8 (cut-off), defaults to an economic allocation for most processes. However, in some cases a mass-based allocation is used, where there is a direct physical relationship. The allocation approach of specific Ecoinvent modules is documented on their website and method reports (see www.Ecoinvent.org).

In the case of end-of-life allocation of generic data, the Ecoinvent v3.8 with a cut-off by classification end-of- life allocation method was used. In this approach, environmental burdens and benefits of recycled/reused materials are given to the product system consuming them, rather than the system providing them, and are quantified based on recycling content of the material under investigation.

3. Life Cycle Assessment Scenarios

Table 6. Transport to the building site (A4)

NAME	VALUE	UNIT
Fuel type	Diesel	
Liters of fuel	2.55 E-03	l/100km
Vehicle type	Truck-trailer	
Transport distance	248	km
Capacity utilization (including empty runs, mass based	50	%
Gross density of products transported	14.4	kg/m^3
Capacity utilization volume factor (factor: =1 or <1 or ;? 1 for compressed or nested packaging products)	1	-

Table 7. Installation into the building (AS)

NAME	VALUE	UNIT
Waste materials at the construction site before waste processing, generated by product installation	4.58E-03	kg
Direct emissions to ambient air, soil and water	4.17E-03	kg

Table 8. Reference Service Life

NAME	VALUE	UNIT
RSL	75	years
Declared R-value at 75 years due to aging	1	1 $m^2°K/W$

Table 9. End of life (CI-C4)

NAME		VALUE	UNIT
Collection process (specified by type)	Collected separately	-	kg
	Collected with mixed construction waste	0.578	kg
Disposal, landfill	Product or material for final deposition	0.578	kg

4. Life Cycle Assessment Results

Table 10. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE 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 from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational	Building Operational Water	Deconstruction	Transport	Waste	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND*

*MND: MODULE NOT DECLARED

Table 11. Impact Category Abbreviations

IMPACT CATEGORY	ABBREVIATION
GLOBAL WARMING POTENTIAL	GWP 100
OZONE DEPLETION POTENTIAL	ODP
ACIDIFICATION POTENTIAL	AP
EUTROPHICATION POTENTIAL	EP
PHOTOCHEMICAL OXIDANT CREATION POTENTIAL	POCP
ABIOTIC RESOURCE DEPLETION POTENTIAL OF NONRENEWABLE (FOSSIL) ENERGY RESOURCES	ADPFOSSIL

4.1 Life Cycle Impact Assessment Results

Table 12. North American Impact Assessment Results

TRACI v2.1	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP 100 [kg CO_2 eq]	2.63E+00	2.42E-02	2.34E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.33E-02	0.00	2.99E-03
ODP [kg CFC-11 eq]	2.21E-07	5.55E-09	1.73E-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69E-08	0.00	1.30E-09
AP [kg SO_2 eq]	8.31E-03	6.08E-05	7.62E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.22E-04	0.00	2.54E-05
EP [kg N eq]	4.04E-03	2.32E-05	4.92E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.36E-05	0.00	4.96E-06
POCP [kg O_3 eq]	1.17E-01	9.02E-04	5.49E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20E-02	0.00	6.29E-04
ADP_{fossil} [MJ, LHV]	5.99E+01	3.56E-01	8.54E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00E+00	0.00	2.99E-03

Table 13. EU Impact Assessment Results

CML v4.2	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	2.59E+00	2.41E-02	2.32E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.32E-02	0.00	2.98E-03
ODP [kg CFC-11 eq]	1.78E-07	4.17E-09	1.35E-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27E-08	0.00	9.74E-10
AP [kg SO2 eq]	8.36E-03	5.89E-05	5.97E-07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.41E-04	0.00	2.16E-05
EP [kg PO4-3 eq]	2.13E-03	1.28E-05	1.82E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.30E-05	0.00	4.63E-06
POCP [kg ethene eq]	5.64E-03	2.92E-06	1.65E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13E-05	0.00	9.06E-07
ADPelement [kg Sb-eq]	8.82E-06	8.47E-08	2.79E-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.44E-08	0.00	6.95E-09
ADPfossil [MJ, LHV]	5.99E+01	3.56E-01	1.29E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00E+00	0.00	8.42E-02

4.2 Life Cycle Inventory Results

Table 14. Life Cycle Inventory Abbreviations

PARAMETER	ABBREVIATION
RENEWABLE PRIMARY ENERGY USED AS ENERGY CARRIER (EXCLUDING RAW MATERIALS)	RPRE
RENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS	RPRM
TOTAL USE OF RENEWABLE PRIMARY ENERGY RESOURCES	RPR T
NONRENEWABLE PRIMARY ENERGY USED AS ENERGY CARRIER (EXCLUDING RAW MATERIALS)	NRPRE
NONRENEWABLE PRIMARY ENERGY RESOURCES USED AS RAW MATERIALS	NRPRM
TOTAL USE OF NONRENEWABLE PRIMARY ENERGY RESOURCES	NRPRT
USE OF SECONDARY MATERIAL	SM
USE OF RENEWABLE SECONDARY FUELS	RSF
USE OF NONRENEWABLE SECONDARY FUELS	NRSF
RECOVERED ENERGY	RE
USE OF NET FRESHWATER RESOURCES	FW

Table 15. Resource Use

PARAMETER	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
RPRE [MJ, LHV]	8.18E-01	4.20E-03	3.39E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92E-03	0.00	7.25E-04
RPRM [MJ, LHV]	0.00	0.00	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RPRT [MJ, LHV]	8.18E-01	4.20E-03	3.39E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92E-03	0.00	7.25E-04
$NRPR_E$ [MJ, LHV]	6.72E+01	3.83E-01	1.42E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.07E+00	0.00	9.03E-02
$NRPR_M$ [MJ, LHV]	0.00	0.00	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$NRPR_T$ [MJ, LHV]	6.72E+01	3.83E-01	1.42E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.07E+00	0.00	9.03E-02
SM [kg]	0.00	0.00	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF [MJ, LHV]	0.00	0.00	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF [MJ, LHV]	0.00	0.00	0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RE [MJ,LHV]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW [m3]	2.43E-02	4.17E-05	3.39E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.74E-05	0.00	9.11E-05

Table 16. Waste Abbreviations

WASTE	
HAZARDOUS WASTE, DISPOSED	HWD
NONHAZARDOUS WASTE, DISPOSED	NHWD
HIGH-LEVEL RADIOACTIVE WASTE, CONDITIONED, TO FINAL REPOSITORY	HLRW
INTERMEDIATE-AND LOW-LEVEL RADIOACTIVE WASTE, CONDITIONED, TO FINAL REPOSITORY	ILLIRW
COMPONENT FOR REUSE	CRU
MATERIALS FOR RECYCLING	MR
MATERIALS FOR ENERGY RECOVERY	MER
RECOVERED ENERGY EXPORTED FROM THE PRODUCT SYSTEM	EE

Table 17. Output Flows and Wastes

PARAMETER	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD [kg]	4.95E-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NHWD [kg]	6.68E-08	0.00	1.41E-06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.27E-07
HLRW [Kg]*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ILLIRW [Kg]*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRU [kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR [kg]	9.84E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER [kg]	0.00	0.00	8.24E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE [MJ, LHV]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

*Note- This inventory metric on the background data is unavailable; therefore, zero values have been reported.

Table 18. Carbon Emission & Removals

PARAMETER	ABBREVIATION
BIOGENIC CARBON REMOVAL FROM PRODUCT	BCRP
BIOGENIC CARBON EMISSION FROM PRODUCT	BCEP
BIOGENIC CARBON REMOVAL FROM PACKAGING	BCRK
BIOGENIC CARBON EMISSION FROM PACKAGING	BCEK
BIOGENIC CARBON EMISSION FROM COMBUSTION OF WASTE FROM RENEWABLE SOURCES USED IN PRODUCTION PROCESSES	BCEW
CALCINATION CARBON EMISSIONS	CCE
CARBONATION CARBON REMOVALS	CCR
CARBON EMISSIONS FROM COMBUSTION OF WASTE FROM NONRENEWABLE SOURCES USED IN PRODUCTION PROCESSES	CWNR

Table 19. Carbon Emissions & Removals

PARAMETER	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEP [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCRK [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEK [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCEW [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCE [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CCR [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CWNR [Kg CO_2]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

*Note- This inventory metric on the background data is unavailable; therefore, zero values have been reported.

5. LCA Interpretation

Atlas Molded Products' LCA is used for this EPD with LCI data contributed by its manufacturing plants. Further, the raw material inputs for the LCA were based on primary LCA data for EPS resin manufacturing. EPS resin accounts for the majority of raw materials.

From the TRACIV 2.1 results raw material (A1) represent the largest contributor to environmental impact and resources, ranging from about 55% to 84% of the total impacts. Insulation manufacturing is generally the second largest contributor at 7% to 27% of the total.

The EPD is based on a functional unit of 1 m² of Type I EPS insulation with a thickness that gives an average thermall resistance of RSI = 1 m² K/W and with a building service life of 75 years. For this functional unit, the EPS insulation thickness would be 0.0401 m (4.01 cm) with a mass of 0.578 kg. However, this functional unit does not represent all EPS insulation Types that might be used. Therefore, EPS Type factors have been calculated for use with the Type I results to calculate results for other Types based on their densities and R-values.

Table 20. ASTM C578 Properties

Property	Units	Test Method	ASTM C578						
			XI	I	VIII	II	IX	XIV	XV
Thermal Resistance	F•ft2•h/Btu, min	ASTM C518	3.1	3.6	3.8	4.0	4.2	4.2	4.3
	K•m2/W		0.55	0.63	0.67	0.70	0.74	0.74	0.76
Compressive Resistance	psi, min	ASTM D1621 ASTM C165	5	10	13	15	25	40	60
	kPa		35	69	90	104	173	276	414
Water Vapor Permeance	perm, max	ASTM E96	5.0	5.0	3.5	3.5	2.5	2.5	2.5
	ng/Pa•s•m2		287	287	201	201	143	143	143
Water Absorption	vol%, max	ASTM C272	4.0	4.0	3.0	3.0	2.0	2.0	2.0
Flexural Strength	psi, min	ASTM C203	10	25	30	35	50	60	75
	kPa		70	173	208	240	345	414	517
Dimensional Stability	% change, max	ASTM D2126	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Density	lb/ft3, min	ASTM C303 ASTM D1622	0.70	0.90	1.15	1.35	1.80	2.40	3.00
	kg/m3		12	15	18	22	29	38	48

Table 21. CAN/ULC S701 PROPERTIES

Property	Units	Test Method	CAN/ULC-S701		
			1	2	3
Thermal Resistance (RSI per 25 mm/R-value per inch)	F•ft2•h/BTU	ASTM C518	3.75	4.04	4.27
	K•m2/W, min		0.65	0.70	0.74
Compressive Strength (at 10% deformation or yield)	psi	ASTM D1621 ASTM C165	10	16	20
	kPa, min		70	110	140
Water Vapor Permeance (per 25 mm)	perm	ASTM E96	5.2	3.5	2.3
	ng/Pa•s•m2, max		300	200	130
Water Absorption (by immersion)	vol%, max	ASTM D2842	6.0	4.0	2.0
Flexural Strength	psi	ASTM C203	25	35	44
	kPa, min		170	240	300
Dimensional Stability	% change, max	ASTM D2126	1.5	1.5	1.5

The available Types of EPS insulation and relevant physical properties according to ASTM C578 and for Canadian Types per CAN/ULC S701.1 were used to determine a Product Type Factor.

Table 22. Product Type Factors

Product Type	XI	I	VIII	II	IX	XIV	XV	1	2	3
Product Type Factor	0.90	1.00	1.21	1.35	1.71	2.29	2.79	0.96	1.34	1.69

Product Type Factors were used to calculate the impacts of additional EPS Types.

Table 23. ThermalStar ASTM C578 Types Impacts

Method	Impact	ASTM C578						
		Type XI	Type I	Type VIII	Type II	Type IX	Type XIV	Type XV
North America Results	GWP 100 [kg CO_2 eq]	2.46E+00	2.73E+00	3.30E+00	3.68E+00	4.66E+00	6.25E+00	7.61E+00
	ODP [kg CFC-11 eq]	2.20E-07	2.44E-07	2.95E-07	3.29E-07	4.17E-07	5.59E-07	6.81E-07
	AP [kg SO_2 eq]	8.00E-03	9.00E-03	1.10E-02	1.20E-02	1.50E-02	2.00E-02	2.50E-02
	EP [kg N eq]	4.00E-03	4.00E-03	5.00E-03	6.00E-03	7.00E-03	1.00E-02	1.20E-02
	POCP [kg O_3 eq]	1.22E-01	1.36E-01	1.64E-01	1.84E-01	2.32E-01	3.11E-01	3.79E-01
	ADP_{fossil} [MJ, LHV]	5.52E+01	6.14E+01	7.42E+01	8.28E+01	1.05E+02	1.41E+02	1.71E+02
CML	GWP 100 [kg CO2 eq]	2.43E+00	2.70E+00	3.26E+00	3.64E+00	4.61E+00	6.18E+00	7.52E+00
	ODP [kg CFC-11 eq]	1.77E-07	1.97E-07	2.38E-07	2.65E-07	3.36E-07	4.50E-07	5.48E-07
	AP [kg SO2 eq]	8.00E-03	9.00E-03	1.10E-02	1.20E-02	1.50E-02	2.00E-02	2.40E-02
	EP [kg PO4-3 eq]	2.00E-03	2.00E-03	3.00E-03	3.00E-03	4.00E-03	5.00E-03	6.00E-03
	POCP [kg ethene eq]	7.00E-03	7.00E-03	9.00E-03	1.00E-02	1.20E-02	1.70E-02	2.00E-02
	ADPelement [kg Sb-eq]	8.08E-06	8.98E-06	1.09E-05	1.21E-05	1.54E-05	2.06E-05	2.50E-05
	ADPfossil [MJ, LHV]	5.52E+01	6.14E+01	7.42E+01	8.28E+01	1.05E+02	1.41E+02	1.71E+02
Resources	RPRT [MJ, LHV]	7.45E-01	8.28E-01	1.00E+00	1.12E+00	1.42E+00	1.90E+00	2.31E+00
	$NRPR_T$ [MJ, LHV]	6.18E+01	6.87E+01	8.31E+01	9.28E+01	1.18E+02	1.57E+02	1.92E+02
	FW [m3]	2.20E-02	2.45E-02	2.96E-02	3.31E-02	4.19E-02	5.61E-02	6.83E-02

Table 24. ThermalStar CAN/ULC S701.1 Type Impacts

Method	Impact	CAN/ULC S701.1		
		Type 1	Type 2	Type 3
North America Results	GWP 100 [kg CO2 eq]	2.62E+00	3.66E+00	4.61E+00
	ODP [kg CFC-11 eq]	2.34E-07	3.27E-07	4.12E-07
	AP [kg SO2 eq]	8.00E-03	1.20E-02	1.50E-02
	EP [kg N eq]	4.00E-03	6.00E-03	7.00E-03
	POCP [kg O3 eq]	1.30E-01	1.82E-01	2.30E-01
	ADPfossil [MJ, LHV]	5.89E+01	8.22E+01	1.04E+02
CML	GWP 100 [kg CO2 eq]	2.59E+00	3.61E+00	4.56E+00
	ODP [kg CFC-11 eq]	1.89E-07	2.63E-07	3.32E-07
	AP [kg SO2 eq]	8.00E-03	1.20E-02	1.50E-02
	EP [kg PO4-3 eq]	2.00E-03	3.00E-03	4.00E-03
	POCP [kg ethene eq]	7.00E-03	1.00E-02	1.20E-02
	ADPelement [kg Sb-eq]	8.62E-06	1.20E-05	1.52E-05
	ADPfossil [MJ, LHV]	5.89E+01	8.22E+01	1.04E+02
Resources	RPRT [MJ, LHV]	7.94E-01	1.11E+00	1.40E+00
	NRPRT [MJ, LHV]	6.60E+01	9.21E+01	1.16E+02
	FW [m3]	2.35E-02	3.28E-02	4.14E-02

6. Additional Environmental Information

6.1 Environment and Health During Manufacturing

The ThermalStar blowing agents have zero ozone-depleting potential and low global warming potential.

6.2 Environment and Health During Installation

No special handling or protection is needed when installing precut ThermalStar insulation boards.

6.3 Environmental Activities and Certifications

UL GREENGUARD Certification helps demonstrate compliance with chemical emission standards and our commitment to healthier indoor environments. ThermalStar has been recognized by UL for compliance with UL's GREENGUARD indoor air quality emission standards.

6.4 Further Information

Please visit www.atlasmoldedproducts.com for additional information on ThermalStar insulation.

7. References

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