Declaration Owner
Owens Corning
One Owens Corning Parkway, Toledo, OH, USA
1-800-GET-PINK (1-800-438-7465)
www.owenscorning.com

Products
Loosefill Insulation

Functional Unit
1 m² of insulation with a thickness required for an average thermal resistance RSI = 1 m²K/W maintained for 75 years

EPD Number and Period of Validity
SCS-EPD-09349
EPD Valid September 1, 2023 through August 31, 2028

Product Category Rule
PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4.0. Mar. 2022

PCR Guidance for Building-Related Products and Services Part B: Building Envelope Thermal Insulation EPD Requirements. Version 3.0. April 2023

Program Operator
SCS Global Services
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Declaration Owner:	Owens Corning
Address:	One Owens Corning Parkway, Toledo, OH, USA
Declaration Number:	SCS-EPD-09349
Declaration Validity Period:	EPD Valid September 1, 2023 through August 31, 2028
Product:	Loosefill Insulation
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Nick Haukom (Owens Corning) Katerina Softa (Owens Corning)
LCA Software:	SimaPro 9.5.0.0
LCI Database & Version Number	ecoinvent 3.9.1
LCIA Methodology & Version Number	TRACI 2.1 v1.08; CML I-A baseline v4.7; IPCC (2013, 2021)
Market(s) of Applicability	North America
EPD Type	Product-specific
EPD Scope	Cradle-to-Gate with Options
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal X external
LCA Reviewer:	Beth Cassese Beth Cassese, LCACP, SCS Global Services
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4.0. UL Environment. Mar. 2022
PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services Part B: Building Envelope Thermal Insulation EPD Requirements. Version 3.0. April 2023
Part B PCR Review conducted by:	Thomas Gloria (chair), Industrial Ecology Consultants; Christoph Koffler, thinkstep; Andre Desjarlais,Oak Ridge National Laboratory
Independent verification of the declaration and data, according to ISO 14025, ISO 21930, and the PCR	☐ internal X external
EPD Verifier:	Beth Cassese Beth Cassese, LCACP, SCS Global Services
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

1. About Owens Corning

Founded in 1938, Owens Corning is a global building and construction materials leader committed to building a sustainable future through material innovation. Our three integrated businesses – Composites, Insulation, and Roofing – provide durable, sustainable, energy-efficient solutions that leverage our unique material science, manufacturing, and market knowledge to help our customers win and grow.

2. Product

2.1 Product Description and Application

Owens Corning's loosefill fiberglass insulation is manufactured under several trade names. AttiCat® PINK® Blown-In Insulation is marketed in the United States and Canada and is designed for application in attics of new and existing homes. PROPINK® L77 PINK® Fiberglas™ Insulation is marketed in the United States and is an alternative to roll or batt insulation in attics, ceilings, walls, and floors for new construction or retrofit applications. PROPINK® Fiberglas® Blown Loosefill Insulation is marketed in Canada and serves as an alternative to thermal batt insulation in attics, ceilings, and floors for new construction or retrofit applications. ProCat® Insulation products are marketed in the United States and are intended for use in both "open" applications, such as the floor of vented attics, and in "closed cavity" applications, such as walls and floors between stories of a house. It can be used in both existing and new construction.

The following product names reflect differences in final product density and application. All loosefill insulation products included in this study are made using consistent raw material inputs and manufacturing processes, making it appropriate to group them within a single EPD.

Loosefill Fiberglass Insulation Products	AttiCat® PINK® Blown-In Insulation
	PROPINK® L77 PINK® Fiberglas™ Insulation
	PROPINK® Fiberglas® Blown Loosefill Insulation
	ProCat® Insulation

These products are covered by Construction Specification Institute (CSI) Masterformat code 07 21 23 Loose-Fill Insulation.

2.2 Methodological Framework

This declaration is a product-specific EPD and is cradle-to-installation with end-of-life. The underlying LCA upon which this EPD is based included the following life cycle modules: *Raw Material supply* (A1); *Inbound Transportation* (A2); *Manufacturing* (A3); *Distribution* (A4); *Installation* (A5); *End-of-life, Transport* (C2); and *End-of-life, Disposal* (C4). No known flows have been deliberately excluded. The product is expected to perform as claimed for the 75-year reference service life (RSL) if it remains clean and dry in its installed state.

2.3 Technical Data

Standards, Code Compliance

- AttiCat® PINK® Blown-in Insulation
    - Noncorrosive per ASTM C764, section 12.7
    - Does not absorb moisture per ASTM C1104
    - Does not support mold growth per ASTM C1338
    - Noncombustible by the model building codes per ASTM E136
    - Manufactured in accordance with ASTM C764 Type I (pneumatic application)
    - R-values are determined in accordance with ASTM C687
    - The surface burning characteristics have been determined in accordance with:
    - Flame spread <0 per ASTM E 84
    - Smoke developed <0 per ASTM E 84
    - Conforms to the quality standards of the State of California
- PROPINK® L77 PINK® Fiberglas™ Insulation
    - Manufactured in accordance with ASTM C764 Type I (pneumatic application)
    - R-values are determined in accordance with ASTM C687
    - Noncombustible by the model building codes per ASTM E136
    - Noncorrosive per ASTM C764, section 12.7
    - Does not absorb moisture per ASTM C1104
    - Does not support mold growth per ASTM C1338
    - The surface burning characteristics have been determined in accordance with:
    - Flame spread = 0 per ULC S 102.2 and ASTM E84
    - Smoke developed = 0 per ULC S 102.2 and ASTM E84
    - Conforms to the quality standards of the State of California
    - Meets requirements of Minnesota Insulation Standards Program
- PROPINK® Fiberglas® Blown Loosefill Insulation
    - CCMC Evaluation Report No. 12851-L
    - Type 5 as defined by CAN/ULC-S702
    - Refer to product application chart to achieve listed thermal resistance values per CAN/ULC-S702.1-14-AMD1
    - Noncombustible per CAN/ULC-S114
    - Smoulder Resistance Mean Mass Loss ≤ 0.02% per CAN/ULC-S129
    - Flame Spread = 0 per CAN/ULC-S102.2
    - Smoke Developed = 10 per CAN/ULC-S102.2
    - Resistant to Fungi per ASTM C1338
    - Noncorrosive to Steel, Aluminum, Copper per ASTM C665
- ProCat® Insulation
    - Manufactured in accordance with ASTM C674
    - Meets requirements of the State of Minnesota Standards for Insulation Materials and Installation

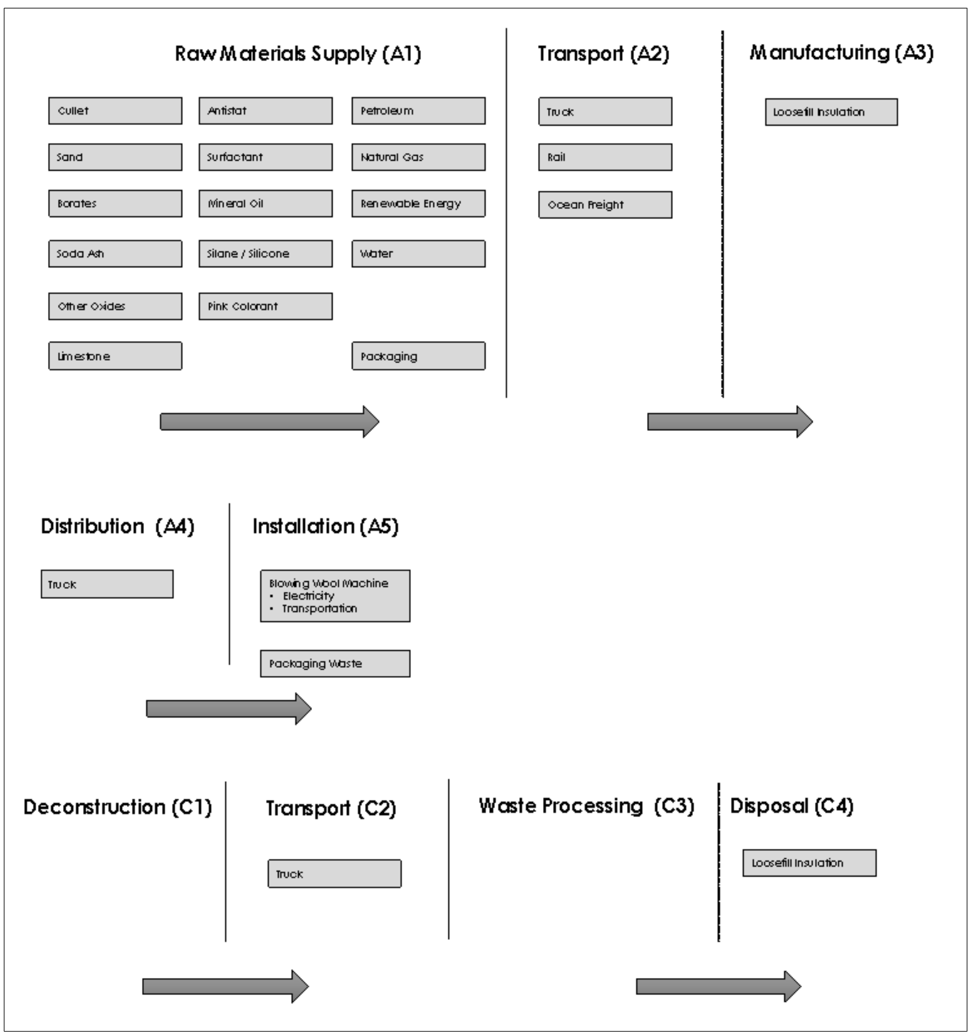
2.4 Properties of Declared Product as Delivered

Loosefill insulation does not have a predetermined thermal resistance. Rather, a desired R-value is achieved by filling a cavity until the insulation material in that space has been installed to a specific density. The thermal resistance loosefill insulation provides is specific to the application. The table below provides thickness and R-value ranges for the different loosefill insulation products and applications. More detailed information can be found at www.owenscorning.com.

Table 1. *Loosefill insulation Product Properties as Delivered*

Product	Application	Thickness Range	R-Value Range
AttiCat® PINK® Blown-in Insulation	Open Cavity (attic)	5" – 20.5" (0.127 m – 0.521 m)	13 – 60
PROPINK® L77 PINK® Fiberglas™	Open Cavity (attic)	4.75" – 20" (0.121 m – 0.508 m)	13 – 60
	Closed Cavity (walls, floors, cathedral ceiling)	3.5" – 11.25" (0.089 m – 0.286 m)	14 – 49
PROPINK® Fiberglas®	Open Cavity (attic)	4.5" – 28.5" (0.114 m – 0.724 m)	12 – 80
ProCat®	Open Cavity (attic)	4.75" – 19.75" (0.121 m – 0.502 m)	13 – 60
	Closed Cavity (walls)	3.5" – 5.5" (0.089 m – 0.140 m)	14 – 24

2.5 Flow Diagram



2.6 Material Composition

The loosefill insulation product covered by this EPD consist of two major components, fiberglass (nominally ≥ 98%) and add-on chemicals. The fiberglass is made from various inorganic materials, which are referred to as batch minerals. The use of glass cullet in the batch results in an average recycled content of 55% in loosefill insulation final products manufactured in the US. Finished loosefill products manufactured in Canada have an average total recycled content of 73%. The add-on chemicals are an oil-based product and function to help control dust when the insulation is installed.

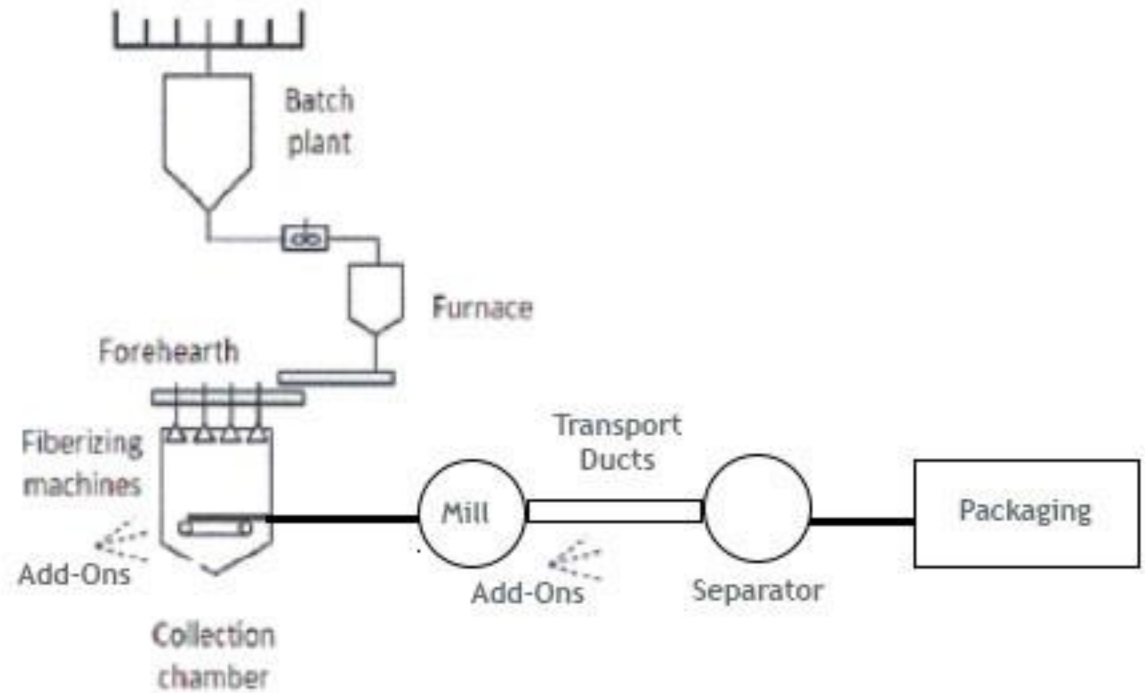
Table 2. *Batch and Add-on Composition*

Component	Composition % (by Mass)
Batch	
Cullet	25-75%
Borates/Ulexite	10-30%
Sand	8-25%
Soda Ash	0-10%
Lime	0-5%
Other Oxides	1-2%
Add-on	
De-dusting Mineral Oil	< 2%
Silanes	< 2%
Antistat	< 2%
Surfactant	< 2%
Pink Colorant	< 2%

2.7 Manufacture

Owens Corning North American Insulation manufacturing locations can be found across the United States and Canada. Product covered by this Environmental Product Declaration was produced in the following locations:

Edmonton Plant Edmonton, Alberta, Canada
Kansas City Plant Kansas City, Kansas, USA
Lakeland Plant Lakeland, Florida, USA
Mount Vernon Plant Mount Vernon, Ohio, USA
Toronto Plant Toronto, Ontario, Canada



The diagram above represents the manufacturing process for loosefill insulation product. All varieties of product described are not produced at all locations listed above, but there are no significant process differences between locations.

2.8 Packaging

Loosefill insulation is packaged in polyethylene (LDPE) bags. Some individual packages are wrapped in a polyethylene (LDPE) film sheet for shipment to a distributor or box store.

Table 3. *Weighted Average Packaging for 1 m^2 of Loosefill Insulation, per Functional Unit*

Packaging Material
Bonded Bags (LDPE)
Film Stretch Wrap (LDPE)

Per the PCR regional packaging scenarios, the following dispositions are assumed:

Table 4. *Waste Treatment of Packaging*

Country/Region	Material Type	Recycling Rate	Landfill Rate	Incineration Rate
Canada	Plastics	78%	22%	0%
	Other	20%	80%	0%
United States	Plastics	15%	68%	17%
	Pulp (cardboard, paper)	75%	20%	5%

2.9 Transportation

The outbound transportation or distribution includes the transportation of the finished product to customers primarily by diesel semi-truck. The weighted average outbound transportation distance from the specified location to the building site is 554 km.

2.10 Product Installation

To increase R-value in a ceiling of an existing structure, simply apply additional loosefill fiberglass insulation on top of the existing layers of insulation. For installation in an existing structure where there is no insulation, fill the ceiling joist cavities to the thickness of the desired R-value. The manufacturer's coverage chart includes information on thickness and number of bags required to achieve the desired R-value. Failure by the installer to provide the specific bag count will result in a lower installed insulation R-value.

An insulation blowing wool machine, either a commercial-grade machine or a DIY AttiCat® machine should be used to install the product.

For existing structures that have no insulation in the wall or cathedral ceiling cavities, a hole is drilled into the surface and the blowing machine hose is inserted into the hole for filling the cavity. In most wall applications, filling the cavity from the exterior is preferred.

For new building installations, the process requires a non-woven fabric to be installed on the open side of the wall or cathedral ceiling. This non-woven fabric contains the loosefill blown-in fiberglass insulation until the finished surface is appllied to the framing members – studs or rafters.

For standard ceiling installations on new structures, the application method would be as depicted above for the retrofit of an existing building.

The total amount of energy needed for installation of product was accounted for within the underlying LCA study.

2.11 Use

Insulation is a passive device that requires no extra utilities or maintenance to operate over its useful life.

2.12 Reference Service Life and Estimated Building Service Life

As prescribed in the applicable PCR, the Reference Service Life (RSL) of the insulation product is 75 years, which aligns with an assumed building Estimated Service Life (ESL) of 75 years, for the purposes of this study.

2.13 Re-use Phase

Loosefill insulation can be reused if it remains clean and dry. Recycling programs do not currently exist for fiberglass insulation.

2.14 Disposal

It was assumed that all materials removed from the decommissioning of a building were taken to a local construction waste landfill, using 100 miles (or 161 km) as the average distance to landfill.

3. LCA: Calculation Rules

3.1 Functional Unit

1 m^2 of installed insulation material with a thickness that gives an average thermal resistance RSI = 1 m^2K/W and with a building service life of 75 years, including packaging.

Product Average

The results of this declaration represent an average performance for the listed products. Reported area weights for included products and production locations were taken from quality control data to create a weighted average which was used to determine the functional unit mass for the LCA.

Table 5. *Functional unit and reference flows*

Functional Unit	Thickness to Achieve FU (m)	Reference flow (kg/m^2)
1 m² of insulation with a thickness required for an average thermal resistance RSI = 1 m²K/W	4.40E-02	5.67E-01

3.2 System Boundary

This declaration is a product-specific EPD and is cradle-to-installation with end-of-life. Details of the system boundaries may be found in the diagrams below.

Table 6. *System boundary*

Product			Construction Process		Use							End-of-life				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 extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	MND

x = Included in system boundary | MND = Module not declared

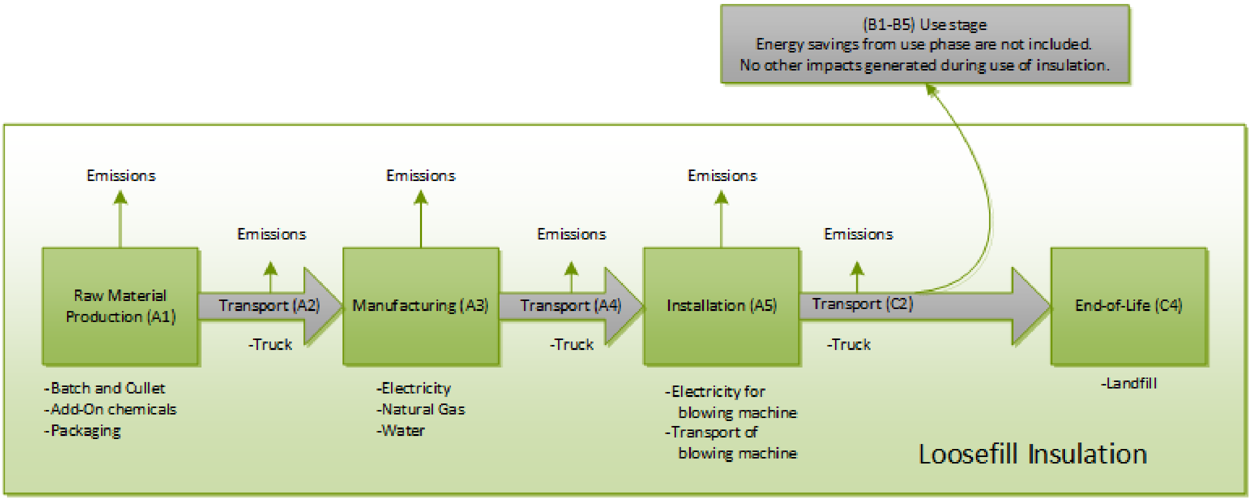


Figure 3. *Flow diagram/System Boundary for Loosefill Insulation*

3.3 Estimates and Assumptions

Since insulation is a passive device, it is assumed that no utility source or maintenance is needed during the use stage.

3.4 Cut-off criteria

The underlying LCA study is in compliance with the cutoff criteria specified in the PCR. Due to the long lifetime of equipment, capital goods and infrastructure flows were excluded as having a negligible impact on the conclusions of the LCA.

3.5 Background Data

Primary manufacturing data were collected from the included manufacturing locations listed in the Manufacturing section. Secondary data reference the ecoinvent 3.9.1 database.

Table 7. *Data Sources*

Component		Dataset	Database Source(s)
Product Materials			
Cullet	Batch	Glass cullet, sorted {RoW}| treatment of waste glass from unsorted public collection, sorting | Cut-off, U	Ecoinvent 3.9.1
Borates/Ulexite	Batch	Borax, anhydrous, powder {RoW}| borax production, anhydrous, powder | Cut-off, U	Ecoinvent 3.9.1
Sand	Batch	Silica sand {RoW}| silica sand production | Cut-off, U	Ecoinvent 3.9.1
Soda Ash	Batch	Soda ash, dense {GLO}| modified Solvay process, Hou's process | Cut-off, U	Ecoinvent 3.9.1
Lime	Batch	Dolomite {RoW}| dolomite production | Cut-off, U	Ecoinvent 3.9.1
	Batch	Limestone, crushed, for mill {RoW}| limestone production, crushed, for mill | Cut-off, U	Ecoinvent 3.9.1
Other Oxides	Batch	Manganese dioxide {GLO}| manganese dioxide production | Cut-off, U	Ecoinvent 3.9.1
De-dusting Mineral Oil	Add-on	Lubricating oil {RoW}| lubricating oil production | Cut-off, U	Ecoinvent 3.9.1
Silanes	Add-on	Silicon tetrahydride {GLO}| silicon hydrochloration | Cut-off, U	Ecoinvent 3.9.1
		Tap water {RoW}| market for tap water | Cut-off, U	Ecoinvent 3.9.1
Antistat	Add-on	Lubricating oil {RoW}| lubricating oil production | Cut-off, U	Ecoinvent 3.9.1
Surfactant	Add-on	Ethoxylated alcohol (AE3) {RoW}| ethoxylated alcohol (AE3) production, petrochemical | Cut-off, U	Ecoinvent 3.9.1
Pink Colorant	Add-on	Tap water {RoW}| market for tap water | Cut-off, U	Ecoinvent 3.9.1
		Triethanolamine {RoW}| ethanolamine production | Cut-off, U	Ecoinvent 3.9.1
		Propylene glycol, liquid {RoW}| propylene glycol production, liquid | Cut-off, U	Ecoinvent 3.9.1
Bags	Packaging	Polyethylene, low density, granulate {RoW}| polyethylene production, low density, granulate | Cut-off, U	Ecoinvent 3.9.1
		Extrusion, plastic film {RoW}| extrusion, plastic film | Cut-off, U	Ecoinvent 3.9.1
Stretch Wrap Film	Packaging	Packaging film, low density polyethylene {RoW}| packaging film production, low density polyethylene | Cut-off, U	Ecoinvent 3.9.1
Electricity - Edmonton		Electricity, medium voltage {CA-AB}| market for electricity, medium voltage | Cut-off, U	Ecoinvent 3.9.1
Electricity – Kansas City		Electricity, medium voltage {MRO, US only}| market for electricity, medium voltage | Cut-off, U	Ecoinvent 3.9.1
Electricity – Lakeland		Electricity, medium voltage {SERC}| market for electricity, medium voltage | Cut-off, U	Ecoinvent 3.9.1
Electricity – Mt Vernon		Electricity, medium voltage {RFC}| market for electricity, medium voltage | Cut-off, U	Ecoinvent 3.9.1
Electricity - Toronto		Electricity, medium voltage {CA-ON}| market for electricity, medium voltage | Cut-off, U	Ecoinvent 3.9.1
Natural Gas – Canadian Plants (Volume)		Natural gas, high pressure {CA}| market for natural gas, high pressure | Cut-off, U	Ecoinvent 3.9.1
Natural Gas – US Plants (volume)		Natural gas, high pressure {US}| market for natural gas, high pressure | Cut-off, U	Ecoinvent 3.9.1
Water – All Plants, except Toronto		Tap water {RoW}| market for tap water | Cut-off, U	Ecoinvent 3.9.1
Water – Toronto		Tap water {CA-QC}| market for tap water | Cut-off, U	Ecoinvent 3.9.1
Oxygen		Oxygen, liquid {RoW}| market for oxygen, liquid | Cut-off, U	Ecoinvent 3.9.1
Rail		Transport, freight train {US}| transport, freight train, diesel | Cut-off, U	Ecoinvent 3.9.1
Truck		Transport, freight, lorry >32 metric ton, EURO6 {RoW}| transport, freight, lorry >32 metric ton, EURO6 | Cut-off, U	Ecoinvent 3.9.1

3.6 Data Quality

Primary data were based on measured and calculated data from the listed North American Owens Corning plants which produced the product in calendar year 2022. It meets requirements for completeness along with temporal, geographical and technological representativeness. Background data were taken from the ecoinvent database, which is on the approved database list in the PCR.

Table 8. *Data quality assessment*

Data Quality Parameter	Data Quality Discussion
Time-related Coverage: Age of data and the minimum length of time over which data is collected	Primary data were based on Owens Corning's annual operations during calendar year 2022 (2021 for the Toronto Plant), consistent with the goal and scope of this analysis. The time coverage of secondary data used from the LCI databases is discussed in the Background Data section.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The geographical coverage for this study is the USA and Canada. As such, data were sourced from two facilities in Canada and three facilities in the USA. Facility details can be found in each product section since not all products are produced at all facilities. The geographical coverage of the secondary data used from the LCI databases is discussed in the Background Data section.
Technology Coverage: Specific technology or technology mix	Technological representativeness was based on primary manufacturing data from the five Owens Corning facilities included in the study.
Precision: Measure of the variability of the data values for each data expressed	Primary data were based on measured and calculated data from all the Owens Corning plants which manufacture products covered by this study. The facility data were collected for the reference year 2022 (2021 for Toronto), and several sources were used to compare collected values and ensure precision. The data precision is therefore deemed to be of high quality for all measured and calculated data.
Completeness: Percentage of flow that is measured or estimated	All relevant process steps within the system boundary were considered. The primary data provided for fiberglass insulation manufacturing were benchmarked with data collected for previous models which have undergone third party review.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data sets used in the underlying LCA study were selected based on the most appropriate temporal, geographical, and technological representation of the actual processes and technology. These data sets reflect average processes from multiple sources, and thus generally represent the actual technology utilized to produce the materials. Still, it is often unknown the extent to which secondary data sets deviate from the specific system being studied
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	To ensure consistency, only primary data of the same level of detail and equivalent time interval (i.e., one calendar year) were used, and allocation was conducted similarly for all data categories and life cycle stages. All background data were sourced from the ecoinvent 3.9.1 database selecting the most appropriate geography.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	The reproducibility of the study results is merited by the scope information provided in the underlying LCA report. Due to confidentiality of the data values, however, certain details were omitted from this public facing EPD, which may limit reproducibility by the public.
Sources of the Data: Description of all primary and secondary data sources	Primary data for raw material consumption, inbound transportation, annual production, energy consumption, water consumption, emissions to air, waste generation, packaging usage, distribution of finished goods, waste generation during installation, and installation practices were used in this study. Secondary data sets were selected from the ecoinvent 3.9.1 database.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Because the quality of secondary data is not as good as primary data, the use of secondary data becomes an inherent limitation of the study. Secondary data may cover a broad range of technologies, time periods, and geographical locations. Because hundreds of data sets are linked together and because it is often unknown how much the secondary data used deviate from the specific system being studied, quantifying data uncertainty for the complete system becomes very challenging. As a result, it is not possible to provide a reliable quantified assessment of overall data uncertainty for this study.

3.7 Period under review

The period of review is calendar year 2022 for all plants except Toronto. During 2022, Toronto ran an alternate technology on a line of products not covered by this EPD, but reverted in 2023, so the 2021 calendar year was selected as most representative of manufacturing conditions moving forward.

3.8 Allocation

Allocation of primary data was used in this study. In some cases, primary data collected from manufacturing sites were provided on a facility-wide basis and then allocated to the specific insulation product based on production volume (by mass). The types of production activities for the products manufactured at a given manufacturing facility are similar, so mass allocation is considered an acceptable allocation strategy.

3.9 Comparability

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled. In addition, comparability of EPDs is limited to those applying a functional unit.

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of Building Envelope Thermal Insulation products using EPD information shall be based on the product's use and impacts at the construction works level, and therefore EPDs may not be used for comparability purposes when not considering the constructions works energy use phase as instructed under this PCR. Full conformance with the PCR for Building Envelope Thermal Insulation products allows EPD comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category Part B PCR, and use equivalent scenarios with respect to construction works. However, variation and deviations are possible.

4. LCA: Scenarios and Additional Technical Information

4.1 Transport to the Building Site (A4)

Table 9. *Product distribution parameters, per functional unit, for loosefill insulation*

Name	Unit	Value
Vehicle type	-	EURO6, lorry >32 metric ton
Fuel type	-	Low-sulfur diesel
Liters of fuel	l/100km	1.29E-03
Transport distance	km	6.68E+02
Capacity utilization	%	50
Gross density of products transported	kg/m^3	1.28E+01
Capacity utilization volume factor	-	≥1

4.2 Installation into the Building (A5)

Table 10. *Installation summary, per functional unit, for loosefill insulation*

Name	Unit	Value	Comment
Ancillary materials (per m^2)	kg	0.00E+00	No additional materials needed to install
Water consumption specified by water source and fate	m^3	0.00E+00	No freshwater needed to install
Other resources	kg	0.00E+00	No additional resources needed to install
Electricity consumption	kwh	2.22E-03	
Other energy carriers	MJ	0.00E+00	No other energy carriers are needed
Product loss per functional unit	kg	0.00E+00	No loss expected
Waste materials at the construction site before waste processing, generated by product installation	kg	7.89E-03	Packaging waste
Output materials resulting from on-site waste processing	kg	0.00E+00	No on-site waste processing is expected
Mass of packaging waste specified by type	kg	7.89E-03	
Recycle (US / Canada)	kg	*1.18E-03 / 6.15E-03*	
Landfill (US / Canada)	kg	*5.37E-03 / 1.74E-03*	
Incineration (US / Canada)	kg	*1.34E-03 / 0.00E+00*	
Biogenic carbon contained in packaging	kg CO_2	0.00E+00	No biogenic carbon in packaging
Direct emissions to ambient air, soil, and water	kg	0.00E+00	No direct emissions expected during installation
VOC content	μg/m^3	None detected	

4.3 Reference Service Life

Table 11. *Reference Service Life, per functional unit, for loosefill insulation*

Name	Unit	Loosefill Fiberglass Insulation	Comment
RSL	years	75	N/A
Declared product properties (at the gate) and finishes, etc	Not applicable		Insulation properties require installation into a building
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes	Install per product coverage chart		N/A
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Will meet R-value based on installed thickness		Installer should install per manufacturer coverage chart to achieve R-value
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	Not applicable		Indoor application
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure	Product should be kept dry		N/A
Use conditions, e.g. frequency of use, mechanical exposure	Not applicable		Insulation is a passive product which is not used directly during life
Maintenance, e.g. required frequency, type and quality of replacement components	None needed		Insulation does not need maintenance during its use

4.4 End-of-Life (C1-C4)

Table 12. *End-of-Life summary, per functional unit, for loosefill insulation*

End-of-life		Unit	Unfaced Fiberglass Insulation
Assumptions for scenario development	Although reuse and recycling of fiberglass insulation at its end of life is possible, there are no formal programs for collection and transport. It is assumed that all product is sent to landfill at end of life.		
Collection process	Collected separately	kg	0.00E+00
	Collected with mixed construction waste	kg	5.67E-01
Disposition	Reuse	kg	0.00E+00
	Recycling	kg	0.00E+00
	Energy recovery	kg	0.00E+00
	Landfill	kg	5.67E-01
Removals of biogenic carbon (excluding packaging)		kg CO_2	0.00E+00

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All values in the tables below are rounded to three significant digits. The following impact indicators, specified by the PCR, are reported below:

Table 13. *Life Cycle Impact Assessment Indicators and characterization methods used*

Abbreviation	Impact Category	Unit	Characterization Method
GWP 100	Global Warming Potential, IPCC 2013	kg CO_2 eq	IPCC 2013 (AR5)
ODP	Ozone Depletion Potential	kg CFC-11 eq	TRACI 2.1
AP	Acidification Potential	kg SO2 eq	TRACI 2.1
EP	Eutrophication Potential	Kg N eq	TRACI 2.1
SFP	Smog Formation Potential	kg O3 eq	TRACI 2.1
ADP_{fossil}	Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources (ADPfossil)	MJ, LHV	CML-baseline v4.7
GWP 100a	Global Warming Potential, IPCC 2021	kg CO_2 eq	IPCC 2021 (AR6)

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development, however the EPD users shall not use additional measures for comparative purposes.

Table 14. *Additional transparency indicators used*

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary energy used as energy carrier (fuel)	[MJ, LHV]	**HWD**: Hazardous waste disposed	[kg]
RPR_M: Renewable primary resources with energy content used as material	[MJ, LHV]	**NHWD**: Non-hazardous waste disposed	[kg]
RPR_T: Total use of renewable primary resources with energy content	[MJ, LHV]	**HLRW**: High-level radioactive waste, conditioned, to final repository	[kg] or [m^3]
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	[MJ, LHV]	**ILLRW**: Intermediate- and low-level radioactive waste, conditioned, to final repository	[kg] or [m^3]
$NRPR_M$: Non-renewable primary resources with energy content used as material	[MJ, LHV]	**CRU**: Components for re-use	[kg]
$NRPR_T$: Total use of non-renewable primary resources with energy content	[MJ, LHV]	**MR**: Materials for recycling	[kg]
SM: Secondary materials	[kg]	**MER**: Materials for energy recovery	[kg]
RSF: Renewable secondary fuels	[MJ, LHV]	**EE**: Recovered energy exported from the product system	MJ, heating value ([Hi] lower heating value) per energy carrier
NRSF: Non-renewable secondary fuels	[MJ, LHV]		
RE: Recovered energy	[MJ, LHV]		
FW: Use of net fresh water resources	[m^3]		

Table 15. *Carbon Emissions and Removals*

Parameter	Unit
BCRP: Biogenic Carbon Removal from Product	[kg CO2]
BCEP: Biogenic Carbon Emission from Product	[kg CO2]
BCRK: Biogenic Carbon Removal from Packaging	[kg CO2]
BCEK: Biogenic Carbon Emission from Packaging	[kg CO2]
BCEW: Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	[kg CO2]
CCE: Calcination Carbon Emissions	[kg CO2]
CCR: Carbonation Carbon Removals	[kg CO2]
CWNR: Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	[kg CO2]

Table 16. *North American Life Cycle Impact Assessment (LCIA) results for 1 m^2 loosefill insulation at R_{SI} = 1*

Impact Category	Unit	A1 – A3	A4	A5	C2	C4
GWP 100[1]	[kg CO_2 eq]	8.72E-01	3.86E-02	1.34E-02	9.30E-03	3.46E-03
ODP	[kg CFC-11 eq]	1.27E-08	7.18E-10	1.76E-10	1.73E-10	1.07E-10
AP	[kg SO_2 eq]	2.39E-03	9.10E-05	2.44E-05	2.19E-05	2.33E-05
EP	[kg N eq]	2.62E-03	3.28E-05	8.17E-05	7.90E-06	3.97E-06
SFP	[kg O_3 eq]	3.87E-02	1.63E-03	4.25E-04	3.94E-04	6.18E-04
ADP_{fossil}	[MJ, LHV]	1.14E+01	5.73E-01	1.45E-01	1.38E-01	8.50E-02
IPCC GWP 100a (2021)[2]	[kg CO_2 eq]	8.71E-01	3.85E-02	1.34E-02	9.28E-03	3.45E-03

[1]The GWP 100 are based on 100-year time horizon GWP factors provided by the IPCC 2013 Fifth Assessment Report (AR5).
[2]100-year time horizon GWP factors as provided by the Sixth Assessment Report (AR6) shall be used for conformance with ISO 21930, Section 7.3.

Table 17. *Resource Use Indicator Results for 1 m^2 loosefill insulation at R_{SI} = 1*

Resource Use	Unit	A1 – A3	A4	A5	C2	C4
RPR_E	[MJ, LHV]	8.77E-01	7.36E-03	3.87E-03	1.77E-03	7.28E-04
RPR_M	[MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$	[MJ, LHV]	1.46E+01	5.82E-01	1.55E-01	1.40E-01	8.59E-02
$NRPR_M$	[MJ, LHV]	4.20E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM	[kg]	3.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	[MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	[MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	[MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	[m^3]	9.27E-03	9.28E-05	3.92E-05	2.24E-05	9.12E-05

Table 18. *Waste and Output Flow Indicator Results for 1 m^2 loosefill insulation at R_{SI} = 1*

Resource Use	Unit	A1 – A3	A4	A5	C2	C4
HWD	[kg]	4.21E-05	3.67E-06	8.84E-07	8.84E-07	4.55E-07
NHWD	[kg]	1.68E-01	5.06E-02	2.52E-02	1.22E-02	1.13E+00
HLRW	[kg]	3.30E-05	3.69E-08	9.18E-08	8.90E-09	3.63E-09
ILLRW	[kg]	3.11E-05	8.99E-08	9.78E-08	2.17E-08	9.06E-09
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	[kg]	1.10E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 19. *Carbon Emissions and Removals Indicator Results for 1 m2 loosefill insulation at RSI = 1*

Resource Use	Unit	A1 – A3	A4	A5	C2	C4
BCRP	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE	[kg CO_2]	1.54E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR	[kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Calculating Environmental Impact Values for "R" Values other than the Functional Unit

The functional unit for the study is in metric units of RSI = 1 m^2K/W. That is equivalent to R = 5.68 in US Customary Units, which is the value one would find stated on the label of an insulation package as sold in North America. In order to determine the impact for the desired R-value of product sold, the scaling factor of the appropriate R-value as listed in the charts below should be used to multiply the impact category value as listed for the functional unit in the Impact Assessment Results tables above.

Open Cavity Application

PROPINK® L77 PINK Fiberglas™	
R-value	Scaling Factor for 1 m^2 at listed R-value and Install Thickness
13	1.13
19	1.67
22	1.96
26	2.32
30	2.71
38	3.47
44	4.10
49	4.63
60	5.82
AttiCat® PINK® Blown-In Insulation	
13	1.05
19	1.61
22	1.89
26	2.26
30	2.62
38	3.40
44	4.01
49	4.48
60	5.63
ProCat®	
13	1.10
19	1.69
22	1.97
26	2.33
30	2.71
38	3.58
44	4.17
49	4.70
60	5.91

PROPINK® Fiberglas®	
R-value	Scaling Factor for 1 m^2 at listed R-value and Install Thickness
12	1.20
16	1.60
20	2.01
24	2.41
28	2.81
32	3.21
36	3.66
40	4.12
44	4.57
48	5.04
50	5.24
52	5.49
56	5.93
60	6.40
64	6.86
68	7.30
70	7.53
72	7.77
76	8.22
80	8.74

Closed Cavity Application

PROPINK® L77 PINK Fiberglas™ - Wall Application	
R-value	Scaling Factor for 1 m^2 at listed R-value and Install Thickness
14	2.47
15	2.85
22	3.88
23	4.48
24	5.67
PROPINK® L77 PINK Fiberglas™ - Floor Application	
30	7.08
40	10.03
48	11.59
PROPINK® L77 PINK Fiberglas™ - Cathedral Ceiling Application	
30	5.31
38	6.77
49	11.28
ProCat® Walls	
14	2.47
15	2.85
22	3.88
24	5.37

Example: Environmental Impact Values for PROPINK® L77 PINK Fiberglas™ R-13 Ceiling Application

Ceiling Application	
PROPINK® L77 PINK Fiberglas™	
R-value	Scaling Factor for 1 m^2 at listed R-value and Install Thickness
13	1.13

X

Impact Category	Unit	A1 – C4
GWP 100	[kg CO_2 eq]	9.37E-01
ODP	[kg CFC-11 eq]	1.39E-08
AP	[kg SO_2 eq]	2.55E-03
EP	[kg N eq]	2.74E-03
SFP	[kg O_3 eq]	4.17E-02
ADP_{fossil}	[MJ, LHV]	1.23E+01

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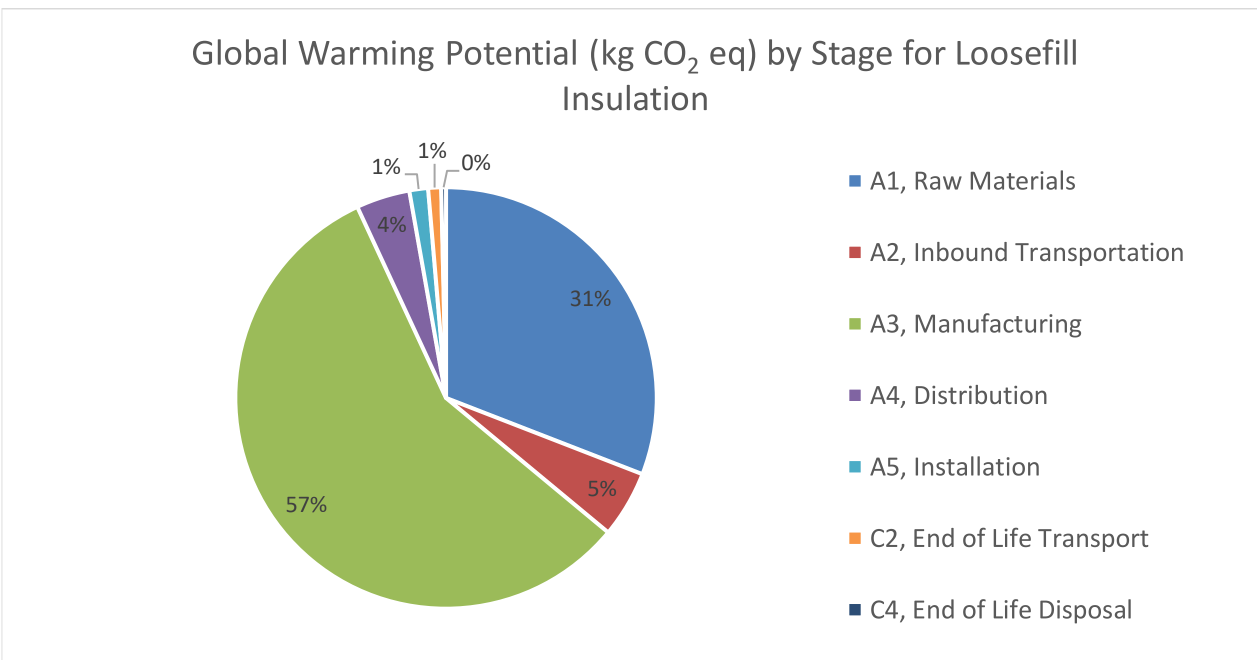
Impact Category	Unit	A1 – C4
GWP 100	[kg CO_2 eq]	1.06E+00
ODP	[kg CFC-11 eq]	1.57E-08
AP	[kg SO_2 eq]	2.88E-03
EP	[kg N eq]	3.10E-03
SFP	[kg O_3 eq]	4.71E-02
ADP_{fossil}	[MJ, LHV]	1.39E+01

6. LCA: Interpretation

The manufacturing stage drives most of the environmental impact categories, followed by the raw materials stage. Manufacturing impacts are primarily driven by energy use (electricity and natural gas) for glass melting.



6.1 Sensitivity Analysis

Comparison between the individual plant and overall average indicator result totals shows some variations. Despite these variations, it is still appropriate to group the Loosefill insulation products made at these facilities into a single network average, because the data reflect a consistent time window and there is no significant variation in methods or materials used to manufacture the products.

6.2 Assumptions and Limitations

The ability of LCA to consider the entire life cycle of products makes it an attractive tool for the assessment of potential environmental impacts. Nevertheless, similar to other environmental management analysis tools, LCA has several limitations related to data quality and unavailability of potentially relevant data. It should be kept in mind that the impact assessment results are relative expressions and do not predict impacts on category endpoints, exceeding thresholds, or risks.

The study was conducted by including the relevant system boundaries and best available data for Loosefill Insulation products, using a consistent data collection method and timeframe for each facility. In cases where data were reported for the entire facility rather than for the specific insulation materials product, mass allocation was used to allocate the facility-wide impacts to the specific product. This assumes that all products equally consume facility inputs and contribute to facility outputs.

7. Additional Environmental Information

7.1 Environment and Health during Manufacture

Depending on the plant facility, the following environmental equipment may be used to control emissions: electrostatic precipitator, scrubber, and/or fabric filter (baghouse).

7.2 Energy Savings During Use

Insulation is a passive device that requires no extra utilities to operate over its useful life. Insulation of a building is responsible for reducing the energy burden associated with heating and cooling of a building. The example below provides the net energy savings (energy saved minus life cycle energy of fiberglass), as well as the carbon dioxide equivalent savings computed using the US EPA Greenhouse Gas Equivalencies Calculator.

Example Basis:

- A two-story 2400 square foot home located in different climate zones throughout the US and Canada, insulated with Loosefill Insulation to meet the 2015 International Energy Conservation Code for US locations and Ontario Building Code A3 Package 2017 for Toronto.
    - *Note: Zone 2 OBC (Toronto), and IECC Zones 6A and 7 require an additional, continuous insulation layer. For these, the carbon and energy data for Owens Corning® FOAMULAR® NGX™ at R-5 (Zones 6A and 7) and R-7.5 (Toronto) were used in combination with the Loosefill Insulation carbon and energy data.

Table 20. *Energy and Carbon Savings for Loosefill Insulation Used in Various US and Canada Climate Zones*

	*Zone 2 OBC	Zone 1A	Zone 2A	Zone 3A	Zone 3C	Zone 4A	Zone 5B	Zone 5 A	*Zone 6A	*Zone 7
	Toronto	Miami	New Orleans	Atlanta	San Francisco	Baltimore	Seattle	Chicago	Minneapolis	Duluth
Heating and Cooling Energy Savings										
Total Life Cycle MJ for Loosefill Insulation Products Used in Home	50,206	14,114	15,215	23,930	23,930	25,609	25,609	25,609	48,064	48,064
Total Annual MJ Energy Saved for an Insulated vs. Non-insulated Home	167,754	4,220	17,936	51,698	77,019	97,065	92,845	122,386	174,084	213,121
Payback Time (months) for Heating and Cooling Energy Saved	3.6	40.1	10.2	5.6	3.7	3.2	3.3	2.5	3.3	2.7
MJ Saved over the 75 Year Use Phase of Building	12,531,336	302,402	1,329,982	3,853,401	5,752,501	7,254,276	6,937,760	9,153,377	13,008,252	15,936,032
Carbon Equivalent Savings										
Total kg CO2 eq for Loosefill Insulation Products Used in Home (Embodied Carbon)	4,264	775	835	1,314	1,314	1,406	1,406	1,406	3,500	3,500
Annual Savings kg CO2 eq from heating and cooling (Operational Carbon)	33,000	831	3,500	10,200	15,200	19,100	18,300	24,100	34,300	42,000
Payback Time (months) for CO2 eq. Saved	1.6	11.2	2.9	1.5	1.0	0.9	0.9	0.7	1.2	1.0
Annual Number of Passenger Vehicles Driven	7.3	0.2	0.8	2.3	3.4	4.3	4.1	5.4	7.6	9.3

7.3 Environment and Health during Installation

This product is considered an article. 29 CFR 1910.1200(c) definition of an article is as follows: "Article" means a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees.

Manufactured articles which meet the definition of the Canadian Hazardous Products Act (any article that is formed to a specific shape or design during manufacture, the intended use of which when in that form is dependent in whole or in part on its shape or design, and that, when being installed, if the intended use of the article requires it to be installed, and under normal conditions of use, will not release or otherwise cause an individual to be exposed to a hazardous product) are not regulated by the Canadian Hazardous Products Regulation SOR/2015-17.

The product's Safe Use Instruction Sheet includes exposure guidelines, engineering controls and individual protection measures. The following individual protection measures can be considered:

- Eye/face protection – Wear safety glasses with side shields (or goggles)
- Skin and body protection – Wear protective gloves, long-sleeved shirt and long pants
- Respiratory protection – When facing airborne/dust concentration above the exposure limits, use an appropriate certified respirator. A properly fitted NIOSH approved disposable N 95 type dust respirator or better is recommended.
- General hygiene considerations – Wash hands before breaks and immediately after handling products. Remove and wash contaminated clothing before re-use.

7.4 Extraordinary Effects

No extraordinary effects or environmental impacts are expected due to destruction of the product by fire, water, or mechanical means.

7.5 Delayed Emissions

No delayed emissions are expected from this product.

7.6 Environmental Activities and Certifications

Loosefill Insulation products have the following certifications and sustainable features:

- Loosefill insulation certified by SCS Global Services to contain an average of 55% recycled glass content, minimum 37% post-consumer and balance 18% pre-consumer
- GREENGUARD Gold: Certified products are certified to GREENGUARD standards for low chemical emissions into indoor air during product usage.
- Declare
- UL Formaldehyde Free Validated Certification
- Seal and Insulate with ENERGY STAR

Made with Renewable Electricity and Reduced Carbon Footprint

Loosefill insulation is certified by SCS Global Services for "Made with Renewable Electricity" and "Reduced Carbon Footprint". The updated environmental impacts for the products by matching the amount of electricity used in manufacturing with wind energy produced as part of Owens Corning's Power Purchase Agreement were calculated and can be found in the tables below. The values for life cycle stages A1-A3 below reflect calculations based on the 2022 plant dataset and the electricity impacts per the SimaPro implementation of the ecoinvent versions of the NERC power grids. Certificates published on the SCS Global Services website are based on calculations using updated NERC and eGrid power grid data and updated manufacturing production data per the certifcation guideline, so variation between the values is expected.

Table 21. *Changes in Environmental Impact Category Results Due to the use of Renewable Energy*

Impact category	Unit	A1-A3 with A3 Grid Electricity	A1-A3 with A3 REC Electricity	Change with REC	% Change
GWP 100	[kg CO_2 eq]	8.72E-01	5.64E-01	-3.08E-01	-35%
ODP	[kg CFC-11 eq]	1.27E-08	1.00E-08	-2.66E-09	-21%
AP	[kg SO_2 eq]	2.39E-03	1.63E-03	-7.53E-04	-32%
EP	[kg N eq]	2.62E-03	9.67E-04	-1.65E-03	-63%
SFP	[kg O_3 eq]	3.87E-02	3.05E-02	-8.21E-03	-21%
ADP_{fossil}	[MJ, LHV]	1.14E+01	7.70E+00	-3.66E+00	-32%

7.7 Further Information

Further information on the product can be found on the manufacturers' website at www.owenscorning.com.

8. References

- Life Cycle Assessment of Owens Corning Fiberglass Insulation: Unfaced and Faced Batts and Rolls and Loosefill.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework
- ISO 14044: 2006/AMD 1:2017/ AMD 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
- PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 4.0. UL Environment. Mar. 2022
- PCR Guidance for Building-Related Products and Services Part B: Building Envelope Thermal Insulation EPD Requirements. Version 3.0. April 2023.
- ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
- SCS Type III Environmental Declaration Program: Program Operator Manual. V11.0 November 2021. SCS Global Services.
- IECC-2015, International Energy Conservation Code
- Ontario Building Code A3 Package 2017 for Toronto
- ASTM C665, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
- ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- ASTM C1104/C1104M-13a, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation
- ASTM C1338, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E970, Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source
- ASTM C1304, Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials
- ASTM E96, Standard Test Method for Water Vapor Transmission of Materials
- US EPA Greenhouse Gas Equivalencies Calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator)
- SCS Global Services Guideline for Claims of “Made with Renewable Energy” or “Reduced Carbon Footprint” Based on Power Purchase Agreement, February 2018

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