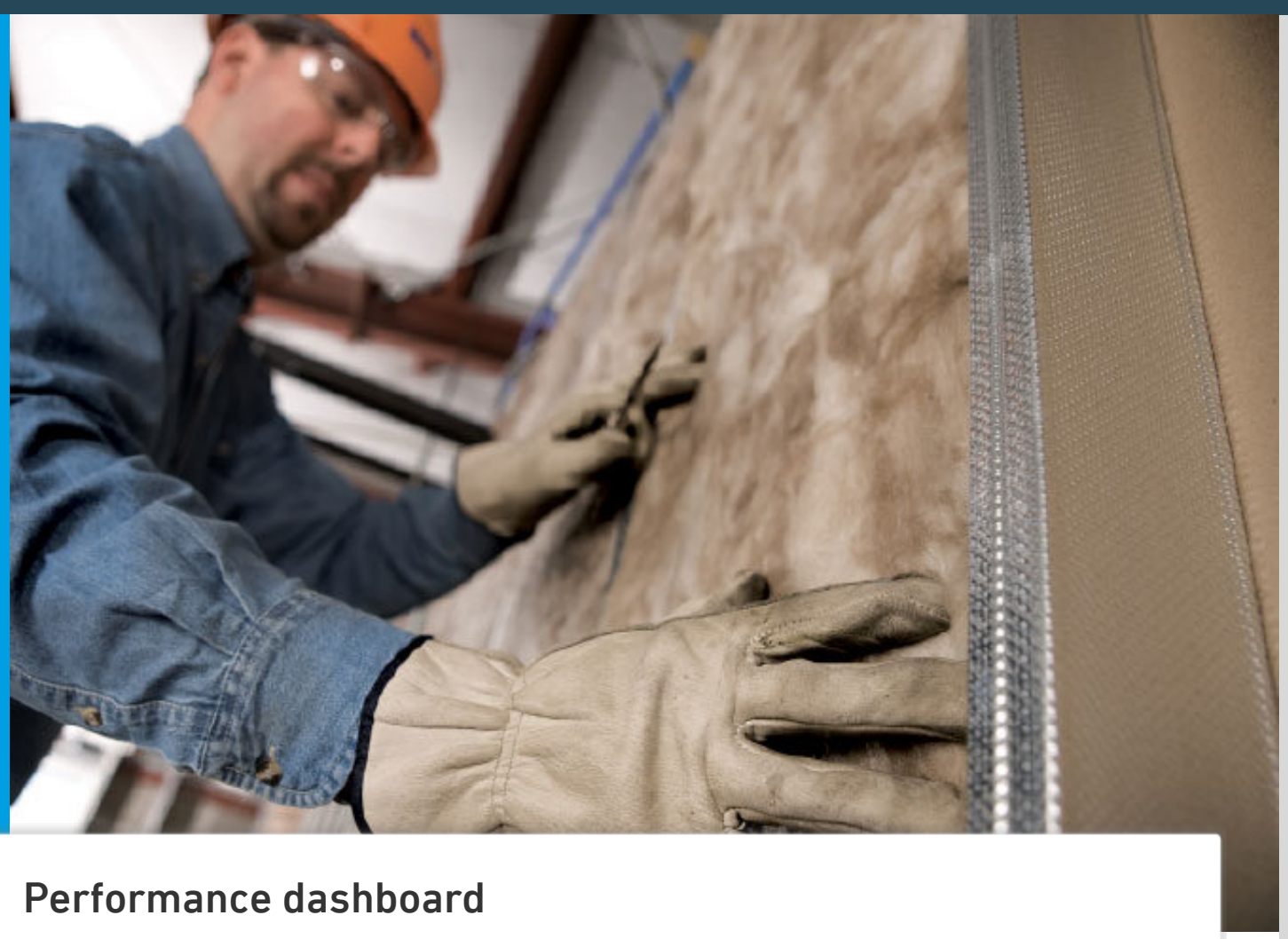
EcoBatt® batts and rolls

Unfaced, Kraft, FSK, Foil

Fiberglass insulation takes sustainability to a new level while delivering Knauf's exceptional quality, handling and durability. Leverages ECOSE® Technology— a revolutionary binder that transformed the glass wool insulation industry. It is based on rapidly renewable, bio- based material. EcoBatt® also contains sand— an abundant resource— for making glass and recycled glass.



Performance dashboard

Features & functionality

Faced products resist tears, are marked in one-foot increments, and feature extra wide stapling flange for faster and easier install

Highly resilient, recovers quickly to full thickness for snug fit and superior aesthetics

Consistent quality materials cut easily with low dust

Excellent acoustical properties reduce sound transmission

Visit Knauf for more product information

EcoBatt® Insulation unfaced, kraft-faced, foil-faced, FSK-faced

EcoRoll® Insulation unfaced, kraft-faced, foil-faced, FSK-faced

Environment & materials

Improved by:

Utilization of recycled glass

Knauf's original plant-based ECOSE® Technology binder technology

Optimized compression packaging

Certification & rating systems:

Declare, Red List Free

HPD v2.2

Energy Star

UL GREENGUARD Gold certified

UL Validated recycled content

UL Validated formaldehyde-free

Audited, European Certification Board for Mineral Wool Products exoneration process

ASTM C 665; Type 1, Class A (unfaced); ASTM C 665; Type II, Class C (kraft faced); ASTM C 665; Type III, Class A (FSK-25 foil faced); ASTM C 665; Type III, Class B (foil faced)

MasterFormat® 07 21 00
EcoBatt® Insulation Technical Data Sheet
EcoRoll® Insulation Technical Data Sheet
EcoBatt® and EcoRoll® Insulation Guide Spec
For spec help, contact us or call 317 421 8727

See LCA, interpretation & rating systems

See materials, interpretation & rating systems

SM Transparency Report (EPD)™ + Material Health Overview™

EPD	LCA
3rd-party verified	✔
	Transparency Report (EPD)
3rd-party verified	✔

Validity: 12/12/23 – 12/12/28
KNA – 12122023 – 001

MATERIAL HEALTH	Material evaluation
Self-declared	✔

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC, according to ISO 21930:2017; UL Part A; UL Part B for Building Envelope Thermal Insulation Products; and ISO 14025:2006.

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Beyond Sustainability, Striving for Harmony

SUMMARY

Reference PCR
UL Part B: Building Envelope Thermal Insulation v2.0

Regions; system boundaries
North America; Cradle-to-grave

Functional unit / ESL:
1 m^2 installed insulation material, packaging included, with thickness that gives average thermal resistance of $R_{SI} = 1m^2 \cdot K/W$ over an estimated service life (ESL) of 75 years

LCIA methodology: TRACI 2.1

LCA software; LCI database
LCA for Experts v10.7; LCA for Experts 2023

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.

Public LCA:
Knauf Insulation North America and Manson Insulation Products

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LCA results & interpretation

EcoBatt® and EcoRoll® Insulation

Albion, MI | Inwood, WV | Lanett, AL | Shasta Lake, CA | Shelbyville, IN | EPD v0.1 comment | Material health

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ◉ Cradle to grave

Application

Thermal and acoustical barriers for energy-efficient construction. They can be used in new and retrofit wood and metal frame applications in residential and commercial structures, as well as in manufactured housing. These applications include thermal and acoustical treatments to walls, ceilings, and floors.

Functional unit

One square meter of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of R_{si} = ft² K/W with a building service life of 75 years.

Reference service life: 75 years when installed per manufacturer's instructions
Reference flow:
Unfaced: 0.546 kg of product with no face option.
Kraft-faced: 0.632 kg of product with kraft facer.
Foil-faced: 0.668 kg of product with foil skrim kraft (FSK) facer.
Foil-faced: 0.644 kg of product with foil facer.

A thickness of 0.0398m achieves the functional unit. (ASTM C518)

Manufacturing data

Reporting period: January 2022 – December 2022
Location: Albion, MI

Default installation, packaging, and disposal scenarios

At the installation site, insulation products are unpackaged and installed. Staples may be used to install batts and rolls. The potential impact of the staples is assumed to be negligible since their use is spread out over hundreds of bags of product; therefore, they were not included in the model.

No material is assumed to be lost or wasted. Scraps are typically used to fill corners or crevices. Plastic packaging waste is disposed (9% to recycling, 68% to landfill, and 17% to incineration), and no maintenance or replacement is required over the life of the building. After removal, the insulation is assumed to be landfilled. Insulation and packaging waste are assumed to be transported 100 miles for disposal.

Unfaced product composition and impacts

Material composition greater than 1% by weight

PART	MATERIAL	%WT.
Batch	**Cullet**	45-50%
Batch	**Borates**	8-10%
Batch	**Soda ash**	2-5%
Batch	**Feldspar**	2-5%
Batch	**Limestone**	<1%
Batch	**Oxides**	<1%
Binder	**Water**	10-15%
Binder	**Sugars**	2-5%
Binder	**Additives**	2-5%
Packaging	**Plastic**	8-10%

Total impacts by life cycle stages (mPts/per func unit)

LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Raw material acquisition	3.28E-03
Manufacturing	7.38E-03
Transportation	2.97E-04
Installation and maintenance	1.39E-04
Disposal/reuse/recycling	3.75E-04
Total impacts (per 75 years installed)	**= 1.15E-02 mPts**

LCA results

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
	(X) A1 Raw materials **(X) A2 Transportation**	**(X) A3 Manufacturing**	**(X) A4 Distribution**	**(X) A5 Installation** **(X) B1 Use** **(X) B2 Maintenance** **(X) B3 Repair** **(X) B4 Replacement** **(X) B5 Refurbishment** **(X) B6 Operational energy use** **(X) B7 Operational water use**	**(X) C1 Deconstruction** **(X) C2 Transportation** **(X) C3 Waste processing** **(X) C4 Disposal**

Information modules: Included (X) / Excluded (MND)*

*Module D is also excluded from this system boundary (MND).

SM Single Score

Learn about SM Single Score results

Impacts per 1 square meter of insulation material		RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
	Unfaced	3.28E-03 mPts	7.38E-03 mPts	2.97E-04 mPts	1.39E-04 mPts	3.75E-04 mPts
	Kraft faced	3.51E-03 mPts	8.19E-03 mPts	3.44E-04 mPts	1.39E-04 mPts	4.40E-04 mPts
	FSK faced	3.12E-03 mPts	1.72E-02 mPts	3.64E-04 mPts	1.39E-04 mPts	4.69E-04 mPts
	Foil faced	3.29E-03 mPts	1.13E-02 mPts	3.50E-04 mPts	1.39E-04 mPts	4.50E-04 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage		Batch material and binder material production.	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to landfill and landfilling of packaging materials.	Transportation to landfill and landfilling of product at end of life.

TRACI v2.1 results per functional unit (unfaced EcoBatt® and EcoRoll® Insulation - Albion, MI)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	1.23E-01	8.74E-01	1.60E-02	2.70E-02	1.82E-02
Ozone depletion / kg CFC-11 eq	2.75E-11	9.23E-14	3.58E-17	2.73E-16	5.23E-16
Acidification / $kg\ SO_2$ eq	6.35E-04	1.33E-03	8.23E-05	1.61E-05	7.61E-05
Eutrophication / kg N eq	1.88E-04	3.37E-04	7.05E-06	7.45E-06	4.68E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	7.06E-03	2.48E-02	2.82E-03	2.10E-04	1.49E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	4.93E-05	7.32E-05	4.02E-06	7.97E-07	5.13E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU_h	4.3%	92.1%	0.3%	0.4%	3.0%
Non-carcinogenics / CTU_h	8.5%	82.5%	0.5%	1.2%	7.3%
Ecotoxicity / CTU_e	13.5%	84.3%	1.0%	0.4%	0.9%
Fossil fuel depletion / MJ surplus	2.57E-01	1.66E+00	3.01E-02	6.56E-03	3.55E-02

TRACI v2.1 results per functional unit (kraft-faced EcoBatt® and EcoRoll® Insulation - Albion, MI)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	1.17E-01	8.89E-01	1.86E-02	2.69E-02	2.13E-02
Ozone depletion / kg CFC-11 eq	2.62E-11	2.82E-09	4.38E-17	2.72E-16	6.15E-16
Acidification / $kg\ SO_2$ eq	6.05E-04	3.31E-03	1.01E-04	1.55E-05	9.53E-05
Eutrophication / kg N eq	1.79E-04	4.49E-04	8.63E-06	7.20E-06	5.86E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	6.72E-03	4.79E-02	3.45E-03	2.03E-04	1.86E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	4.70E-05	2.16E-04	4.92E-06	7.70E-07	6.42E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU_h	3.4%	92.8%	0.3%	0.3%	3.2%
Non-carcinogenics / CTU_h	5.8%	86.3%	0.5%	0.8%	6.6%
Ecotoxicity / CTU_e	11.6%	86.0%	1%	0.3%	1.1%
Fossil fuel depletion / MJ surplus	2.45E-01	2.39E+00	3.68E-02	6.34E-03	4.45E-02

TRACI v2.1 results per functional unit (PSK-faced EcoBatt® and EcoRoll® Insulation - Albion, MI)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	1.17E-01	1.33E+00	1.96E-02	2.61E-02	2.27E-02
Ozone depletion / kg CFC-11 eq	2.62E-11	2.82E-09	4.38E-17	2.64E-16	6.55E-16
Acidification / $kg\ SO_2$ eq	6.05E-04	3.31E-03	1.01E-04	1.55E-05	9.53E-05
Eutrophication / kg N eq	1.79E-04	4.49E-04	8.63E-06	7.20E-06	5.86E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	6.72E-03	4.79E-02	3.45E-03	2.03E-04	1.86E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	4.70E-05	2.16E-04	4.92E-06	7.70E-07	6.42E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU_h	3.4%	92.8%	0.3%	0.3%	3.2%
Non-carcinogenics / CTU_h	5.8%	86.3%	0.5%	0.8%	6.6%
Ecotoxicity / CTU_e	11.6%	86.0%	1%	0.3%	1.1%
Fossil fuel depletion / MJ surplus	2.45E-01	2.39E+00	3.68E-02	6.34E-03	4.45E-02

TRACI v2.1 results per functional unit (foil-faced EcoBatt® and EcoRoll® Insulation - Albion, MI)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	1.23E-01	1.12E+00	1.89E-02	2.69E-02	2.18E-02
Ozone depletion / kg CFC-11 eq	2.76E-11	2.15E-09	4.22E-17	2.72E-16	6.28E-16
Acidification / $kg\ SO_2$ eq	6.36E-04	2.12E-03	9.70E-05	1.60E-05	9.13E-05
Eutrophication / kg N eq	1.89E-04	4.15E-04	8.32E-06	7.43E-06	5.61E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	7.07E-03	3.74E-02	3.33E-03	2.09E-04	1.78E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	4.95E-05	1.25E-04	4.74E-06	7.94E-07	6.16E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU_h	3.8%	92.4%	0.3%	0.3%	3.2%
Non-carcinogenics / CTU_h	6.7%	84.9%	0.5%	0.9%	7.0%
Ecotoxicity / CTU_e	12.0%	85.7%	1.0%	0.3%	1.0%
Fossil fuel depletion / MJ surplus	2.58E-01	2.42E+00	3.55E-02	6.54E-03	4.26E-02

What's causing the greatest impacts

All life cycle stages

The manufacturing stage dominates all impact categories except ozone depletion, where the raw material acquisition stage takes precedence. The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage. The impact of the raw material acquisition stage is mostly due to the batch and binder materials. The contributions to outbound transportation are caused by the use of trucks and rail transport. The only impacts associated with installation and maintenance are due to the disposal of packaging waste, which is the smallest contributor of all the stages. At the end of life, insulation is manually removed from the building and landfilled. For all products, waste is dominated by the final disposal of the product. Non-hazardous waste accounts for waste generated during manufacturing and installation.

Raw materials acquisition and transportation

The raw material acquisition stage is the second highest contributor for most impact categories, but ozone depletion potential is almost entirely generated from this stage. The raw materials acquisition stage impact is largely due to the borax, manganese oxide, and soda ash in the batch and the sugars in the binder. Third-party verified ISO 14040/44 secondary LCI data sets contribute more than 80% of the total impacts to ozone depletion.

Manufacturing stage

The manufacturing stage has the most significant contribution to all impact categories, primarily due to the energy required to melt the glass and produce the glass fibers. Since some batch ingredients significantly contribute to the respiratory effects category, they can lead to higher impact results in the raw materials acquisition stage. However, since sand and borax are melted in the oven with the other batch materials, they are not released into the air as fine particulates. Therefore, the calculated potential impacts as shown in the results tables are likely much larger than the actual impacts in the raw material acquisition stage. This implies that the manufacturing stage may have a greater share of the impact than what is displayed in the total impacts by life cycle stage.

Distribution

Outbound transportation is the third highest contributor to smog impacts.

End of life

The end-of-life impacts are largely due to landfilling of the product after it has been removed from the building and transported to a landfill. Since materials are assumed to be landfilled at the end of life rather than incinerated or reused/recycled, no materials are available for energy recovery or recycling.

Embodied carbon

Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The total embodied carbon per functional unit of EcoBatt® and EcoRoll® Insulation manufactured in Albion, MI is as follows: 9.97E-01 kg CO_2 eq for unfaced, 1.01E-02 kg CO_2 eq for kraft-faced, 1.45E+00 kg CO_2 eq for FSK-faced, and 1.24E+00 kg CO_2 eq for foil-faced.

Material composition for other facers

The kraft facer accounts for 10-15%, and the foil and FSK facers account for 15-20% of the total mass per functional unit.

How we're making it greener

Knauf Insulation North America (KINA) is committed to providing products that conserve energy and preserve natural resources.

- Our products with ECOSE® Technology contain a bio-based binder adhesive instead of a fossil fuel-based binder.
- The glass contains on average over 60% recycled glass, which requires about 20% less energy required to form glass fibers, and results in about 25% reduction in embodied carbon.
- Our glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

See how we make it greener

References

LCA Background Report
Knauf Insulation North America and Manson Insulation Products LCA Background Report (public version), Knauf Insulation North America (KINA) 2023; developed using the TRACI v2.1 and CML impact assessment methodologies, and LCA for Experts modeling software.

ISO 14025, "Sustainability in buildings and civil engineering works – Core rules for environmental product declarations and services".

ISO 21930:2017 serves as the core PCR along with UL Part A.

UL Part A: Life Cycle Assessment Calculation Rules and Report Requirements v4.0
March, 2022, PCR review conducted by Lindita Bushi, PhD, Chair (Athena Sustainable Materials Institute), lindita.bushi@athenasmi.org; Hugues Imbault-Tétreault (Group AGECO), and Jack Gelsig (Exiform).

UL Part B: Building Envelope Thermal Insulation EPD Requirements, v2.0
April, 2018, PCR review conducted by Thomas Gloria, PhD, Chair (Industrial Ecology Consultants) (tgloria@industrialecology.com); Christoph Koffler, PhD (thinkstep); Andre Desjarlais (Oak Ridge National Laboratory).

UL Environment General Program Instructions v2.4, July 2018 (available upon request)

Download PDF SM Transparency Report / EPD

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information requires the application of the product category rules (PCR) and professional judgment. It is not be used for comparativity purposes when not considering the building energy use phase as indicated under this PCR. Full conformance with the PCR for Building Envelope Thermal Insulation 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.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

Environmental product declarations

- ☐ Industry-wide (generic) EPD — 1 product
- ☑ Product-specific Type III EPD — 1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1

Building product disclosure and optimization

Environmental product declarations

- ☐ Industry-wide (generic) EPD — 1 product
- ☐ Product-specific Type III EPD — 1.5 product

Collaborative for High Performance Schools National Criteria

MW CS.1 – Environmental Product Declarations

- ☑ Third-party certified Type III EPD — 2 point

Green Globes for New Construction and Sustainable Interiors

Materials and resources

- ☐ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
- ☐ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

BREEAM New Construction 2018

Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

- ☐ Industry-average EPD — 5 point
- ☐ Multi-product specific EPD — 75 points
- ☑ Product-specific EPD — 1 point

SM Transparency Report (EPD) | + Material Health Overview

EPD	LCA
3rd-party verified	✓
Transparency Report (EPD)	
3rd-party verified	✓
Validity: 12/12/23 – 12/12/28 KINA - 12122023 - 001	
MATERIAL HEALTH	Material evaluation
Self-declared	✓

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC according to ISO 21930:2017, UL Part A, UL Part B for Building Envelope Thermal Insulation Products and ISO 14025:2006.

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Harmony Environmental, LLC
Responsible Products Framework
Good Sustainability, Everyday Science.

SUMMARY
Reference PCR
UL Part A: Building Envelope Thermal Insulation v2.0
Regions/system boundaries
North America; Cradle-to-grave
Functional unit / EIU.
1 m^2 installed insulation material, packaging included, with thickness that gives an average thermal resistance of R_{si} = ft² K/W with a installed service life (ESL) of 75 years
LCIA methodology: TRACI 2.1
LCA software LCI database
LCA for Experts v10.7, LCA for Experts 2023
In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.
Public LCA:
Knauf Insulation North America and Manson Insulation Products

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LCA results & interpretation

EcoBatt® and EcoRoll® Insulation

Albion, MI | Inwood, WV | Lanett, AL | Shasta Lake, CA | Shelbyville, IN | EPD add'l content | Material health

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ✔ Cradle to grave

Application

Thermal and acoustical barriers for energy-efficient construction. They can be used in new and retrofit wood and metal frame applications in residential and commercial structures, as well as in manufactured housing. These applications include thermal and acoustical treatments to walls, ceilings, and floors.

Functional unit

One square meter of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of R_{si} = 1m² K/W with a building service life of 75 years.

Reference service life: 75 years when installed per manufacturer's instructions

Reference flow:
Unfaced: 0.646 kg of product with no facer option.
Kraft-faced: 0.652 kg of product with kraft facer.
FSK-faced: 0.668 kg of product with foil-skrim kraft (FSK) facer.
Foil-faced: 0.644 kg of product with foil facer.

A thickness of 0.039m achieves the functional unit. (ASTM C518)

Manufacturing data

Reporting period: January 2022 – December 2022
Location: Inwood, WV

Default installation, packaging, and disposal scenarios

At the installation site, insulation products are unpackaged and installed. Staples may be used to install batts and rolls. The potential impact of the staples is assumed to be negligible since their use is spread out over hundreds of bags of product; therefore, they were not included in the model.

No material is assumed to be lost or wasted. Scraps are typically used to fill corners or crevices. Plastic packaging waste is disposed (9% to recycling, 68% to landfill, and 17% to incineration), and no maintenance or replacement is required over the life of the building. After removal, the insulation is assumed to be landfilled. Insulation and packaging waste are assumed to be transported 100 miles for disposal.

Unfaced product composition and impacts

Material composition greater than 1% by weight

Mark	MATERIAL	%WT
Blue	Cullet	35-40%
Blue	Sand	10-15%
Blue	Borates	5-8%
Blue	Soda ash	5-8%
Blue	Feldspar	2-5%
Blue	Limestone	2-5%
Blue	Oxides	<1%
Blue	Water	10-15%
Blue	Sugars	2-5%
Blue	Additives	2-5%
Packaging	Plastic	8-10%

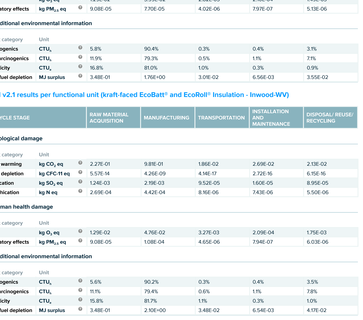
Total impacts by life cycle stages [MPts/per func unit]

LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Raw material acquisition	6.03E-03
Manufacturing	7.84E-03
Transportation	2.97E-04
Installation and maintenance	1.39E-04
Disposal/reuse/recycling	3.75E-04

Total impacts = 1.47E-02 mPts per 75 years installed

Information modules: Included (X) / Excluded (MND)*

*Module D is also excluded from this system boundary (MND).



SM Single Score

Learn about SM Single Score results

	Unfaced	6.03E-03 mPts	7.84E-03 mPts	2.97E-04 mPts	1.39E-04 mPts	3.75E-04 mPts
Impacts per 1 square meter of insulation material	Kraft-faced	6.03E-03 mPts	9.85E-03 mPts	3.44E-04 mPts	1.39E-04 mPts	4.40E-04 mPts
	FSK-faced	5.81E-03 mPts	1.77E-02 mPts	3.64E-04 mPts	1.34E-04 mPts	4.92E-04 mPts
	Foil-faced	6.1E-03 mPts	1.16E-02 mPts	3.50E-04 mPts	1.38E-04 mPts	4.50E-04 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage		Batch material and binder material production.	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to landfill and landfilling of packaging materials.	Transportation to landfill and landfilling of product at end of life.

TRACI v2.1 results per functional unit (unfaced EcoBatt® and EcoRoll® Insulation - Inwood-WV)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	2.27E-01	9.28E-01	1.60E-02	2.70E-02	1.82E-02
Ozone depletion / kg CFC-11 eq	5.57E-14	8.60E-14	3.58E-17	2.73E-16	5.23E-16
Acidification / $kg\ SO_2$ eq	1.24E-03	1.73E-03	8.23E-05	1.61E-05	7.61E-05
Eutrophication / kg N eq	2.69E-04	3.44E-04	7.05E-06	7.45E-06	4.68E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	1.29E-02	3.99E-02	2.82E-03	2.10E-04	1.49E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	9.08E-05	7.70E-05	4.02E-06	7.97E-07	5.13E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU$_h$	5.8%	90.4%	0.3%	0.4%	3.1%
Non-carcinogenics / CTU$_h$	11.9%	79.3%	0.5%	1.1%	7.1%
Ecotoxicity / CTU$_e$	16.8%	81.0%	1.0%	0.3%	0.9%
Fossil fuel depletion / MJ surplus	3.48E-01	1.76E+00	3.01E-02	6.56E-03	3.55E-02

TRACI v2.1 results per functional unit (kraft-faced EcoBatt® and EcoRoll® Insulation - Inwood-WV)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	2.29E-01	1.39E+00	1.96E-02	2.69E-02	2.27E-02
Ozone depletion / kg CFC-11 eq	5.57E-14	2.82E-09	4.38E-17	2.64E-16	6.55E-16
Acidification / $kg\ SO_2$ eq	1.24E-03	2.19E-03	9.52E-05	1.60E-05	8.95E-05
Eutrophication / kg N eq	2.69E-04	4.42E-04	8.16E-06	7.43E-06	5.50E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	1.29E-02	4.76E-02	3.27E-03	2.09E-04	1.75E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	9.08E-05	1.08E-04	4.65E-06	7.94E-07	6.03E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU$_h$	5.6%	90.2%	0.3%	0.4%	3.5%
Non-carcinogenics / CTU$_h$	11.1%	79.4%	0.6%	1.1%	7.8%
Ecotoxicity / CTU$_e$	15.8%	81.7%	1.1%	0.3%	1.0%
Fossil fuel depletion / MJ surplus	3.48E-01	2.10E+00	3.48E-02	6.53E-03	4.17E-02

TRACI v2.1 results per functional unit (FSK-faced EcoBatt® and EcoRoll® Insulation - Inwood-WV)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	2.19E-01	1.39E+00	1.96E-02	2.68E-02	2.27E-02
Ozone depletion / kg CFC-11 eq	5.37E-14	2.82E-09	4.38E-17	2.64E-16	6.55E-16
Acidification / $kg\ SO_2$ eq	1.20E-03	3.7E-03	1.06E-04	1.56E-05	9.53E-05
Eutrophication / kg N eq	2.59E-04	4.60E-04	8.63E-06	7.20E-06	5.86E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	1.24E-02	6.26E-02	3.45E-03	2.03E-04	1.86E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	8.75E-05	2.20E-04	4.92E-06	7.70E-07	6.43E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU$_h$	4.7%	91.5%	0.3%	0.3%	3.2%
Non-carcinogenics / CTU$_h$	8.3%	84.0%	0.5%	0.8%	6.4%
Ecotoxicity / CTU$_e$	14.5%	83.1%	1.1%	0.3%	1.0%
Fossil fuel depletion / MJ surplus	3.35E-01	2.50E+00	3.68E-02	6.34E-03	4.45E-02

TRACI v2.1 results per functional unit (foil-faced EcoBatt® and EcoRoll® Insulation - Inwood-WV)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category / Unit					
Global warming / $kg\ CO_2$ eq	2.30E-01	1.18E+00	1.89E-02	2.69E-02	2.18E-02
Ozone depletion / kg CFC-11 eq	5.65E-14	2.15E-09	4.22E-17	2.72E-16	6.28E-16
Acidification / $kg\ SO_2$ eq	1.26E-03	2.54E-03	9.70E-05	1.60E-05	9.13E-05
Eutrophication / kg N eq	2.72E-04	4.27E-04	8.32E-06	7.43E-06	5.61E-06
Human health damage					
Impact category / Unit					
Smog / $kg\ O_3$ eq	1.30E-02	5.29E-02	3.33E-03	2.09E-04	1.78E-03
Respiratory effects / $kg\ PM_{2.5}$ eq	9.21E-05	1.30E-04	4.74E-06	7.94E-07	6.16E-06
Additional environmental information					
Impact category / Unit					
Carcinogenics / CTU$_h$	5.1%	91.0%	0.3%	0.3%	3.2%
Non-carcinogenics / CTU$_h$	9.6%	82.3%	0.5%	0.9%	6.7%
Ecotoxicity / CTU$_e$	15.0%	82.7%	1.0%	0.3%	1.0%
Fossil fuel depletion / MJ surplus	3.53E-01	2.53E+00	3.55E-02	6.54E-03	4.26E-02

What's causing the greatest impacts

All life cycle stages

The manufacturing stage dominates all impact categories except ozone depletion, where the raw material acquisition stage takes precedence. The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage. The impact of the raw material acquisition stage is mostly due to the batch and binder materials. The contributions to outbound transportation are caused by the use of trucks and rail transport. The only impacts associated with installation and maintenance are due to the disposal of packaging materials, which is the smallest contributor of all the stages. At the end of life, insulation is manually removed from the building and landfilled. For all products, waste is dominated by the final disposal of the product. Non-hazardous waste accounts for waste generated during manufacturing and installation.

Raw materials acquisition and transportation

The raw material acquisition stage is the second highest contributor for most impact categories, but ozone depletion potential is almost entirely generated from this stage. The raw materials acquisition stage impact is largely due to the borax, manganese oxide, and soda ash in the batch and the sugars in the binder. Third-party verified ISO 14040/44 secondary LCI data sets contribute more than 80% of the total impacts to ozone depletion.

Manufacturing stage

The manufacturing stage has the most significant contribution to all impact categories, primarily due to the energy required to melt the glass and produce the glass fibers. Since some batch ingredients significantly contribute to the respiratory effects category, they can lead to higher impact results in the raw materials acquisition stage. However, since sand and borax are melted in the oven with the other batch materials, they are not released into the air as fine particles. Therefore, the calculated potential impacts as shown in the results tables are likely much larger than the actual impacts in the raw material acquisition stage. This implies that the manufacturing stage may have a greater share of the impact than what is displayed in the total impacts by life cycle stage.

Distribution

Outbound transportation is the third highest contributor to smog impacts.

End of life

The end-of-life impacts are largely due to landfilling of the product after it has been removed from the building and transported to a landfill. Since materials are assumed to be landfilled at the end of life rather than incinerated or reused/recycled, no materials are available for energy recovery or reuse/recycling.

Embodied carbon

Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The total embodied carbon per functional unit of EcoBatt® and EcoRoll® Insulation manufactured in Inwood, WV is as follows: 1.16E+00 kg CO_2 eq for unfaced, 1.21E+00 kg CO_2 eq for kraft-faced, 1.61E+00 kg CO_2 eq for FSK-faced, and 1.41E+00 kg CO_2 eq for foil-faced.

Material composition for other facers

The kraft facer accounts for 10-13%, and the foil and FSK facers account for 15-20% of the total mass per functional unit.

How we're making it greener

Knauf Insulation North America (KINA) is committed to providing products that conserve energy and preserve natural resources.

- Our products with ECOSE® Technology contain a bio-based binder adhesive instead of a fossil fuel-based binder.
- Our fiberglass contains an average over 60% recycled glass, which requires about 20% less energy required to form glass fibers, and results in about 25% reduction in embodied carbon.
- Our glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

See how we make it greener

References

LCA Background Report
Knauf Insulation North America and Manson Insulation Products LCA Background Report (public version), Knauf Insulation North America (KINA) 2023, developed using the TRACI v2.1 and CML impact assessment methodologies, and LCA for Experts modeling software.

ISO 14025, "Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services"

ISO 21930:2017 serves as the core PCR along with UL Part A.

UL Part A: Life Cycle Assessment Calculation Rules and Report Requirements v4.0
March, 2022. PCR review conducted by Lindita Bushi, PhD, Chair (Athena Sustainable Materials Institute), lindita.bushi@athenasmi.org; Hugues Imbeault-Tétreault (Group AGECO), and Jack Geibig (Earthsoft).

UL Part B: Building Envelope Thermal Insulation EPD Requirements, v2.0
April, 2018. PCR review conducted by Thomas Gloria, PhD, Chair (Industrial Ecology Consultants) t.gloria@industrial-ecology.com; Christoph Koffler, PhD (thinkstep); Andre Desjardins (Oak Ridge National Laboratory).

UL Environment General Program Instructions v2.4, July 2018 (available upon request)

Download PDF SM Transparency Report / EPD

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that rely on life cycle assessment (LCA) to calculate environmental impacts associated with products as a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products 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 explained in ISO 21930:2017 paragraphs 8.3.3 and 8.3.4. Comparisons between Thermal Insulation albeit 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.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

Environmental product declarations

- ✔ Product-specific Type III EPD — 1 product
- ○ Industry-wide (generic) EPD — 1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1

Building product disclosure and optimization

Environmental product declarations

- ○ Industry-wide (generic) EPD — 1 product
- ✔ Product-specific Type III EPD — 1.5 product

Collaborative for High Performance Schools National Criteria

MW CS.1 - Environmental Product Declarations

- ✔ Third-party certified type III EPD — 2 point

Green Globes for New Construction and Sustainable Interiors

Materials and resources

- ✔ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
- ✔ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

BREEAM New Construction 2018

Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

- ○ Industry-average EPD — 5 point
- ○ Multi-product specific EPD — 75 points
- ✔ Product-specific EPD — 1 point

SM Transparency Report (EPD)™ + Material Health Overview™

EPD — LCA
3rd-party verified ✔
Transparency Report (EPD)
3rd-party verified ✔
Validity: 12/12/23 – 12/12/28
KNA - 12122023 - 001

MATERIAL HEALTH — Material evaluation
Self-declared ✔

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC, according to ISO 21930:2017, UL Part A, UL Part B for Building Envelope Thermal Insulation Products and ISO 14025:2006.
Harmony Environmental, LLC
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Olathe, KS 66062
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(913) 780-3328
Harmony Environmental, LLC — Professional Services Environmental Sound Sustainability, Strategy for Success

SUMMARY
Reference PCR
UL Part A: Building Envelope Thermal Insulation v2.0

Regions system boundaries
North America; Cradle-to-grave

Functional unit / EIU
1 m^2 installed insulation material, packaging included, with thickness that gives average thermal resistance R_{si} = 1m² K/W with a building service life (BSL) of 75 years

LCIA methodology: TRACI 2.1

LCA software: LCI database
LCA for Experts v10.7, LCI for Experts 2023

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.

Public LCA:
Knauf Insulation North America and Manson Insulation Products

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Shelbyville, IN 46176
www.knaufinsulation.com
317 392 4424

Contact us

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LCA results & interpretation

EcoBatt® and EcoRoll® Insulation

Albion, NE | Inwood, WV | Lanett, AL | Shasta Lake, CA | Shelbyville, IN | EPD addendum | Material health

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ◉ Cradle to grave

Application

Thermal and acoustical barriers for energy-efficient construction. They can be used in new and retrofit wood and metal frame applications in residential and commercial structures, as well as in manufactured housing. These applications include thermal and acoustical treatments to walls, ceilings, and floors.

Functional unit

Per square meter of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of R_{si} = $ft^2 \cdot K/W$ with a building service life of 75 years.

Reference service life: 75 years when installed per manufacturer's instructions

Reference flow:
Unfaced: 0.546 kg of product with no facer option.
Kraft-faced: 0.632 kg of product with kraft facer.
FSK-faced: 0.668 kg of product with foil skrim kraft (FSK) facer.
Foil-faced: 0.644 kg of product with foil facer.

A thickness of 0.039m achieves the functional unit. (ASTM C518)

Manufacturing data

Reporting period: January 2022 – December 2022
Location: Lanett, AL

Default installation, packaging, and disposal scenarios

At the installation site, insulation products are unpackaged and installed. Staples may be used to install batts and rolls. The potential impact of the staples is assumed to be negligible since there are only a few pounds per ton (hundreds of bags of product); therefore, they were not included in the model.

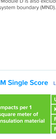
No material is assumed to be lost or wasted. Scraps are typically used to fill corners or crevices. Plastic packaging waste is disposed (9% to recycling, 58% to landfill, and 17% to incineration), and no maintenance or replacement is required over the lifetime of the building. After removal, the insulation is assumed to be landfilled. Insulation and packaging waste are assumed to be transported 100 miles for disposal.

Unfaced product composition and impacts

Material composition greater than 1% by weight

PART	MATERIAL	%WT
Batch	**Cullet**	25-30%
Batch	**Sand**	10-15%
Batch	**Borates**	5-8%
Batch	**Soda ash**	8-10%
Batch	**Feldspar**	5-8%
Batch	**Limestone**	5-8%
Binder	**Water**	10-15%
Binder	**Sugars**	2-5%
Binder	**Additives**	2-5%
Packaging	**Plastic**	8-10%

Total impacts by life cycle stages [mPts/per func unit]



LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Raw material acquisition	4.75E-03
Manufacturing	7.26E-03
Transportation	2.97E-04
Installation and maintenance	1.39E-04
Disposal/reuse/recycling	3.75E-04
Total impacts per 75 years installed	**= 1.28E-02 mPts**

Information modules: Included (X) | Excluded (MND)*

*Module D is also excluded from this system boundary (MND).

What's causing the greatest impacts

All life cycle stages

The manufacturing stage dominates all impact categories except ozone depletion, where the raw material acquisition stage takes precedence. The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage. The impact of the raw material acquisition stage is mostly due to the batch and binder materials. The contributions to outbound transportation are caused by the use of trucks and rail transport. The only impacts associated with installation and maintenance are due to the disposal of packaging waste, which is the smallest contributor of all the stages. At the end of life, insulation is manually removed from the building and landfilled. For all products, waste is dominated by the final disposal of the product. Non-hazardous waste accounts for waste generated during manufacturing and installation.

Raw materials acquisition and transportation

The raw material acquisition stage is the second highest contributor for most impact categories, but ozone depletion potentially is almost entirely generated from this stage. The raw materials acquisition stage impact is largely due to the borax, manganese oxide, and soda ash in the batch and the sugars in the binder. Third-party verified ISO 14040/44 secondary LCI data sets contribute more than 80% of the total impacts to ozone depletion.

Manufacturing stage

The manufacturing stage has the most significant contribution to all impact categories, primarily due to the energy required to melt the glass and produce the glass fibers. Since some batch ingredients significantly contribute to the respiratory effects category, they can lead to higher impact results in the raw materials acquisition stage. However, since sand and borax are melted in the oven with the other batch materials, they are not released into the air as fine particulates. Therefore, the calculated potential impacts as shown in the results tables are likely much larger than the actual impacts in the raw material acquisition stage. This implies that the manufacturing stage may have a greater share of the impact than what is displayed in the total impacts by life cycle stage.

Distribution

Outbound transportation is the third highest contributor to smog impacts.

End of life

The end-of-life impacts are largely due to landfilling of the product after it has been removed from the building and transported to a landfill. Since materials are assumed to be landfilled at the end of life rather than incinerated or reused/recycled, no materials are available for energy recovery or reuse/recycling.

Embodied carbon

Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming impact results. The total embodied carbon per functional unit of EcoBatt® and EcoRoll® Insulation manufactured in Lanett, AL is as follows: 1.12E+00 kg CO_2 eq for unfaced, 1.17E+00 kg CO_2 eq for kraft-faced, 1.59E+00 kg CO_2 eq for FSK-faced, and 1.40E+00 kg CO_2 eq for foil-faced.

Material composition for other facers

The kraft, foil, and FSK facers account for 15-20% of the total mass per functional unit.

How we're making it greener

Knauf Insulation North America (KINA) is committed to providing products that conserve energy and preserve natural resources.

- Our products with ECOSE® Technology contain a bio-based binder adhesive instead of a fossil fuel-based binder.
- Our fiberglass contains on average over 60% recycled glass, which requires about 20% less energy required to form glass fibers, and results in about 25% reduction in embodied carbon.
- Our glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

See how we make it greener

LCA results

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
	(X) A1 Raw materials (X) A2 Transportation	(X) A3 Manufacturing	(X) A4 Distribution	(X) A5 Installation (X) B1 Use (X) B2 Maintenance (X) B3 Repair (X) B4 Replacement (X) B5 Refurbishment (X) B6 Operational energy use (X) B7 Operational water use	(X) C1 Deconstruction (X) C2 Transportation (X) C3 Waste processing (X) C4 Disposal

SM Single Score

Learn about SM Single Score results

Impacts per 1 square meter of insulation material					
	Unfaced	4.75E-03 mPts	7.26E-03 mPts	2.97E-04 mPts	1.39E-04 mPts	3.75E-04 mPts
	Kraft faced	4.73E-03 mPts	5.21E-03 mPts	2.44E-04 mPts	1.39E-04 mPts	4.40E-04 mPts
	FSK-faced	4.68E-03 mPts	1.73E-02 mPts	3.64E-04 mPts	1.39E-04 mPts	4.68E-04 mPts
	Foil-faced	4.93E-03 mPts	1.14E-02 mPts	3.50E-04 mPts	1.38E-04 mPts	4.50E-04 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage		Batch material and binder material production	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to landfill and landfilling of packaging materials.	Transportation to landfill and landfilling of product at end of life.

TRACI v2.1 results per functional unit (unfaced EcoBatt® and EcoRoll® Insulation - Lanett, AL)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.73E-01	9.46E-01	1.60E-02	2.70E-02	1.82E-02
Ozone depletion — kg CFC-11 eq	2.66E-15	1.11E-13	3.58E-17	2.73E-16	5.23E-16
Acidification — kg SO_2 eq	9.20E-04	1.40E-03	8.23E-05	1.61E-05	7.61E-05
Eutrophication — kg N eq	2.31E-04	3.65E-04	7.05E-06	7.45E-06	4.68E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	9.74E-03	3.04E-02	2.82E-03	2.10E-04	1.49E-03
Respiratory effects — kg $PM_{2.5}$ eq	7.18E-05	6.60E-05	4.02E-06	7.97E-07	5.13E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	4.5%	92.2%	0.3%	0.3%	2.7%
Non-carcinogenics — CTU_h	9.1%	83.1%	0.5%	1.0%	6.4%
Ecotoxicity — CTU_e	13.8%	84.1%	0.9%	0.3%	0.8%
Fossil fuel depletion — MJ surplus	3.08E-01	1.96E+00	3.01E-02	6.56E-03	3.55E-02

TRACI v2.1 results per functional unit (kraft-faced EcoBatt® and EcoRoll® Insulation - Lanett, AL)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.73E-01	9.96E-01	1.86E-02	2.69E-02	2.13E-02
Ozone depletion — kg CFC-11 eq	2.65E-15	1.14E-09	4.14E-17	2.72E-16	6.15E-16
Acidification — kg SO_2 eq	9.17E-04	1.84E-03	9.52E-05	1.60E-05	8.95E-05
Eutrophication — kg N eq	2.30E-04	4.59E-04	8.16E-06	7.43E-06	5.50E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	9.70E-03	3.79E-02	3.27E-03	2.09E-04	1.75E-03
Respiratory effects — kg $PM_{2.5}$ eq	7.15E-05	9.63E-05	4.65E-06	7.94E-07	6.03E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	4.4%	92.0%	0.3%	0.3%	3.1%
Non-carcinogenics — CTU_h	8.6%	82.9%	0.5%	1.0%	7.1%
Ecotoxicity — CTU_e	13.2%	84.6%	1.0%	0.3%	0.9%
Fossil fuel depletion — MJ surplus	3.07E-01	2.29E+00	3.48E-02	6.54E-03	4.17E-02

TRACI v2.1 results per functional unit (FSK-faced EcoBatt® and EcoRoll® Insulation - Lanett, AL)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.71E-01	1.42E+00	1.96E-02	2.61E-02	2.27E-02
Ozone depletion — kg CFC-11 eq	2.63E-15	2.82E-09	4.38E-17	2.64E-16	6.55E-16
Acidification — kg SO_2 eq	9.08E-04	3.41E-03	1.01E-04	1.55E-05	9.53E-05
Eutrophication — kg N eq	2.28E-04	4.88E-04	8.63E-06	7.20E-06	5.86E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	9.61E-03	5.41E-02	3.45E-03	2.03E-04	1.86E-03
Respiratory effects — kg $PM_{2.5}$ eq	7.08E-05	2.1E-04	4.92E-06	7.70E-07	6.43E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	3.8%	92.9%	0.3%	0.3%	2.8%
Non-carcinogenics — CTU_h	6.6%	86.4%	0.4%	0.7%	5.8%
Ecotoxicity — CTU_e	12.2%	85.7%	0.9%	0.3%	0.9%
Fossil fuel depletion — MJ surplus	3.04E-01	2.73E+00	3.68E-02	6.34E-03	4.45E-02

TRACI v2.1 results per functional unit (foil-faced EcoBatt® and EcoRoll® Insulation - Lanett, AL)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.80E-01	1.22E+00	1.89E-02	2.69E-02	2.18E-02
Ozone depletion — kg CFC-11 eq	2.76E-15	2.19E-09	4.22E-17	2.72E-16	6.28E-16
Acidification — kg SO_2 eq	9.55E-04	2.23E-03	9.70E-05	1.60E-05	9.13E-05
Eutrophication — kg N eq	2.39E-04	4.56E-04	8.32E-06	7.43E-06	5.61E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	1.01E-02	4.39E-02	3.33E-03	2.09E-04	1.78E-03
Respiratory effects — kg $PM_{2.5}$ eq	7.45E-05	1.20E-04	4.74E-06	7.94E-07	6.16E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	4.1%	92.6%	0.3%	0.3%	2.8%
Non-carcinogenics — CTU_h	7.5%	85.2%	0.4%	0.8%	6.1%
Ecotoxicity — CTU_e	12.6%	85.4%	0.9%	0.3%	0.9%
Fossil fuel depletion — MJ surplus	3.20E-01	2.77E+00	3.55E-02	6.54E-03	4.26E-02

References

LCA Background Report
Knauf Insulation North America and Manson Insulation Products LCA Background Report (public version), Knauf Insulation North America (KINA) 2023; developed using the TRACI v2.1 and CML impact assessment methods, and LCA for Experts modeling software.

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LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

Environmental product declarations

- Industry-wide (generic) EPD — 1 product
- Product-specific Type III EPD — 1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1

Building product disclosure and optimization

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- Third-party certified type III EPD — 2 point

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- NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
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BREEAM New Construction 2018

Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

- Industry average EPD — 5 point
- Multi-product specific EPD — 75 points
- Product-specific EPD — 1 point

SM Transparency Report (EPD) + + Material Health Overview

EPD | LCA

3rd-party verified ✓ (Transparency Report (EPD))

3rd-party verified ✓ (Material Health)

Validity: 12/12/23 – 12/12/28
KINA - 12122023 - 001

MATERIAL HEALTH — Material evaluation

Self-declared

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC, Contact: (913) 789-3328 UL Part A: UL Part B for Building Envelope Thermal Insulation Products, and ISO 14025:2006.

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Harmony Environmental, LLC
Independent Verification Environmental and Sustainability Strategic Review

SUMMARY
Reference PCR
UL Part A: Building Envelope Thermal Insulation | v2.0

Regions: system boundaries
North America; Cradle-to-grave

Functional unit / EIU.
1 m^2 installed insulation material, packaging included, with a thickness that gives average thermal resistance of R_{si} = $ft^2 \cdot K/W$ over an estimated service life (ESL) of 75 years

LCIA methodology: TRACI 2.1

LCA software: LCI database
LCA for Experts v10.7, LCA for Experts 2023

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.

Public LCA:
Knauf Insulation North America and Manson Insulation Products

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LCA results & interpretation

EcoBatt® and EcoRoll® Insulation

Albion, MI | Inwood, WV | Lanett, AL | Shasta Lake, CA | Shelbyville, IN | EPD w/out climate | Material health

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ◉ Cradle to grave

Application

Thermal and acoustical barriers for energy-efficient construction. They can be used in new and retrofit wood and metal frame applications in residential and commercial structures, as well as in manufactured housing. These applications include thermal and acoustical treatments to walls, ceilings, and floors.

Functional unit

One square meter of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of R_{si} = $ft^2 \cdot K/W$ with a building service life of 75 years.

Reference service life: 75 years when installed per manufacturer's instructions
Reference flow:
Unfaced: 0.546 kg of product with no face option.
Kraft-faced: 0.632 kg of product with kraft facer.
Foil-faced: 0.668 kg of product with foil skrim kraft (FSK) facer.
Foil-faced: 0.644 kg of product with foil facer.

A thickness of 0.0398m achieves the functional unit. (ASTM C518)

Manufacturing data

Reporting period: January 2022 – December 2022
Location: Shasta Lake, CA

Default installation, packaging, and disposal scenarios

At the installation site, insulation products are unpackaged and installed. Staples may be used to install batts and rolls. The potential impact of the staples is assumed to be negligible since their use is spread out over hundreds of bags of product; therefore, they were not included in the model.

No material is assumed to be lost or wasted. Scraps are typically used to fill corners or crevices. Plastic packaging waste is disposed (8% to recycling, 68% to landfill, and 17% to incineration), and no maintenance or replacement is required over the life of the building. After remove, the insulation is assumed to be landfilled. Insulation and packaging waste are assumed to be transported 100 miles for disposal.

Unfaced product composition and impacts

Material composition greater than 1% by weight

PART	MATERIAL	%WT.
Batts	**Cullet**	40-45%
Batts	**Sand**	8-10%
Batts	**Borates**	5-8%
Batts	**Soda ash**	2-5%
Batts	**Limestone**	2-5%
Batts	**Oil**	<1%
Binder	**Water**	10-15%
Binder	**Sugars**	2-5%
Binder	**Additives**	2-5%
Packaging	**Plastic**	8-10%

Total impacts by life cycle stages (mPts/per func unit)

LIFE CYCLE STAGE	MPTS/FUNC. UNIT
◉ Raw material acquisition	2.99E-03
◉ Manufacturing	6.00E-03
◉ Transportation	2.97E-04
◉ Installation and maintenance	1.39E-04
◉ Disposal/reuse/recycling	3.75E-04
Total impacts = 9.80E-03 mPts per 75 years installed	

Information modules: Included (X) / Excluded (MND)*

*Module D is also excluded from this system boundary (MND).

What's causing the greatest impacts

All life cycle stages

The manufacturing stage dominates all impact categories except ozone depletion, where the raw material acquisition stage takes precedence. The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage. The impact of the raw material acquisition stage is mostly due to the batch and binder materials. The contributions to outbound transportation are caused by the use of trucks and rail transport. The only impacts associated with installation and maintenance are due to the disposal of packaging waste, which is the smallest contributor of all the stages. At the end of life, insulation is manually removed from the building and landfilled. For all products, waste is dominated by the final disposal of the product. Non-hazardous waste accounts for waste generated during manufacturing and installation.

Raw materials acquisition and transportation

The raw material acquisition stage is the second highest contributor for most impact categories, but ozone depletion potential is almost entirely generated from this stage. The raw materials acquisition stage impact is largely due to the borax, manganese oxide, and soda ash in the batch and the sugars in the binder. Third-party verified ISO 14040/44 secondary LCI data sets contribute more than 80% of the total impacts to ozone depletion.

Manufacturing stage

The manufacturing stage has the most significant contribution to all impact categories, primarily due to the energy required to melt the glass and produce the glass fibers. Since some batch ingredients significantly contribute to the respiratory effects category, they can lead to higher impact results in the raw materials acquisition stage. However, since sand and borax are melted in the oven with the other batch materials, they are not released into the air as fine particulates. Therefore, the calculated potential impacts as shown in the results tables are likely much larger than the actual impacts in the raw material acquisition stage. This implies that the manufacturing stage may have a greater share of the impact than what is displayed in the total impacts by life cycle stage.

Distribution

Outbound transportation is the third highest contributor to smog impacts.

End of life

The end-of-life impacts are largely due to landfilling of the product after it has been removed from the building and transported to a landfill. Since materials are assumed to be landfilled at the end of life rather than incinerated or reused/recycled, no materials are available for energy recovery or recycling.

Embodied carbon

Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The total embodied carbon per functional unit of EcoBatt® and EcoRoll® Insulation manufactured in Shasta Lake, CA is as follows: 8.22E-01 kg CO_2 eq for unfaced; 8.77E-01 kg CO_2 eq for kraft-faced; 1.31E+00 kg CO_2 eq for FSK-faced; and 1.1E+00 kg CO_2 eq for foil-faced.

Material composition for other facers

The kraft facer accounts for 10-15%, and the foil and FSK facers account for 15-20% of the total mass per functional unit.

How we're making it greener

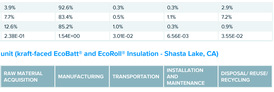
Knauf Insulation North America (KINA) is committed to providing products that conserve energy and preserve natural resources.

- Our products with ECOSE® Technology contain a bio-based binder adhesive instead of a fossil fuel-based binder.
- Our glass is produced using an average over 60% recycled glass, which requires about 20% less energy required to form glass fibers, and results in about 25% reduction in embodied carbon.
- Our glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

See how we make it greener

LCA results

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
	(X) A1 Raw materials **(X) A2 Transportation**	**(X) A3 Manufacturing**	**(X) A4 Distribution**	**(X) A5 Installation** **(X) B1 Use** **(X) B2 Maintenance** **(X) B3 Repair** **(X) B4 Replacement** **(X) B5 Refurbishment** **(X) B6 Operational energy use** **(X) B7 Operational water use**	**(X) C1 Deconstruction** **(X) C2 Transportation** **(X) C3 Waste processing** **(X) C4 Disposal**



SM Single Score

Learn about SM Single Score results

Impacts per 1 square meter of insulation material					
	Unfaced	2.99E-03 mPts	6.00E-03 mPts	2.97E-04 mPts	1.39E-04 mPts	3.75E-04 mPts
	Kraft faced	3.02E-03 mPts	7.96E-03 mPts	3.44E-04 mPts	1.39E-04 mPts	4.40E-04 mPts
	FSK-faced	3.02E-03 mPts	1.62E-02 mPts	3.64E-04 mPts	1.39E-04 mPts	4.69E-04 mPts
	Foil-faced	3.18E-03 mPts	1.02E-02 mPts	3.50E-04 mPts	1.39E-04 mPts	4.50E-04 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage		Batch material and binder material production.	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to landfill and landfilling of packaging materials.	Transportation to landfill and landfilling of product at end of life.

TRACI v2.1 results per functional unit (unfaced EcoBatt® and EcoRoll® Insulation - Shasta Lake, CA)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.10E-01	7.12E-01	1.60E-02	2.70E-02	1.82E-02
Ozone depletion — kg CFC-11 eq	6.32E-13	2.32E-13	3.58E-17	2.73E-16	5.23E-16
Acidification — kg SO_2 eq	5.68E-04	1.55E-03	8.23E-05	1.61E-05	7.61E-05
Eutrophication — kg N eq	1.75E-04	3.39E-04	7.05E-06	7.45E-06	4.68E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	6.40E-03	2.41E-02	2.82E-03	2.10E-04	1.49E-03
Respiratory effects — kg $PM_{2.5}$ eq	4.51E-05	5.85E-05	4.02E-06	7.97E-07	5.13E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	3.9%	92.6%	0.3%	0.3%	2.9%
Non-carcinogenics — CTU_h	7.7%	83.4%	0.5%	1%	7.2%
Ecotoxicity — CTU_e	12.6%	85.2%	1.0%	0.3%	0.9%
Fossil fuel depletion — MJ surplus	2.38E-01	1.54E+00	3.01E-02	6.56E-03	3.55E-02

TRACI v2.1 results per functional unit (kraft-faced EcoBatt® and EcoRoll® Insulation - Shasta Lake, CA)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.10E-01	7.67E-01	1.86E-02	2.69E-02	2.13E-02
Ozone depletion — kg CFC-11 eq	6.36E-13	4.05E-09	4.14E-17	2.72E-16	6.15E-16
Acidification — kg SO_2 eq	5.72E-04	2.00E-03	9.52E-05	1.60E-05	8.95E-05
Eutrophication — kg N eq	1.77E-04	4.36E-04	8.16E-06	7.43E-06	5.50E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	6.44E-03	3.16E-02	3.27E-03	2.09E-04	1.75E-03
Respiratory effects — kg $PM_{2.5}$ eq	4.55E-05	8.88E-05	4.65E-06	7.94E-07	6.03E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	3.8%	92.3%	0.3%	0.3%	3.3%
Non-carcinogenics — CTU_h	7.3%	83.2%	0.6%	1.1%	7.9%
Ecotoxicity — CTU_e	11.9%	85.7%	1.0%	0.3%	1.0%
Fossil fuel depletion — MJ surplus	2.40E-01	1.88E+00	3.48E-02	6.54E-03	4.17E-02

TRACI v2.1 results per functional unit (FSK-faced EcoBatt® and EcoRoll® Insulation - Shasta Lake, CA)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.11E-01	1.20E+00	1.96E-02	2.61E-02	2.27E-02
Ozone depletion — kg CFC-11 eq	6.38E-13	2.82E-09	4.38E-17	2.64E-16	6.55E-16
Acidification — kg SO_2 eq	5.74E-04	3.59E-03	1.01E-04	1.55E-05	9.53E-05
Eutrophication — kg N eq	1.77E-04	4.69E-04	8.63E-06	7.20E-06	5.86E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	6.46E-03	4.82E-02	3.45E-03	2.03E-04	1.86E-03
Respiratory effects — kg $PM_{2.5}$ eq	4.56E-05	2.04E-04	4.92E-06	7.70E-07	6.42E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	3.2%	93.3%	0.3%	0.3%	3.0%
Non-carcinogenics — CTU_h	5.5%	87.0%	0.5%	0.8%	6.3%
Ecotoxicity — CTU_e	11.0%	86.7%	1.0%	0.3%	1.0%
Fossil fuel depletion — MJ surplus	2.40E-01	2.33E+00	3.68E-02	6.34E-03	4.45E-02

TRACI v2.1 results per functional unit (foil-faced EcoBatt® and EcoRoll® Insulation - Shasta Lake, CA)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Impact category — Unit					
Global warming — kg CO_2 eq	1.16E-01	9.90E-01	1.89E-02	2.69E-02	2.18E-02
Ozone depletion — kg CFC-11 eq	6.7E-13	2.15E-09	4.22E-17	2.72E-16	6.28E-16
Acidification — kg SO_2 eq	6.04E-04	2.41E-03	9.70E-05	1.60E-05	9.13E-05
Eutrophication — kg N eq	1.87E-04	4.37E-04	8.32E-06	7.43E-06	5.61E-06
Human health damage					
Impact category — Unit					
Smog — kg O_3 eq	6.80E-03	3.77E-02	3.33E-03	2.09E-04	1.78E-03
Respiratory effects — kg $PM_{2.5}$ eq	4.80E-05	1.13E-04	4.74E-06	7.94E-07	6.16E-06
Additional environmental information					
Impact category — Unit					
Carcinogenics — CTU_h	3.5%	93.0%	0.3%	0.3%	2.9%
Non-carcinogenics — CTU_h	6.3%	85.8%	0.5%	0.9%	6.6%
Ecotoxicity — CTU_e	11.4%	86.4%	1.0%	0.3%	0.9%
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- ☑ Product-specific Type III EPD — 1 product

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BREEAM New Construction 2018

Mat 02 - Environmental impacts from construction products

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- ☑ Multi-product specific EPD — 75 points
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SM Transparency Report (EPD) + Material Health Overview

EPD	LCA
3rd-party verified	✓
Transparency Report (EPD)	
3rd-party verified	✓
Validity: 12/12/23 – 12/12/28 KNA - 12122023 - 001	
MATERIAL HEALTH	Material evaluation
Self-declared	✓

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC according to ISO 21930:2017, UL Part A, UL Part B for Building Envelope Thermal Insulation Products and ISO 14025:2006.

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Harmony Environmental, LLC
Registered Product Stewardship Council Sustainability Scorecard Partner

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Contact us

LCA results & interpretation

EcoBatt® and EcoRoll® Insulation

Albion, ME | Inwood, WV | Laredo, TX | Shasta Lake, CA | Shelbyville, IN | EPD addt'l content | Material health

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ◉ Cradle to grave

Application

Thermal and acoustical barriers for energy efficient construction. They can be used in new and retrofit wood and metal frame applications in residential and commercial structures, as well as in manufactured housing. These applications include thermal and acoustical treatments to walls, ceilings, and floors.

Functional unit

Per square meter of installed insulation material, packaging (included), with a thickness that gives an average thermal resistance of R_{si} = $m^2 \cdot K/W$ with a building service life of 75 years.

Reference service life: 75 years when installed per manufacturer's instructions
Reference flow:
Unfaced: 0.546 kg of product with no facer option.
Kraft faced: 0.623 kg of product with kraft facer.
FSK faced: 0.668 kg of product with foil skrim kraft (FSK) facer.
Foil-faced: 0.644 kg of product with foil facer.

A thickness of 0.0398m achieves the functional unit. (ASTM C518)

Manufacturing data

Reporting period: January 2022 – December 2022
Location: Shelbyville, IN

Default installation, packaging, and disposal scenarios

At the installation site, insulation products are unpackaged and installed. Staples may be used to install batts and rolls. The potential impact of the staples is assumed to be negligible since their use is spread out over hundreds of bags of product; therefore, they were not included in the model.

No material is assumed to be lost or wasted. Scraps are typically used to fill corners or crevices. Plastic packaging waste is disposed (5% to recycling, 68% to landfill, and 17% to incineration), and no maintenance or replacement is required over the life of the building. After removal, the insulation is assumed to be landfilled. Insulation and packaging waste are assumed to be transported 100 miles for disposal.

Unfaced product composition and impacts

Material composition greater than 1% by weight

PART	MATERIAL	WT.
Batch	Cullet	45-50%
Batch	Sand	8-10%
Batch	Borates	5-8%
Batch	Soda ash	2-5%
Batch	Feldspar	1-2%
Batch	Limestone	2-5%
Batch	Oxides	<1%
Binder	Water	10-15%
Binder	Sugars	2-5%
Binder	Additives	2-5%
Packaging	Plastic	8-10%

Total impacts by life cycle stages [MPs/per func unit]

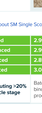
LIFE CYCLE STAGE	MPS/FUNC. UNIT
Raw material acquisition	2.99E-03
Manufacturing	9.26E-03
Transportation	2.97E-04
Installation and maintenance	1.39E-04
Disposal/reuse/recycling	3.75E-04

Total impacts = 1.93E-02mPts per 75 years installed

Information modules:

Included (IN): Excluded (INKD)*

*Module D is also excluded from this system boundary (MND).



What's causing the greatest impacts

All life cycle stages

The manufacturing stage dominates all impact categories except ozone depletion, where the raw material acquisition stage takes precedence. The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage. The impact of the raw material acquisition stage is mostly due to the batch and binder materials. The contributions to outbound transportation are caused by the use of trucks and rail transport. The only impacts associated with installation and maintenance are due to the disposal of packaging waste, which is the smallest contributor of all the stages. At the end of life, insulation is manually removed from the building and landfilled. For all products, waste is dominated by the final disposal of the product. Non-hazardous waste accounts for waste generated during manufacturing and installation.

Raw materials acquisition and transportation

The raw material acquisition stage is the second highest contributor for most impact categories, but ozone depletion potential is almost entirely generated from this stage. The raw materials acquisition stage impact is largely due to the borax, manganese oxide, and soda ash in the batch and the sugars in the binder. Third-party verified ISO 14040/44 secondary LCI data sets contribute more than 80% of the total impacts to ozone depletion.

Manufacturing stage

The manufacturing stage has the most significant contribution to all impact categories, primarily due to the energy required to melt the glass and produce the glass fibers. Since some batch ingredients significantly contribute to the respiratory effects category, they can lead to higher impact results in the raw materials acquisition stage. However, since sand and borax are melted in the oven with the other batch materials, they are not released into the air as fine particulates. Therefore, the calculated potential impacts as shown in the results tables are likely much larger than the actual impacts in the raw material acquisition stage. This implies that the manufacturing stage may have a greater share of the impact than what is displayed in the total impacts by life cycle stage.

Distribution

Outbound transportation is the third highest contributor to smog impacts.

End of life

The end-of-life impacts are largely due to landfilling of the product after it has been removed from the building and transported to a landfill. Since materials are assumed to be landfilled at the end of life rather than incinerated or reused/recycled, no materials are available for energy recovery or reuse/recycling.

Embodied carbon

Embodied carbon can be defined as the cradle-to-gate (A1-A3) global warming potential impacts. The total embodied carbon per functional unit of EcoBatt® and EcoRoll® Insulation manufactured in Shelbyville, IN is as follows: 1.22E+00 kg CO_2 eq for unfaced, 1.25E+00 kg CO_2 eq for kraft-faced, 1.63E+00 kg CO_2 eq for FSK-faced; and 1.45E+00 kg CO_2 eq for foil-faced.

Material composition for other facers

The left four accounts for 10-15%, and the foil and FSK facers account for 15-20% of the total mass per functional unit.

How we're making it greener

Knauf Insulation North America (KINA) is committed to providing products that conserve energy and preserve natural resources.

- Our products with ECOSE® Technology contain a bio-based binder adhesive instead of a fossil fuel-based binder.
- Our fiberglass contains on average over 60% recycled glass, which requires about 20% less energy required to form glass fibers, and results in about 25% reduction in embodied carbon.
- Our glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

See how we make it greener

LCA results

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
	(X) A1 Raw materials (X) A2 Transportation	(X) A3 Manufacturing	(X) A4 Distribution	(X) A5 Installation (X) B1 Use (X) B2 Maintenance (X) B3 Repair (X) B4 Replacement (X) B5 Refurbishment (X) B6 Operational energy use (X) B7 Operational water use	(X) C1 Deconstruction (X) C2 Transportation (X) C3 Waste processing (X) C4 Disposal

SM Single Score Learn about SM Single Score results

	Unfaced	Kraft faced	FSK faced	Foil faced	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Impacts per 1 square meter of insulation material	2.99E-03 mPts	1.12E-02 mPts	3.44E-04 mPts	1.38E-04 mPts	3.75E-04 mPts				
	2.99E-03 mPts	1.12E-02 mPts	3.64E-04 mPts	1.34E-04 mPts	4.49E-04 mPts				
	2.99E-03 mPts	1.12E-02 mPts	3.50E-04 mPts	1.38E-04 mPts	4.50E-04 mPts				
Materials or processes contributing >20% to total impacts in each life cycle stage	Batch material and binder material production.	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to landfill and landfilling of packaging materials.	Transportation to landfill and landfilling of product at end of life.				

TRACI v2.1 results per functional unit (unfaced EcoBatt® and EcoRoll® Insulation - Shelbyville, IN)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Global warming	1.07E-01	1.09E+00	1.60E-02	2.70E-02	1.82E-02
Ozone depletion	8.10E-13	1.15E-13	3.88E-17	2.72E-16	5.23E-16
Acidification	5.79E-04	1.72E-03	8.23E-05	1.61E-05	7.61E-05
Eutrophication	1.99E-04	4.26E-04	7.05E-06	7.45E-06	4.68E-06
Human health damage					
Smog	6.66E-03	3.34E-02	2.82E-03	2.10E-04	1.49E-03
Respiratory effects	4.51E-05	9.22E-05	4.02E-06	7.97E-07	5.13E-06
Additional environmental information					
Carcinogenics	3.6%	93.5%	0.2%	0.3%	2.4%
Non-carcinogenics	6.9%	85.8%	0.4%	0.3%	6.5%
Ecotoxicity	11.8%	86.4%	0.8%	0.3%	0.8%
Fossil fuel depletion	2.52E-01	1.92E+00	3.01E-02	6.56E-03	3.55E-02

TRACI v2.1 results per functional unit (kraft-faced EcoBatt® and EcoRoll® Insulation - Shelbyville, IN)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Global warming	1.04E-01	1.53E+00	1.96E-02	2.61E-02	2.27E-02
Ozone depletion	7.85E-13	2.82E-09	4.38E-17	2.64E-16	6.55E-16
Acidification	5.61E-04	3.70E-03	1.08E-04	1.56E-05	9.53E-05
Eutrophication	1.89E-04	5.40E-04	8.63E-06	7.20E-06	5.86E-06
Human health damage					
Smog	6.45E-03	5.64E-02	3.45E-03	2.03E-04	1.86E-03
Respiratory effects	4.37E-05	2.34E-04	4.92E-06	7.70E-07	6.43E-06
Additional environmental information					
Carcinogenics	3.0%	93.8%	0.2%	0.2%	2.6%
Non-carcinogenics	5.1%	88.2%	0.4%	0.7%	5.6%
Ecotoxicity	10.4%	87.6%	0.9%	0.3%	0.9%
Fossil fuel depletion	2.44E-01	2.65E+00	3.68E-02	6.34E-03	4.45E-02

TRACI v2.1 results per functional unit (foil-faced EcoBatt® and EcoRoll® Insulation - Shelbyville, IN)

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/ REUSE/ RECYCLING
Ecological damage					
Global warming	1.10E-01	1.34E+00	1.89E-02	2.69E-02	2.18E-02
Ozone depletion	8.26E-13	2.19E-09	4.22E-17	2.72E-16	6.28E-16
Acidification	5.90E-04	2.53E-03	9.70E-05	1.60E-05	9.13E-05
Eutrophication	1.99E-04	5.11E-04	8.32E-06	7.43E-06	5.61E-06
Human health damage					
Smog	6.79E-03	4.63E-02	3.33E-03	2.09E-04	1.78E-03
Respiratory effects	4.60E-05	1.45E-04	4.74E-06	7.94E-07	6.16E-06
Additional environmental information					
Carcinogenics	3.3%	93.6%	0.2%	0.3%	2.6%
Non-carcinogenics	5.8%	87.3%	0.4%	0.8%	5.7%
Ecotoxicity	10.8%	87.3%	0.8%	0.3%	0.8%
Fossil fuel depletion	2.57E-01	2.69E+00	3.55E-02	6.54E-03	4.26E-02

References

LCA Background Report
Knauf Insulation North America and Manson Insulation Products LCA Background Report (public version), Knauf Insulation North America (KINA) 2023; developed using the TRACI v2.1 and CML impact assessment methodologies, and LCA for Experts modeling software.

ISO 14025, "Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services"

ISO 21930:2017 served as the core PCR along with UL Part A.

UL Part A: Life Cycle Assessment Calculation Rules and Report Requirements v4.0
March, 2022. PCR review conducted by Linda Bush, PhD, Chair (Athena Sustainable Materials Institute), lindb.bush@athenasmi.org; Hugues Imbault-Tétreault (Groupe AGECO); and Jack Geibig (Ecoform).

UL Part B: Building Envelope Thermal Insulation EPD Requirements, v2.0
April, 2018. PCR review conducted by Thomas Gloria, PhD, Chair (Industrial Ecology Consultants) (gloria@industrial-ecology.com); Christoph Koffler, PhD (thinkstep); Andre Desjarlais (Oak Ridge National Laboratory).

UL Environment General Program Instructions v2.4, July 2018 (available upon request)

Download PDF SM Transparency Report / EPD

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that provide information on the life cycle environmental impacts of manufactured products sold on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPDs 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 explained in ISO 21930:2017 paragraphs 8.3.3.3 and 9.2 and 9.3. Comparisons between Insulation albeits 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.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

Environmental product declarations

- ✓ Industry-wide (generic) EPD — 1 product
- ✓ Product-specific Type III EPD — 1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1

Building product disclosure and optimization

Environmental product declarations

- ✓ Industry-wide (generic) EPD — 1 product
- ✓ Product-specific Type III EPD — 1.5 product

Collaborative for High Performance Schools National Criteria

NIM CS.1 — Environmental Product Declarations

- ✓ Third-party certified type III EPD — 2 point

Green Globes for New Construction and Sustainable Interiors

Materials and resources

- ✓ NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
- ✓ NC 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

BREEAM New Construction 2018

Mat 02 - Environmental impacts from construction products

Environmental Product Declarations (EPD)

- ○ Industry-average EPD — 5 point
- ○ Multi-product specific EPD — 75 points
- ✓ Product-specific EPD — 1 point

SM Transparency Report (EPD)™ + Material Health Overview™

EPD LCA
3rd-party verified ✓
Transparency Report (EPD)
3rd-party verified ✓
Validity: 12/12/23 - 12/12/28
KNA - 12122023 - 001
MATERIAL HEALTH Material evaluation
Self-declared ✓

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC, according to ISO 21930:2017, UL Part A, UL Part B for Building Envelope Thermal Insulation Products, and ISO 14025:2006.
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Harmony Environmental, LLC
Transparency Verification & Environmental Product Declaration Services
Sound Sustainability, Strong for Harmony

SUMMARY
Insulation
Building Envelope Thermal Insulation (BETI)

Regions; system boundaries
North America; Cradle-to-grave

Functional unit / EIU
1 m^2 installed insulation material, packaging included, with thickness that gives average thermal resistance of R_{si} = $m^2 \cdot K/W$ over an estimated service life (ESL) of 75 years

LCA methodology: TRACI 2.1

LCA software; LCI database
SM LCA Reports v10.7; LCA for Experts (GaBi)

LCIA
In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.

Public LCA:
Knauf Insulation North America and Manson Insulation Products

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Contact us

EPD add'l content

EcoBat® and EcoBoll® Insulation

Albion, MI | Inwood, WV | Lanark, AL | Shasta Lake, CA | Shelbyville, IN

EPD add'l content | Material Health

Scenarios and additional information

EPD add'l content	Value	Unit
Transport to the building site [A4]		
Vehicle type	Truck and trailer	
Fuel type	Diesel	
Average distance from manufacturer to building site	50	km
Capacity utilization	21	%
Bulk density	16.1	kg/m³
Capacity utilization volume factor	1	
Installation into the building [A5]		
Mass of plastic packaging waste	0.0544	kg
Biogenic carbon content of packaging	0	kg CO_2
End of life [C1-C4]		
Assumptions for scenario development	Following manual removal of the insulation, it was assumed to be transported 100 miles to disposal. The PCR prescribes that 100% of the product is landfilled, because no prior waste processing is required.	
Collection process	Collected with mixed construction waste	Unitized: 0.492 kg Diesel; Loose: 0.492 FSK; 0.614 kg Diesel; Blown: 0.492 kg Diesel
Disposal	Product for final disposition in landfill	Unitized: 0.492 kg Diesel; Loose: 0.492 FSK; 0.614 kg Diesel; Blown: 0.492 kg Diesel; Loose: 0.492 FSK; 0.614 kg Diesel; Blown: 0.492 kg Diesel

Technical properties

- EcoBat® is sold in bales. One meter bag contains 5 pallets bags, and each bag contains 10 bales of EcoBat® batts. The dimensions of each EcoBat® batt are 21" (53.34 cm) x 16" (40.64 cm) x 32 – 36" (81.28 cm).
- EcoBoll® is sold in rolls. One meter bag contains 8 pallet bags, and each bag contains 1 roll of EcoBoll. The dimensions of EcoBoll are 39" (99.1 cm) x 16" (40.64 cm) x 32 – 36" (81.28 cm).
- EcoBoll® is sold in rolls. One meter bag contains 8 pallet bags, and each bag contains 1 roll of EcoBoll. The dimensions of EcoBoll are 39" (99.1 cm) x 16" (40.64 cm) x 32 – 62.6" in length.
- ASTM C665, Type II, Class A (unfaced)
- ASTM C665, Type II, Class C (kraft faced)
- ASTM C665, Type III, Class A (unfaced)
- ASTM C665, Type III, Class B (kraft faced)
- ASTM C665, Type III, Class B (foil faced)
- ASTM C665, Type III, Class B (foil faced)

Dimensions/quantities delivered to installation site	Unitized: 0.492 kg FSK; 0.614 kg Blown; Loose: 0.492 FSK; 0.614 kg Blown; Blown: 0.492 kg Blown
ASTM or ANSI product specification	ASTM C665
Corrosion	ASTM C703; Non-combustible
Combustibility	ASTM E136; Non-combustible
Water Vapor Permeance	ASTM E96 • Kraft Faced: 0.3 perms or less • FSK (Foil and Foil Faced): 0.05 perms
Water vapor sorption (by weight)	ASTM E96 • Kraft Faced: 3.5 perms or less • FSK (Foil and Foil Faced): 0.05 perms
Mold growth	ASTM C1338; Pass
Surface burning characteristics (flame spread/smoke developed)	ASTM E84 • Unfaced and flamed-rated FSK facings: 25/50 • Kraft facing with burn and should not be left exposed.

Major system boundary exclusions

- Capital goods and infrastructure; maintenance of operation and support equipment
- Manufacture & transport of packaging materials not associated with the product.
- Human labor and employee transport.
- Building operational energy and water use not associated with final product.

Major assumptions and limitations

- Due to the nature of fibreglass insulation, it is anticipated that it will last for the lifetime of the building, so the reference service life (RSL) is considered to be the same as the building estimated service life (ESL) of 75 years.
- General data sets for material inputs, transport, and energy processing are considered good quality, but actual impacts from material suppliers, transport carriers, and energy processing may vary.
- The impact assessment methodology categories do not represent all possible environmental impact categories.
- Characterization factors used within the impact assessment methodology may contain varying degrees of uncertainty.
- LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Unfaced EcoBat® and EcoBoll® Insulation produced in Albion, MI: LCA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq.	9.97E-01	1.60E-02	2.70E-02	0	0	7.89E-03	0	1.03E-02	**1.22E+00**
Ozone depletion	kg CFC-11 eq.	2.76E-11	3.58E-17	2.71E-16	0	0	1.76E-17	0	5.06E-16	**2.76E-11**
Acidification	kg SO_2 eq.	1.97E-03	8.27E-05	1.24E-04	0	0	3.94E-05	0	1.24E-05	**2.19E-03**
Eutrophication	kg N_e eq.	5.25E-04	7.05E-06	7.45E-06	0	0	2.29E-06	0	2.39E-06	**5.44E-04**
Smog	kg O_3 eq.	3.38E-02	2.82E-03	4.32E-03	0	0	4.93E-04	0	9.91E-04	**3.88E-02**
Respiratory effects	kg $PM_{2.5}$ eq.	1.23E-04	2.42E-06	7.97E-07	0	0	2.93E-07	0	4.29E-06	**1.32E-04**
Additional environmental information										
Carcinogenics	CTUh	96.4%	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	2.9%	**100%**
Non-carcinogenics	CTUh	91.0%	0.5%	1.2%	0.0%	0.0%	0.3%	0.0%	7%	**100%**
Ecotoxicity	CTUe	97.1%	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	1.9%	**100%**
Fossil fuel depletion	MJ surplus	1.99E-00	3.0E-02	6.56E-03	0	0	1.48E-02	0	2.07E-02	**1.99E-00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ LHV	3.72E-00	8.84E-03	1.10E-02	0	0	4.35E-03	0	1.93E-02	**3.76E-00**
Renewable primary resources with energy content used as material	MJ LHV	2.01E-08	7.78E-13	2.57E-12	0	0	-3.60E-13	0	3.84E-12	**2.01E-08**
Non-renewable primary resources used as an energy carrier (fuel)	MJ LHV	1.87E-01	2.27E-01	7.74E-02	0	0	1.12E-01	0	1.65E-01	**1.93E-01**
Non-renewable primary resources with energy content used as material	MJ LHV	7.43E-08	9.05E-10	1.75E-10	0	0	4.45E-10	0	4.10E-10	**7.63E-08**
Secondary materials	kg	2.38E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**2.38E-01**
Renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Recovered energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Use of net fresh water resources	m^3	2.52E-01	3.62E-05	5.97E-05	0	0	1.81E-05	0	2.45E-05	**2.53E-01**
Abiotic depletion potential, fossil	MJ LHV	1.66E-01	2.26E-01	6.07E-02	0	0	1.11E-01	0	1.55E-01	**1.72E-01**
Output flows and waste categories										
Hazardous waste disposed	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-hazardous waste disposed	kg	4.12E-03	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**4.12E-03**
High-level radioactive waste	kg	7.33E-07	6.61E-10	4.56E-09	0	0	3.25E-10	0	2.04E-09	**7.40E-07**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	7.46E-04	5.57E-07	3.83E-06	0	0	2.74E-07	0	1.82E-06	**7.53E-04**
Components for re-use	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Materials for recycling	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Materials for energy recovery	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Exported energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	1.29E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**1.29E-01**
Biogenic carbon emission from product	kg CO_2	8.56E-02	0.00E-00	0.00E-00	0	0	0.00E-00	0	8.45E-04	**8.65E-02**
Biogenic carbon removal from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Calcination carbon emissions	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbonation carbon removals	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**

Kraft-faced EcoBat® and EcoBoll Insulation produced in Albion, MI: LCA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq.	1.01E-00	1.86E-02	2.69E-02	0	0	9.27E-03	0	1.2E-02	**1.07E+00**
Ozone depletion	kg CFC-11 eq.	4.16E-09	4.14E-17	2.72E-16	0	0	2.03E-17	0	5.94E-16	**4.16E-09**
Acidification	kg SO_2 eq.	2.32E-03	9.52E-05	1.60E-05	0	0	2.54E-05	0	6.4E-05	**2.52E-03**
Eutrophication	kg N_e eq.	5.08E-04	8.12E-06	6.04E-06	0	0	2.64E-06	0	2.8E-06	**5.26E-04**
Smog	kg O_3 eq.	3.79E-02	3.27E-03	2.09E-04	0	0	5.79E-04	0	1.17E-03	**4.31E-02**
Respiratory effects	kg $PM_{2.5}$ eq.	1.47E-04	4.65E-06	7.94E-07	0	0	1.09E-06	0	4.94E-06	**1.58E-04**
Additional environmental information										
Carcinogenics	CTUh	95.7%	0.3%	0.4%	0.0%	0.0%	0.2%	0.0%	3.4%	**100%**
Non-carcinogenics	CTUh	89.8%	0.6%	0.6%	0.0%	0.0%	0.3%	0.0%	8.7%	**100%**
Ecotoxicity	CTUe	97.4%	1%	0.3%	0.0%	0.0%	0.6%	0.0%	0.5%	**100%**
Fossil fuel depletion	MJ surplus	2.38E-00	3.48E-02	6.54E-03	0	0	1.74E-02	0	2.42E-02	**2.28E-00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ LHV	5.51E-00	1.02E-02	1.09E-02	0	0	5.1E-03	0	2.26E-02	**5.22E-00**
Renewable primary resources with energy content used as material	MJ LHV	2.04E-05	4.47E-13	2.55E-12	0	0	-4.21E-13	0	4.49E-12	**2.04E-05**
Non-renewable primary resources used as an energy carrier (fuel)	MJ LHV	2.08E-00	2.63E-01	7.02E-02	0	0	1.31E-01	0	1.93E-01	**2.94E-01**
Non-renewable primary resources with energy content used as material	MJ LHV	7.72E-08	1.05E-09	1.74E-10	0	0	5.23E-10	0	4.82E-10	**1.94E-08**
Secondary materials	kg	2.80E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**2.80E-01**
Renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Recovered energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Use of net fresh water resources	m^3	2.75E-01	3.56E-05	5.97E-05	0	0	1.78E-05	0	2.42E-05	**2.75E-01**
Abiotic depletion potential, fossil	MJ LHV	1.98E-01	2.67E-01	6.04E-02	0	0	1.31E-01	0	1.83E-01	**2.05E-01**
Output flows and waste categories										
Hazardous waste disposed	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-hazardous waste disposed	kg	5.08E-03	0.00E-00	0.00E-00	0	0	0.00E-00	0	5.78E-01	**6.29E-01**
High-level radioactive waste	kg	7.92E-07	6.49E-10	4.56E-09	0	0	3.19E-10	0	2.04E-09	**7.99E-07**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	7.70E-04	6.45E-07	3.81E-06	0	0	3.22E-07	0	2.14E-06	**7.77E-04**
Materials for recycling	kg	0.00E-00	0.00E-00	8.92E-03	0	0	0.00E-00	0	0.00E-00	**8.92E-03**
Materials for energy recovery	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Exported energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	2.98E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**2.98E-01**
Biogenic carbon emission from product	kg CO_2	8.20E-02	0.00E-00	0.00E-00	0	0	0.00E-00	0	9.93E-04	**8.30E-02**
Biogenic carbon removal from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Calcination carbon emissions	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbonation carbon removals	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**

FSK-faced EcoBat® and EcoBoll Insulation produced in Albion, MI: LCA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq.	1.44E-00	1.96E-02	2.61E-02	0	0	9.88E-03	0	1.29E-02	**1.51E+00**
Ozone depletion	kg CFC-11 eq.	2.85E-09	4.38E-17	2.64E-16	0	0	2.2E-17	0	6.33E-16	**2.85E-09**
Acidification	kg SO_2 eq.	3.32E-03	1.01E-04	1.55E-05	0	0	2.71E-05	0	6.8E-05	**4.13E-03**
Eutrophication	kg N_e eq.	6.28E-04	8.53E-06	7.22E-06	0	0	2.86E-06	0	2.99E-06	**6.46E-04**
Smog	kg O_3 eq.	5.46E-02	3.45E-03	2.03E-04	0	0	6.17E-04	0	1.25E-03	**6.08E-02**
Respiratory effects	kg $PM_{2.5}$ eq.	2.63E-04	4.92E-06	7.70E-07	0	0	1.16E-06	0	5.27E-06	**2.75E-04**
Additional environmental information										
Carcinogenics	CTUh	96.2%	0.3%	0.3%	0.0%	0.0%	0.2%	0.0%	3.0%	**100%**
Non-carcinogenics	CTUh	92.1%	0.5%	0.8%	0.0%	0.0%	0.2%	0.0%	6.4%	**100%**
Ecotoxicity	CTUe	97.6%	1%	0.3%	0.0%	0.0%	0.6%	0.0%	0.5%	**100%**
Fossil fuel depletion	MJ surplus	2.64E-00	3.68E-02	6.34E-03	0	0	1.85E-02	0	2.59E-02	**2.73E-00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ LHV	7.12E-00	1.08E-02	1.08E-02	0	0	5.45E-03	0	2.41E-02	**7.17E-00**
Renewable primary resources with energy content used as material	MJ LHV	2.12E-05	-8.95E-13	2.48E-12	0	0	-4.51E-13	0	4.80E-12	**2.12E-05**
Non-renewable primary resources used as an energy carrier (fuel)	MJ LHV	2.63E-00	2.78E-01	6.90E-02	0	0	1.40E-01	0	2.06E-01	**2.70E-01**
Non-renewable primary resources with energy content used as material	MJ LHV	8.16E-08	1.11E-09	1.69E-10	0	0	5.57E-10	0	5.14E-10	**8.39E-08**
Secondary materials	kg	2.97E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**2.97E-01**
Renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	6.14E-01	**6.14E-01**
Non-renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Recovered energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Use of net fresh water resources	m^3	2.91E-01	3.62E-05	5.97E-05	0	0	1.81E-05	0	2.45E-05	**2.92E-01**
Abiotic depletion potential, fossil	MJ LHV	2.24E-01	2.68E-01	6.05E-02	0	0	1.32E-01	0	1.9E-01	**3.30E-01**
Output flows and waste categories										
Hazardous waste disposed	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-hazardous waste disposed	kg	5.19E-03	0.00E-00	0.00E-00	0	0	0.00E-00	0	1.02E-01	**1.07E-01**
High-level radioactive waste	kg	8.63E-07	7.80E-10	4.55E-09	0	0	3.90E-10	0	2.44E-09	**8.72E-07**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	8.84E-04	6.57E-07	3.8E-06	0	0	3.29E-07	0	2.18E-06	**8.94E-04**
Components for re-use	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Materials for recycling	kg	0.00E-00	0.00E-00	8.92E-03	0	0	0.00E-00	0	0.00E-00	**8.92E-03**
Materials for energy recovery	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Exported energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	2.98E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**2.98E-01**
Biogenic carbon emission from product	kg CO_2	8.20E-02	0.00E-00	0.00E-00	0	0	0.00E-00	0	9.93E-04	**8.30E-02**
Biogenic carbon removal from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Calcination carbon emissions	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbonation carbon removals	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**

Unfaced EcoBat® and EcoBoll Insulation produced in Inwood, WV: LCA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq.	1.15E-00	1.60E-02	2.70E-02	0	0	7.89E-03	0	1.03E-02	**1.22E+00**
Ozone depletion	kg CFC-11 eq.	1.59E-10	3.58E-17	2.71E-16	0	0	1.76E-17	0	5.06E-16	**1.59E-10**
Acidification	kg SO_2 eq.	2.52E-03	8.27E-05	1.61E-05	0	0	2.92E-05	0	5.46E-05	**2.55E-03**
Eutrophication	kg N_e eq.	6.13E-04	7.05E-06	7.46E-06	0	0	2.29E-06	0	2.39E-06	**6.24E-04**
Smog	kg O_3 eq.	5.28E-02	2.82E-03	2.10E-04	0	0	4.93E-04	0	9.91E-04	**5.73E-02**
Respiratory effects	kg $PM_{2.5}$ eq.	1.75E-04	2.42E-06	7.94E-07	0	0	2.93E-07	0	4.29E-06	**1.81E-04**
Additional environmental information										
Carcinogenics	CTUh	96.2%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	3.0%	**100%**
Non-carcinogenics	CTUh	91.6%	0.5%	0.9%	0.0%	0.0%	0.2%	0.0%	6.4%	**100%**
Ecotoxicity	CTUe	97%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.5%	**100%**
Fossil fuel depletion	MJ surplus	2.57E-00	3.55E-02	6.54E-03	0	0	1.78E-02	0	2.48E-02	**2.76E-00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ LHV	5.26E-00	1.04E-02	1.09E-02	0	0	5.22E-03	0	2.3E-02	**5.31E-00**
Renewable primary resources with energy content used as material	MJ LHV	1.64E-05	-8.63E-13	2.56E-12	0	0	-4.32E-13	0	4.60E-12	**1.64E-05**
Non-renewable primary resources used as an energy carrier (fuel)	MJ LHV	2.49E-00	2.68E-01	7.02E-02	0	0	1.34E-01	0	1.97E-01	**2.95E-01**
Non-renewable primary resources with energy content used as material	MJ LHV	8.68E-08	1.07E-09	1.75E-10	0	0	5.34E-10	0	4.92E-10	**8.91E-08**
Secondary materials	kg	2.86E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**2.86E-01**
Renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-renewable secondary fuels	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Recovered energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Use of net fresh water resources	m^3	2.52E-01	3.62E-05	5.97E-05	0	0	1.81E-05	0	2.45E-05	**2.53E-01**
Abiotic depletion potential, fossil	MJ LHV	1.75E-01	2.26E-01	6.07E-02	0	0	1.11E-01	0	1.55E-01	**1.93E-01**
Output flows and waste categories										
Hazardous waste disposed	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Non-hazardous waste disposed	kg	5.19E-03	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**5.19E-03**
High-level radioactive waste	kg	8.63E-07	7.80E-10	4.56E-09	0	0	3.90E-10	0	2.44E-09	**8.72E-07**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	8.84E-04	6.57E-07	3.8E-06	0	0	3.29E-07	0	2.18E-06	**8.94E-04**
Components for re-use	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Materials for recycling	kg	0.00E-00	0.00E-00	8.92E-03	0	0	0.00E-00	0	0.00E-00	**8.92E-03**
Materials for energy recovery	kg	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Exported energy	MJ LHV	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	1.29E-01	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**1.29E-01**
Biogenic carbon emission from product	kg CO_2	9.14E-02	0.00E-00	0.00E-00	0	0	0.00E-00	0	1.01E-03	**9.24E-02**
Biogenic carbon removal from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from packaging	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Calcination carbon emissions	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbonation carbon removals	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**
Carbon emissions from combustion of waste from renewable sources used in production processes	kg CO_2	0.00E-00	0.00E-00	0.00E-00	0	0	0.00E-00	0	0.00E-00	**0.00E-00**

Unfaced EcoBat® and EcoBoll Insulation produced in Lanark, AL: LCA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq.	1.12E-00	1.60E-02	2.70E-02	0	0	7.89E-03	0	1.03E-02

Respiratory effects	kg $PM_{2.5}$ eq	1.68E-04	4.02E-06	7.97E-07	0	0	0	9.26E-07	0	4.21E-06	**1.78E-04**
Additional environmental information											
Carcinogenics	CTUh	96.2%	0.3%	0.4%	0.0%	0.0%	0.1%	0.0%	2.9%	**100%**	
Non-carcinogenics	CTUh	91.3%	0.5%	1.1%	0.0%	0.0%	0.3%	0.0%	6.8%	**100%**	
Ecotoxicity	CTUe	97.8%	1.0%	0.3%	0.0%	0.0%	0.5%	0.0%	0.4%	**100%**	
Fossil fuel depletion	MJ surplus	2.10E+00	3.01E-02	6.56E-03	0	0	1.48E-02	0	2.07E-02	**2.18E+00**	
Resource use indicators											
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	3.42E+00	8.84E-03	1.10E-02	0	0	4.35E-03	0	1.93E-02	**3.46E+00**	
Renewable primary resources with energy content used as material	MJ, LHV	3.35E-09	-7.31E-13	2.57E-12	0	0	-3.60E-13	0	3.84E-12	**3.35E-09**	
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.18E+01	2.27E-01	7.14E-02	0	0	1.12E-01	0	1.65E-01	**2.24E+01**	
Non-renewable primary resources with energy content used as material	MJ, LHV	7.98E-08	9.05E-10	1.75E-10	0	0	4.45E-10	0	4.10E-10	**8.18E-08**	
Secondary materials	kg	1.80E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**1.80E-01**	
Renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Non-renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Recovered energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Use of net fresh water resources	m^3	2.72E-01	3.07E-05	5.99E-05	0	0	1.51E-05	0	2.04E-05	**2.72E-01**	
Abiotic depletion potential, fossil	MJ, LHV	1.86E+01	2.26E-01	6.07E-02	0	0	1.11E-01	0	1.59E-01	**1.92E+01**	
Output flows and waste category indicators											
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Non-hazardous waste disposed	kg	7.17E-02	0.00E+00	3.70E-02	0	0	0.00E+00	0	4.92E-01	**6.00E-01**	
High-level radioactive waste	kg	1.20E-06	6.61E-10	4.56E-09	0	0	3.25E-10	0	2.04E-09	**1.20E-06**	
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.13E-03	5.57E-07	3.83E-06	0	0	2.74E-07	0	1.82E-06	**1.13E-03**	
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Materials for recycling	kg	0.00E+00	0.00E+00	8.16E-03	0	0	0.00E+00	0	0.00E+00	**8.16E-03**	
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Exported energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Carbon emissions and removals											
Biogenic carbon removal from product	kg CO_2	1.13E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**1.13E-01**	
Biogenic carbon emission from product	kg CO_2	7.32E-02	0.00E+00	0.00E+00	0	0	0.00E+00	0	8.45E-04	**7.40E-02**	
Biogenic carbon removal from packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Biogenic carbon emission from packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Calcination carbon emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Carbonation carbon removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	
Carbon emissions from combustion of waste from renewable sources used in production processes + Carbon emissions from combustion of waste from non renewable sources used in production processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**	

Kraft-faced EcoBatt® and EcoRoll Insulation produced in Inwood, WV: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq	1.21E+00	1.86E-02	2.69E-02	0	0	9.27E-03	0	1.21E-02	**1.28E+00**
Ozone depletion	kg CFC-11 eq	4.26E-09	4.14E-17	2.72E-16	0	0	2.07E-17	0	5.94E-16	**4.26E-09**
Acidification	kg SO_2 eq	3.43E-03	9.52E-05	1.60E-05	0	0	2.54E-05	0	6.41E-05	**3.63E-03**
Eutrophication	kg N eq	7.11E-04	8.16E-06	7.43E-06	0	0	2.69E-06	0	2.81E-06	**7.32E-04**
Smog	kg O_3 eq	6.05E-02	3.27E-03	2.09E-04	0	0	5.79E-04	0	1.11E-03	**6.57E-02**
Respiratory effects	kg $PM_{2.5}$ eq	1.99E-04	4.65E-06	7.94E-07	0	0	1.09E-06	0	4.94E-06	**2.11E-04**
Additional environmental information										
Carcinogenics	CTUh	95.8%	0.3%	0.4%	0.0%	0.0%	0.2%	0.0%	3.3%	**100%**
Non-carcinogenics	CTUh	90.6%	0.6%	1.1%	0.0%	0.0%	0.3%	0.0%	7.5%	**100%**
Ecotoxicity	CTUe	97.6%	1.1%	0.3%	0.0%	0.0%	0.5%	0.0%	0.5%	**100%**
Fossil fuel depletion	MJ surplus	2.45E+00	3.48E-02	6.54E-03	0	0	1.74E-02	0	2.43E-02	**2.53E+00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	5.12E+00	1.02E-02	1.09E-02	0	0	5.11E-03	0	2.26E-02	**5.17E+00**
Renewable primary resources with energy content used as material	MJ, LHV	3.19E-05	-8.47E-13	2.56E-12	0	0	-4.23E-13	0	4.51E-12	**3.19E-05**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.47E+01	2.63E-01	7.12E-02	0	0	1.31E-01	0	1.93E-01	**2.54E+01**
Non-renewable primary resources with energy content used as material	MJ, LHV	8.60E-08	1.05E-09	1.74E-10	0	0	5.23E-10	0	4.82E-10	**8.83E-08**
Secondary materials	kg	2.11E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**2.11E-01**
Renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Non-renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Recovered energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Use of net fresh water resources	m^3	2.73E-01	3.56E-05	5.97E-05	0	0	1.78E-05	0	2.40E-05	**2.73E-01**
Abiotic depletion potential, fossil	MJ, LHV	2.14E+01	2.61E-01	6.05E-02	0	0	1.30E-01	0	1.87E-01	**2.20E+01**
Output flows and waste category indicators										
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Non-hazardous waste disposed	kg	8.43E-02	0.00E+00	3.70E-02	0	0	0.00E+00	0	5.78E-01	**6.99E-01**
High-level radioactive waste	kg	1.30E-06	7.65E-10	4.55E-09	0	0	3.82E-10	0	2.39E-09	**1.30E-06**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.19E-03	6.45E-07	3.81E-06	0	0	3.22E-07	0	2.14E-06	**1.20E-03**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Materials for recycling	kg	0.00E+00	0.00E+00	8.16E-03	0	0	0.00E+00	0	0.00E+00	**8.16E-03**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Exported energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	3.05E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**3.05E-01**
Biogenic carbon emission from product	kg CO_2	7.38E-02	0.00E+00	0.00E+00	0	0	0.00E+00	0	9.93E-04	**7.48E-02**
Biogenic carbon removal from packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Biogenic carbon emission from packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Calcination carbon emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbonation carbon removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbon emissions from combustion of waste from renewable sources used in production processes + Carbon emissions from combustion of waste from non renewable sources used in production processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**

FSK-faced EcoBatt® and EcoRoll Insulation produced in Inwood, WV: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq	1.61E+00	1.96E-02	2.61E-02	0	0	9.88E-03	0	1.29E-02	**1.67E+00**
Ozone depletion	kg CFC-11 eq	2.82E-09	4.38E-17	2.64E-16	0	0	2.21E-17	0	6.33E-16	**2.82E-09**
Acidification	kg SO_2 eq	4.90E-03	1.01E-04	1.55E-05	0	0	2.70E-05	0	6.83E-05	**5.12E-03**
Eutrophication	kg N eq	7.18E-04	8.63E-06	7.20E-06	0	0	2.86E-06	0	2.99E-06	**7.40E-04**
Smog	kg O_3 eq	7.50E-02	3.45E-03	2.03E-04	0	0	6.17E-04	0	1.25E-03	**8.06E-02**
Respiratory effects	kg $PM_{2.5}$ eq	3.07E-04	4.92E-06	7.70E-07	0	0	1.16E-06	0	5.27E-06	**3.19E-04**
Additional environmental information										
Carcinogenics	CTUh	96.2%	0.3%	0.3%	0.0%	0.0%	0.2%	0.0%	3.1%	**100%**
Non-carcinogenics	CTUh	92.3%	0.5%	0.8%	0.0%	0.0%	0.2%	0.0%	6.2%	**100%**
Ecotoxicity	CTUe	97.6%	1.1%	0.3%	0.0%	0.0%	0.5%	0.0%	0.5%	**100%**
Fossil fuel depletion	MJ surplus	2.83E+00	3.68E-02	6.34E-03	0	0	1.85E-02	0	2.59E-02	**2.92E+00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	6.87E+00	1.08E-02	1.06E-02	0	0	5.45E-03	0	2.41E-02	**6.92E+00**
Renewable primary resources with energy content used as material	MJ, LHV	2.11E-05	-8.95E-13	2.48E-12	0	0	-4.51E-13	0	4.80E-12	**2.11E-05**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.94E+01	2.78E-01	6.90E-02	0	0	1.40E-01	0	2.06E-01	**3.01E+01**
Non-renewable primary resources with energy content used as material	MJ, LHV	8.75E-08	1.11E-09	1.69E-10	0	0	5.57E-10	0	5.14E-10	**8.99E-08**
Secondary materials	kg	2.24E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**2.24E-01**
Renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Non-renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Recovered energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Use of net fresh water resources	m^3	2.68E-01	3.76E-05	5.79E-05	0	0	1.89E-05	0	2.55E-05	**2.68E-01**
Abiotic depletion potential, fossil	MJ, LHV	2.52E+01	2.76E-01	5.86E-02	0	0	1.39E-01	0	2.00E-01	**2.58E+01**
Output flows and waste category indicators										
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Non-hazardous waste disposed	kg	8.96E-02	0.00E+00	3.70E-02	0	0	0.00E+00	0	6.14E-01	**7.40E-01**
High-level radioactive waste	kg	1.52E-06	8.09E-10	4.41E-09	0	0	4.07E-10	0	2.55E-09	**1.52E-06**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.52E-03	6.82E-07	3.69E-06	0	0	3.43E-07	0	2.28E-06	**1.52E-03**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Materials for recycling	kg	0.00E+00	0.00E+00	8.16E-03	0	0	0.00E+00	0	0.00E+00	**8.16E-03**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Exported energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	2.55E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**2.55E-01**
Biogenic carbon emission from product	kg CO_2	8.92E-02	0.00E+00	0.00E+00	0	0	0.00E+00	0	1.06E-03	**9.03E-02**
Biogenic carbon removal from packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Biogenic carbon emission from packaging	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Biogenic carbon emission from combustion of waste	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Calcination carbon emissions	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbonation carbon removals	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbon emissions from combustion of waste from renewable sources used in production processes + Carbon emissions from combustion of waste from non renewable sources used in production processes	kg CO_2	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**

Foil-faced EcoBatt® and EcoRoll Insulation produced in Inwood, WV: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	Total
LCIA results										
Global warming	kg CO_2 eq	1.41E+00	1.89E-02	2.69E-02	0	0	9.46E-03	0	1.23E-02	**1.48E+00**
Ozone depletion	kg CFC-11 eq	2.19E-09	4.22E-17	2.72E-16	0	0	2.11E-17	0	6.06E-16	**2.19E-09**
Acidification	kg SO_2 eq	3.79E-03	9.70E-05	1.60E-05	0	0	2.59E-05	0	6.54E-05	**4.00E-03**
Eutrophication	kg N eq	6.99E-04	8.32E-06	7.43E-06	0	0	2.74E-06	0	2.87E-06	**7.21E-04**
Smog	kg O_3 eq	6.60E-02	3.33E-03	2.09E-04	0	0	5.91E-04	0	1.19E-03	**7.13E-02**
Respiratory effects	kg $PM_{2.5}$ eq	2.22E-04	4.74E-06	7.94E-07	0	0	1.11E-06	0	5.05E-06	**2.33E-04**
Additional environmental information										
Carcinogenics	CTUh	96.1%	0.3%	0.3%	0.0%	0.0%	0.2%	0.0%	3.1%	**100%**
Non-carcinogenics	CTUh	91.9%	0.5%	0.9%	0.0%	0.0%	0.2%	0.0%	6.5%	**100%**
Ecotoxicity	CTUe	97.7%	1.0%	0.3%	0.0%	0.0%	0.5%	0.0%	0.5%	**100%**
Fossil fuel depletion	MJ surplus	2.88E+00	3.55E-02	6.54E-03	0	0	1.78E-02	0	2.48E-02	**2.96E+00**
Resource use indicators										
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	5.00E+00	1.04E-02	1.09E-02	0	0	5.22E-03	0	2.31E-02	**5.05E+00**
Renewable primary resources with energy content used as material	MJ, LHV	1.64E-05	-8.63E-13	2.56E-12	0	0	-4.32E-13	0	4.60E-12	**1.64E-05**
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	2.82E+01	2.68E-01	7.12E-02	0	0	1.34E-01	0	1.97E-01	**2.88E+01**
Non-renewable primary resources with energy content used as material	MJ, LHV	9.31E-08	1.07E-09	1.75E-10	0	0	5.34E-10	0	4.92E-10	**9.54E-08**
Secondary materials	kg	2.15E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**2.15E-01**
Renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Non-renewable secondary fuels	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Recovered energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Use of net fresh water resources	m^3	2.79E-01	3.62E-05	5.97E-05	0	0	1.81E-05	0	2.45E-05	**2.79E-01**
Abiotic depletion potential, fossil	MJ, LHV	2.46E+01	2.66E-01	6.05E-02	0	0	1.33E-01	0	1.91E-01	**2.52E+01**
Output flows and waste category indicators										
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Non-hazardous waste disposed	kg	8.61E-02	0.00E+00	3.70E-02	0	0	0.00E+00	0	5.90E-01	**7.13E-01**
High-level radioactive waste	kg	1.34E-06	7.80E-10	4.55E-09	0	0	3.90E-10	0	2.44E-09	**1.35E-06**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.28E-03	6.57E-07	3.81E-06	0	0	3.29E-07	0	2.18E-06	**1.29E-03**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Materials for recycling	kg	0.00E+00	0.00E+00	8.16E-03	0	0	0.00E+00	0	0.00E+00	**8.16E-03**
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Exported energy	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**0.00E+00**
Carbon emissions and removals										
Biogenic carbon removal from product	kg CO_2	2.19E-01	0.00E+00	0.00E+00	0	0	0.00E+00	0	0.00E+00	**2.19E-01**
Biogenic carbon emission from product	kg CO_2	7.97E-02	0.00E+00	0.00E+00	0	0	0.00E+00	0	1.01E-03	**8.07E-02**

AstraZeneca PLC and Subsidiaries Consolidated and Combined Statements of Income (Unaudited)

($ in millions, except per share amounts)	2Q 2020	2Q 2019	Change	1H 2020	1H 2019	Change
Product sales	$ 5,711	$ 4,966	15%	$ 10,964	$ 9,614	14%
Royalty income	74	67	10%	142	134	6%
Collaboration income	19	18	6%	37	35	6%
Total revenue	$ 5,804	$ 5,051	15%	$ 11,143	$ 9,783	14%
Cost of sales	(1,154)	(1,000)	15%	(2,214)	(1,940)	14%
Selling and marketing expenses	(1,386)	(1,270)	9%	(2,660)	(2,480)	7%
Additional commercial manufacturing costs	(50)	(40)	25%	(96)	(80)	20%
Amortisation of intangible assets	(1,000)	(1,000)	0%	(2,000)	(2,000)	0%
Impairment charges	(1,000)	(1,000)	0%	(2,000)	(2,000)	0%
Research and development expenses	(1,000)	(1,000)	0%	(2,000)	(2,000)	0%
Exchange losses	(1,000)	(1,000)	0%	(2,000)	(2,000)	0%
Other operating income	1,000	1,000	0%	2,000	2,000	0%
Operating profit	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Finance expense, net	(1,000)	(1,000)	0%	(2,000)	(2,000)	0%
Profit before tax	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Tax expense	(1,000)	(1,000)	0%	(2,000)	(2,000)	0%
Profit for the period	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Profit attributable to non-controlling interests	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Profit attributable to owners of the parent	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Profit for the period	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Other comprehensive income						
Items that will not be reclassified to profit or loss						
Items that may be reclassified to profit or loss						
Other comprehensive income for the period, net of tax						
Total comprehensive income for the period	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Total comprehensive income attributable to non-controlling interests	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Total comprehensive income attributable to owners of the parent	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Total comprehensive income for the period	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Profit attributable to non-controlling interests	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Profit attributable to owners of the parent	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Profit for the period	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Earnings per share						
Basic earnings per share	$ 1.00	$ 1.00	0%	$ 2.00	$ 2.00	0%
Diluted earnings per share	$ 1.00	$ 1.00	0%	$ 2.00	$ 2.00	0%
Weighted average shares outstanding						
Basic	1,000	1,000	0%	2,000	2,000	0%
Diluted	1,000	1,000	0%	2,000	2,000	0%
Additional information						
Research and development expenditure	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Adjusted profit attributable to owners of the parent	$ 1,000	$ 1,000	0%	$ 2,000	$ 2,000	0%
Adjusted earnings per share	$ 1.00	$ 1.00	0%	$ 2.00	$ 2.00	0%

LCA & material health results & interpretation

EcoBatt® and EcoRoll® Insulation

Albion, MI | Inwood, WV | Lanett, AL | Shasta Lake, CA | Shelbyville, IN | EPD add'l content | Material health

Evaluation programs

Declare

Declare labels are issued to products disclosing ingredient inventory, sourcing and end of life options. Declare labels are based on the Manufacturers Guide to Declare, administered by the International Living Future Institute.

How it works

Material ingredients are inventoried and screened against the Living Building Challenge (LBC) Red List which represents the 'worst in class' materials, chemicals, and elements known to pose serious risks to human health and the greater ecosystem.

The Health Product Declaration®

The HPD Open Standard provides a consistent, and transparent format to accurately disclose the material contents and associated hazard classifications for a building product.

How it works

Material ingredients are screened and categorized according to the hazards that international governmental bodies and toxicology experts have associated with them, based on two listings:

- Authoritative lists maintained or recognized by government bodies
- Screening lists, which include chemicals that government bodies determined need further scrutiny, as well as chemical lists not recognized by any government body.

Assessment scope and results

Declare™

Inventory threshold: 100ppm

Declare level:
The Declare product database and label are used to select products that meet the LBC's stringent materials requirements, streamlining the materials specification and certification process.

- LBC Red List Free
- LBC Red List Approved
- Declared

Click the label to see the full declaration.

EcoBatt® Unfaced | **EcoBatt® Kraft Faced** | **EcoBatt® Foil Faced**

What's in this product and why

Declare level

Unfaced and kraft faced products do not have Red List chemicals. The Red List is a list of chemicals that are not allowed in Living Building Challenge buildings. Being Red List free is our design benchmark at Knauf Insulation North America.

EcoBatt utilizes a bio-based binder chemistry derived from corn that is formaldehyde-free and more interior friendly than phenol-formaldehyde (P/F) systems. This product transformed the industry, moving away from P/F systems and toward bio-based binder adhesive systems for wall and ceiling batt products.

What's in the product and why

The ingredients of most EcoBatt® variants avoid the 800+ chemicals of the Living Building Challenge Red List. This is primarily because of its bio-based binder adhesive chemistry known as ECOSE® Technology. ECOSE is based on dextrose or high fructose corn syrup instead of phenol and formaldehyde. Dextrose and fructose can be used interchangeably. The ECOSE binder allows the product to be validated by the UL Environment as formaldehyde-free. Formaldehyde is a Red List chemical.

EcoBatt Products with foil scrim kraft (FSK) facers do not meet Red List free status because the facer contains a halogenated fire retardant (HFR).

Red List free is our development benchmark and we constantly challenge ourselves on elimination of Red List chemicals. An HFR is used on the FSK variant because the product is for exposed applications and must meet stringent fire performance requirements.

We are very aware of the concerns associated with HFRs and continually work with vendors on this issue. At the same time, fire performance is critical and current events relating to fire performance of building materials only support the importance of fire-safe products.

What's been done in the design and manufacture in consideration of the potential human health impacts in the use stage

The primary ingredient in this product is recycled glass. While recycled content may vary from year to year, the recycled content is currently greater than 60% by weight. The second largest content is silica sand which is sourced as locally as possible. The third largest ingredient is corn-based syrup (dextrose or fructose). As a result of using plant-based binders, the VOC profile of this product is very interior friendly.

The emission from our factories is also much better for our communities. We ensure our glass formulations have no serious health concerns by allowing our processes to be audited to meet European Certification Board for Mineral Wool Products (EUCEB) biosolubility requirements.

Where it goes at the end of its life

At this time, the product is landfilled at end of life. We take extended producer responsibility very seriously and have active programs to address end of life. There is no option other than landfills at this time.

How we're making it healthier

Knauf engages very closely with its vendors to eliminate and avoid chemicals of concern. No competitor has as many Red List free products as Knauf Insulation. We continually reduce our environmental impacts through recycled content and optimize our products by designing them to be transformative.

See how we make it greener

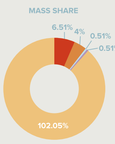
Health Product Declaration®

EcoBatt® (FSK Faced)

Full disclosure known hazards: Yes

Based on the selected content inventory threshold:

✔ Characterized ✔ Screened ○ Identified



GreenScreen® List Translator Scores

- List Translator Likely Benchmark 1 / Benchmark 1
- List Translator Possible Benchmark 1
- List Translator Benchmark Unknown
- Benchmark 2
- Benchmark 3
- Benchmark 4
- No GS data available

Learn about the GreenScreen® List Translator

Total VOC Content

VOC Content data is not applicable for this product category.

References

Declare

ECOBATT UNFACED
ECOBATT KRAFT FACED
KNAUF ECOBATT(R) FOIL FACED BATTS & ROLLS

Manufacturer's Guide to Declare
A comprehensive guide providing information about the program, the assessment methodology, how to submit material data to obtain a Declare label and how they are used to meet the Health & Happiness and Materials Petals of the Living Building Challenge.

Health Product Declaration®
EcoBatt (FSK Faced)

Health Product Declaration Open Standard v2.2
The standard provides guidance to accurately disclose the material contents of a building product using a standard, consistent, and transparent format.

Rating systems

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization
Material Ingredients
Credit value options — 1 product each
✔ 1. Reporting ○ 2. Optimization ○ 3. Supply Chain Optimization

LEED BD+C: New Construction | v4.1 - LEED v4.1
Materials and resources
Material Ingredients
Credit value options — 1 product each
✔ 1. Reporting ○ 2. Optimization ○ 3. Supply Chain Optimization

Living Building Challenge
Materials petals imperatives
✔ 10. Red List Free ○ 12. Responsible Industry ○ 13. Living Economy Sourcing

WELL Building Standard®
Air and Mind Features
✔ **X07** Materials Transparency
○ **X08** Materials Optimization

Collaborative for High Performance Schools National Criteria
EQ C7.1 Material Health Disclosures
✔ Performance Approach — 2 points
✔ Prescriptive Approach — 2 points

SM Transparency Report (EPD)™ + Material Health Overview™

EPD	LCA
3rd-party verified	✔
Transparency Report (EPD)	
3rd-party verified	✔

Validity: 12/12/23 – 12/12/28
KNA – 12122023 – 001

MATERIAL HEALTH	Material evaluation
Self-declared	✔

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC, according to ISO 21930:2017; UL Part A; UL Part B for Building Envelope Thermal Insulation Products; and ISO 14025:2006.

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(913) 780-3328

Harmony Environmental, LLC
Management • Analysis • Communication
Beyond Sustainability, Striving for Harmony

SUMMARY

Reference PCR
UL Part B: Building Envelope Thermal Insulation v2.0

Regions; system boundaries
North America; Cradle-to-grave

Functional unit / ESL:
1 m^2 Installed insulation material, packaging included, with thickness that gives average thermal resistance of R_{ci} = 1m^2·K/W over an estimated service life (ESL) of 75 years

LCIA methodology: TRACI 2.1

LCA software; LCI database
LCA for Experts v10.7; LCA for Experts 2023

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.

Public LCA:
Knauf Insulation North America and Manson Insulation Products

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317 398 4434

Contact us

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How we make it greener

EcoBatt® and EcoRoll® Insulation

Collapse all

RAW MATERIALS ACQUISITION

Utilize recycled content

By leveraging recycled content, we reduce the energy required to form glass fibers.

- We use about 10 railcars of recycled glass per day.

MANUFACTURING

Lead green chemistry efforts

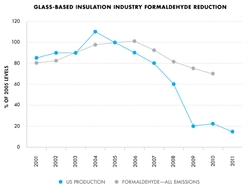
Following the launch of our ECOSE® Technology in 2008, we had transformed most of our products and processes to this new technology. Using our bio-based ECOSE® Technology has removed phenol and formaldehyde from our stack emissions. This initiative not only established Knauf Insulation North America in a leadership position, but it had a transformative impact on our industry in general.

Reduce scrap generation and energy consumption

Continuous improvement is the methodology we utilize to engage the entire Knauf team in our manufacturing excellence and sustainability journey.

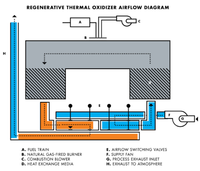
Knauf Insulation, comprised of Knauf Insulation North America (KINA) and Knauf Insulation Europe, Middle East, Asia, Asia Pacific (KI EMEA & APAC), share an overall global certification for ISO 45001 Health & Safety, ISO 14001 Environmental, ISO 50001 Energy, and ISO 9001 Quality through a third-party Certification Body.

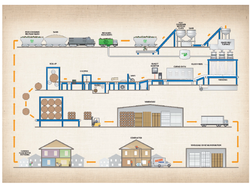
Our Continuous Improvement Program, with all its tools and systems associated with it, provide a formal process where we are constantly monitoring our manufacturing and sustainability Key Performance Indicators (KPIs) with an eye towards improvement. This Continuous Improvement centric management system has proven to be effective in improving our sustainability by reducing scrap generation and energy consumption.



Green manufacturing Processes

Regenerative thermal oxidizers We use regenerative thermal oxidizers (RTO) to capture and recycle much of the energy we use to cure our products. RTO is equipment used for the treatment of exhaust air. Our ovens exhaust into a ceramic heat exchange media to capture and reuse the heat in the exhausted air. Therefore, the amount of energy required to cure our product is reduced substantially.

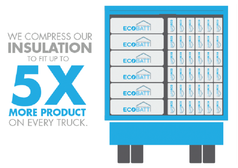




TRANSPORTATION

Leverage compression packaging

Glass is a high modulus material, which helps to facilitate compression packaging. We compress our insulation to fit up to five times more product on every truck, thereby reducing the amount of deliveries that need to be made, which saves time and emissions from transportation.



INSTALLATION AND MAINTENANCE

Be confident in glass fiber's safety

In the past, a label regarding the carcinogenic potential of insulation made from glass fibers was required on all packaging. Following forty years of research, fiberglass has been exonerated entirely. Our fiberglass is comprised of fibers that are biosoluble, meaning that the fibers dissolve in the body in a short period of time and exit the body with normal bodily functions. The scrutiny fiberglass has undergone is now seen as proof of its safety.

Meet and exceed green standards

GREENGUARD certified On the forefront of indoor air quality, Knauf Insulation North America had the first GREENGUARD certified product in 2002. This achievement led us to understand the impact our formaldehyde-free products could have on the indoor environment. The formaldehyde-free claim is third party validated by UL Environment.

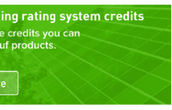
3rd Party UL Environmental Claim Validation states that Knauf Insulation products manufactured in North America contain an average of 61% recycled content, consisting of 20% post-consumer and 41% pre-consumer recycled glass.

EUCEB tested Glass fiber is a widely studied building material. All of our processes and formulations are voluntarily third-party audited for compliance with the health and safety exoneration criteria for glass and rock based fiber through the European Certification Board for Mineral Wool Products (EUCEB) exoneration process. This guarantees the formulations are biosoluble and pose no health concerns. Having over 35 years of research behind its safety, fiberglass products have been thoroughly evaluated and therefore we believe it is one of the safest building materials available today.

Green building rating systems

Our products offer a vast array of potential credits for major green building rating systems, including: WELL, LEED v4, International Green Construction Code, Green Guide for Heath Care, NAHB Green Building Standard, and more.

Visit the green building rating systems page to see all the credits you can earn using Manson and Knauf Insulation products



DISPOSAL

Promote Recycling

By taking a comprehensive approach of the benefits of recycling, Knauf Insulation North America advocates and promotes local recycling initiatives as well as actively participates in state and local government policy development. In addition, as a member of the North American Insulation Manufacturers Association (NAIMA) and Glass Recycling Coalition (GRC), we encourage regulatory and legislative initiatives that focus on glass recycling infrastructure deployment to increase the availability of post-consumer recycled glass.

GLASS RECYCLING COALITION MEMBER glassrecycles.org

SM Transparency Report (EPD)™ + Material Health Overview™

EPD	LCA
3rd-party verified	✔
Transparency Report (EPD)	
3rd-party verified	✔

Validity: 12/12/23 – 12/12/28
KNA – 12122023 – 001

MATERIAL HEALTH	Material evaluation
Self-declared	✔

This environmental product declaration (EPD) was externally verified by Harmony Environmental, LLC. according to ISO 21930:2017; UL Part A: UL Part B for Building Envelope Thermal Insulation Products; and ISO 14025:2006.

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Harmony Environmental, LLC
Management • Analysis • Communication
Beyond Sustainability. Striving for Harmony

SUMMARY

Reference PCR
UL Part B: Building Envelope Thermal Insulation v2.0

Regions; system boundaries
North America; Cradle-to-grave

Functional unit / ESL:
1 m^2 installed insulation material, packaging included, with thickness that gives average thermal resistance of R_{si} = 1$m^2 \cdot K/W$ over an estimated service life (ESL) of 75 years

LCIA methodology: TRACI 2.1

LCA software; LCI database
LCA for Experts v10.7; LCA for Experts 2023

In accordance with ISO 14044 and the reference PCR, this life cycle assessment was conducted by Sustainable Minds and verified by Harmony Environmental, LLC.

Public LCA:
Knauf Insulation North America and Manson Insulation Products

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