ENVIRONMENTAL PRODUCT DECLARATION

BLOWING WOOL FIBERGLASS INSULATION

INSULSAFE SP®, INSULSAFE XC®, TRUECOMFORT®, OPTIMA®

CertainTeed's Premium Blowing Wool is a fiber glass insulation designed for use in new and retrofit, open (attic) and closed (sidewalls/floor) cavity applications in both residential and commercial construction as a thermal and sound absorbing insulation.

CertainTeed Corporation is the leading North American manufacturer of interior building materials including gypsum, ceilings, and insulation as well as exterior building materials including roofing, vinyl siding, trim, fence, railing, and decking products.

All CertainTeed insulation products improve building energy efficiency, helping to lower energy costs throughout the life of the structure. A typical pound of fiber glass like CertainTeed's Blowing Wool Insulation saves 12 times as much energy in its first year in place as the energy used to produce it. Then, it continues to conserve energy for the life of the building with no additional maintenance required. Blowing Wool Insulation can also improve overall occupant comfort through the reduced noise and privacy of increased acoustical performance.

For more, visit:
www.certainteed.com/insulation

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ENVIRONMENTAL PRODUCT DECLARATION
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ENVIRONMENTAL PRODUCT DECLARATION

CertainTeed
SAINT-GOBAIN

Blowing Wool Fiberglass Insulation
InsulSafe SP®, InsulSafe XC®, TrueComfort®, and OPTIMA®

According to ISO 14025, ISO 21930:2017, and EN 15804

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environement
DECLARATION HOLDER	CertainTeed Insulation
DECLARATION NUMBER	4788647002.102.1
DECLARED PRODUCT	Blowing Wool Fiberglass Insulation: InsulSafe SP®, InsulSafe XC®, TrueComfort®, and OPTIMA®
REFERENCE PCR	UL Part B for Building Envelope Thermal Insulation v. 2.0 April 2018
REFERENCE PCR STANDARD	x EN 15804 (2012) ☐ ISO 21930 (2007) x ISO 21930 (2017)
DATE OF ISSUE	January 1, 2019
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications

The PCR review was conducted by:	UL Environment PCR Peer Review Panel Chair: Thomas Gloria, PhD
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine James Mellentine , Ramboll

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Product Definition and Information

Description of Company

CertainTeed manufacturing facilities that produce Blowing Wool Insulation and are included in this EPD are:

Athens, GA	Chowchilla, CA	Kansas City, KS
425 Athena Drive	17775 Ave 23½	103 Funston Rd
Athens, GA 30601	Chowchilla, CA 93610	Kansas City, KS 66115

CertainTeed Insulation has well-established Environmental, Health, and Safety (EHS) and product stewardship programs, which help to enforce proper evaluation and monitoring of chemicals chosen to manufacture products. These programs ensure that all environmental and OSHA requirements are met or exceeded to ensure the health and safety of all employees and contractors. Each of the manufacturing facilities used in this assessment have ISO 9001 quality and ISO 14001 environmental management systems in place.

Product Description

CertainTeed is dedicated to Building Responsibly™ with fiber glass insulation products that are engineered, produced, and shipped with a commitment to minimizing environmental impact and improving energy savings. CertainTeed Blowing Wool Insulation is made of fiber glass that consists of renewable content, a high percentage of recycled glass that is noncombustible, noncorrosive, and odor-free. CertainTeed Blowing Wool Insulation will not settle, contains no chemicals to cause mildew and fungus growth, contains no formaldehyde or asbestos, provides no sustenance for vermin, won't rot or decay, and will not absorb moisture. Blowing Wool insulation R-values 11-68 are included in this EPD.

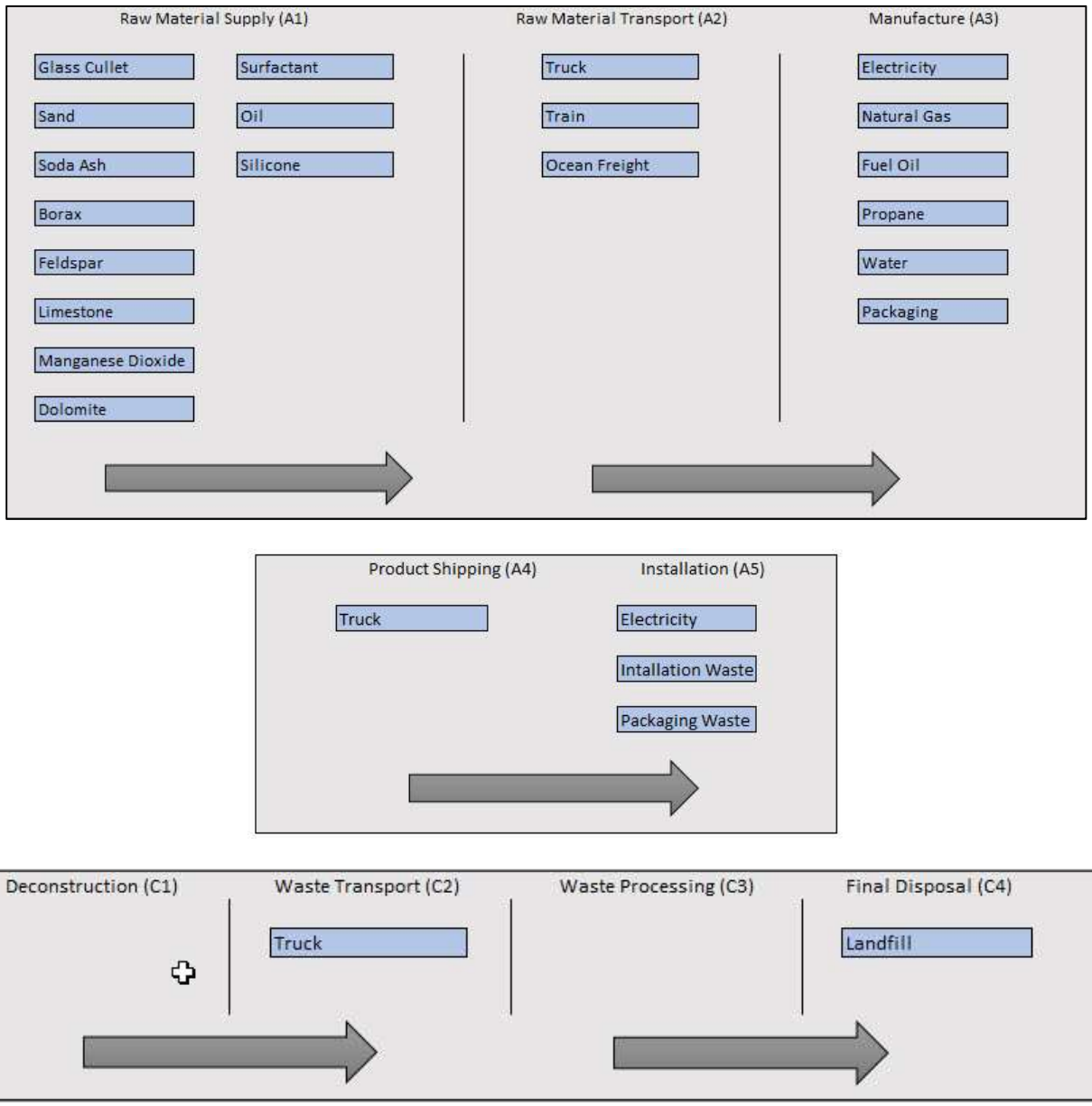
Features and Benefits

CertainTeed Blowing Wool is ideal for open (attic) and closed (floor/sidewall) construction cavities in residential and commercial settings. Our blowing wool product may be used in retrofit applications.

- Made in the USA
- Excellent sound control
- Won't settle
- Noncombustible
- Noncorrosive
- Won't rot or decay
- Won't absorb moisture or support fungas growth
- Made with recycled content (Green Circle Certified)
- Helps create a healthy indoor environment (GREEN GUARD certified)
- Durable, easy to install
- Zero maintenance

Product Flow Diagram

Figure 1: Main Production Processes for Blowing Wool Insulation



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Product Average

The Athens, Chowchilla, and Kansas City facilities are the only locations that produce the Blowing Wool Fiberglass Insulation for CertainTeed in the United States. However, the Blowing Wool Insulation is not the only product produced at these locations. Allocation of the product average was conducted based on the production mass data provided by the facilities as a percentage of the overall production mass at each facility.

Application and Uses

Blowing Wool Insulation is for residental and commercial use. InsulSafe SP, InsulSafe XC, and TrueComfort are fiberglass blowing insulation used as thermal and sound absorbing insulation. It is designed for pneumatic installation in open (attic) and closed (sidewall/floor) construction cavities. It may be used in retrofit applications. OPTIMA gives buildings a custom-designed, seamless, thermally efficient, sound-reducing blanket that completely fills any void. OPTIMA fiber glass insulation is blown behind a special OPTIMA fabric, or equivalent, (excluded from the scope of this study) in new construction. The OPTIMA product is designed for pneumatic installation in closed-cavity applications only.

CertainTeed Blowing Wool Insulation is available in a variety of R-values ranging from 11-68 with blown-in thicknesses ranging from 3.5 to 21.75 inches.

Methodological Framework

This is a cradle-to-grave EPD, with the use phase benefits reported separately as required by the product category rule.

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Technical Requirements

Table 1: Technical Requirements for Blowing Wool Fiberglass Insulation

	InsulSafe SP	InsulSafe XC	TrueComfort	OPTIMA
Model Building Codes				
ICC	X		X	X
New York City MEA 218-85M	X		X	
New York State NYS UFPBC Article 15	X		X	
California quality standards	X		X	X
Minnesota quality standards	X		X	
National Building Code of Canada 2005 & 2010		X	X	
Material Standards				
ASTM C764 – Mineral Fiber Loose-Fill Thermal Insulation Type 1	X		X	X
ASTM C518 and C687 – Thermal resistance	X	X	X	X
ASTM E970 – Critical Radiant flux	X		X	X
ASTM E136 – Combustion characteristics	X		X	X
ASTM C1104 – Water vapor sorption	X	X	X	X
ASTM C1304 – Odor emission	X		X	X
ASTM C764 – Corrosiveness	X	X	X	X
ASTM C1338 – Fungi resistance	X	X	X	X
ASTM E90 and E413	X		X	
GREEN GUARD Gold certified	X	X	X	X
CAN/ULC-S702-09-Type 5		X	X	
CAN/ULC-S702 6.3.2		X	X	
Fire Resistance				
UL 723	X		X	
ASTM E84	X		X	X
CAN/ULC-S102.2		X	X	X
Max Flame Spread Index	5	0	5	25
Max Smoke Developed Index	5	5	5	50
ASTM E136 – Noncombustibility	X	X	X	X
CAN/ULC-S114 – Noncombustibility		X		

Product Delivery Properties

Blowing Wool Insulation is delivered to the site of installation compressed in packaging.

Material Composition

Table 2: Blowing Wool Insulation Product Specifications

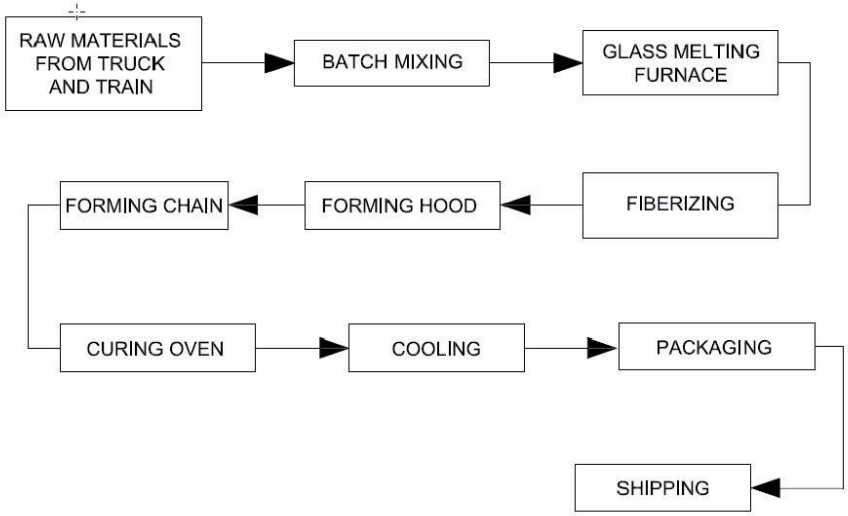
Component	Weight Percent	Recycled Resource	Mineral Resource	Origin	Transportation Distance (km)
Glass Batch					
Cullet	10% - 50%	Y		North America	50 - 700
Sand	10% - 50%		Y	North America	100 - 400
Soda Ash	5% - 15%		Y	North America	400 - 3000
Borates	10% - 15%		Y	North America and Turkey	300 – 11,000
Feldspar	10% - 20%		Y	North America	100 - 300
Limestone	<5%		Y	North America	200 - 2000
Manganese Dioxide	<1%		Y	North America	450 - 3500
Sodium Sulfate	<1%			North America	200 - 500
Sodium Nitrate	<1%			China	7,000 – 10,000
Fuel Oil	<1%			North America	50 - 150
Additives					
Surfactant	<1%			North America	50 - 2500
Oil	<2%			North America	500 – 2500
Silicone	<1%			North America	500 - 2500

The main components of the blowing insulation are the fiberglass and additives, with the fiberglass comprising at least 97% of the product. Fiberglass is primarily made from a variety of inorganic minerals.

Manufacturing

To produce blowing wool insulation, the glass component raw materials are melted and formed into the final product. The additive component raw materials are mixed and injected into the process, after which the product with the combined components is cured, cooled, and then packaged.

Figure 2: Manufacturing Processes for Blowing Wool Insulation



Packaging

The product is packaged in a plastic bags, paper labels are affixed, then the packages are stacked, and the stack is wrapped in stretch wrap before final shipping

Transportation

Final products are transported on trucks throughout North America via standard freight trailers. An average distance of 1100 miles (1770 km) was used for this study.

Installation

All CertainTeed Blowing Wool Insulation products are made for easy handling and installation. When installed with pneumatic equiment, thermal performances will be achieved at the thicknesses, weights, and coverage quantified in the specification sheet.

When blowing, keep the hose level, and install with a minimum of hand deflection. Always blow with, no across, the joists, as shown in Figure 2.

Figure 2: Installation of blowing wool in open cavity application

The OPTIMA Insulation requires installation behind OPTIMA fabric, or equivalent, and is not suitable for attic open blow applications. For closed cavity application, the non-woven fabric should always be covered with a building material suitable to meet building code.

Figure 3: Installation of blowing wool in closed cavity application

Health, Safety, and Environmental Aspects during Installation

Fiber glass insulation may cause temporary skin and respiratory irritation. During installation it is recommended that eye protection, disposable dust masks, gloves, hats, long sleeves and long pants are worn.

Use

During its service life, insulation significantly reduces the energy use in a building, reducing the overall impact on the environment. The environmental benefits of the use-phase of insulation can be significant, and the exclusion of such benefits would severely underestimate the benefits that insulation has on the environment. The energy savings benefits of Blowing Wool Insulation are reported separately.

Once installed Blowing Wool Insulation requires no maintenance, repair, replacement, or refurbishment.

Reference Service Life

The Reference Service Life of Blowing Wool Insulation is 75 years, which is also the Estimated Building Service Life.

Re-Use Phase

At this time there are no scenarios for re-use or recycling of blowing wool insulation at the end of its useful life.

Disposal

Blowing Wool Insulation is usually deconstructed and loaded onto a truck or dumpster at the decomissioning of a building. The product is modeled as being disposed of in a landfill. There are currently no end-of-life recycling programs formally established across the industry.

Extraordinary Effects

There are no extraordinary effects or environmental impacts associated with the destruction of Sustainable Insulation by fire, water, or mechanical destruction.

LCA Calculation

Functional Unit

Environmental impacts are reported per functional unit of a product and the functional unit is the basis for comparison in an LCA. For building insulation, the functional unit is defined as 1 m^2 of installed insulation material with a thinckness that gives an average thermal resistance RSI = 1 m^2K/W and with a buildind service life of 75 years (packaging included).

Table 3: Functional Unit

	Value	Unit
Functional Unit	1 m^2 of insulation with a thickness that gives an average thermal resistance RSI = 1 m^2K/W	
Mass	0.574	kg
Thickness to achieve Functional Unit	4.483 11.387 0.114	in cm m

Scaling Factors

Scaling factors can be used to determine the impacts of each R-value of blowing wool insulation. The scaling factors are based on the mass and thickness of the CertainTeed Blowing Wool Insulation products produced in the United States and can be used to determine the impacts for each R-value based on the functional unit. To calculate the environmental impact potentials per square meter of product, simply multiply the results presented for the base functional unit RSI 1 value by the scaling factor shown for the specific R-value.

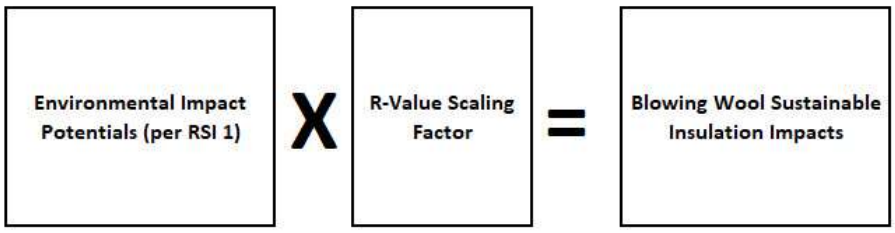


Table 4: Open Attic Blowing Wool Insulation Scaling Factors (U.S.)

Application	Product	R-Value	Thickness	Scaling Factor
Open Attic Application – U.S.	InsulSafe SP®	R-11	11.43 cm (4.5 in)	1.43
		R-13	13.34 cm (5.25 in)	1.66
		R-19	19.05 cm (7.5 in)	2.38
		R-22	21.59 cm (8.5 in)	2.69
		R-26	25.4 cm (10 in)	3.17
		R-30	29.21 cm (11.5 in)	3.65
		R-38	36.83 cm (14.5 in)	4.60
		R-44	41.91 cm (16.5 in)	5.23
		R-49	46.36 cm (18.25 in)	5.79
		R-60	55.25 cm (21.75 in)	6.90
	TruComfort®	R-11	12.45 cm (4.9 in)	1.55
		R-13	14.48 cm (5.7 in)	1.81
		R-19	20.83 cm (8.2 in)	2.60
		R-22	23.62 cm (9.3 in)	2.95
		R-26	27.43 cm (10.8 in)	3.42
		R-30	31.24 cm (12.3 in)	3.90
		R-38	38.61 cm (15.2 in)	4.82
		R-44	43.94 cm (17.3 in)	5.48
		R-49	48.26 cm (19 in)	6.02
		R-60	57.79 cm (22.75 in)	7.21

Table 5: Open Attic Blowing Wool Insulation Scaling Factors (Canada)

Application	Product	R-Value	Thickness	Scaling Factor
Open Attic Application – Canada	InsulSafe XC®	R-12	11.43 cm (4.5 in)	1.66
		R-16	15.24 cm (6 in)	2.21
		R-20	18.8 cm (7.4 in)	2.73
		R-24	22.61 cm (8.9 in)	3.28
		R-28	22.42 cm (10.4 in)	3.83
		R-30	28.7 cm (11.3 in)	4.16
		R-32	30.23 cm (11.9 in)	4.39
		R-36	34.04 cm (13.4 in)	4.94
		R-40	37.85 cm (14.9 in)	5.49
		R-44	41.66 cm (16.4 in)	6.04
		R-48	45.47 cm (17.9 in)	6.60
		R-50	47.5 cm (18.7 in)	6.89
		R-52	49.28 cm (19.4 in)	7.15
		R-56	53.09 cm (20.9 in)	7.70
		R-60	56.64 cm (22.3 in)	8.22
	TruComfort® CAN	R-12	11.43 cm (4.5 in)	1.66
		R-16	15.24 cm (6 in)	2.21
		R-20	18.8 cm (7.4 in)	2.73
		R-24	22.61 cm (8.9 in)	3.28
		R-28	22.42 cm (10.4 in)	3.83
		R-30	28.7 cm (11.3 in)	4.16
		R-32	30.23 cm (11.9 in)	4.39
		R-36	34.04 cm (13.4 in)	4.94
		R-40	37.85 cm (14.9 in)	5.49
		R-44	41.66 cm (16.4 in)	6.04
		R-48	45.47 cm (17.9 in)	6.60
		R-50	47.5 cm (18.7 in)	6.89
		R-52	49.28 cm (19.4 in)	7.15
		R-56	53.09 cm (20.9 in)	7.70
		R-60	56.64 cm (22.3 in)	8.22

Table 6: Closed Cavity Blowing Wool Scaling Factors

Application	Product	R-Value	Thickness	Scaling Factor
Closed Cavity Application	InsulSafe SP®	R-14	8.89 cm (3.5 in)	2.97
		R-15	8.89 cm (3.5 in)	3.97
		R-22	13.97 cm (5.5 in)	4.67
		R-23	13.97 cm (5.5 in)	5.45
		R-24	13.97 cm (5.5 in)	7.01
		R-29	18.42 cm (7.25 in)	6.16
		R-31	18.42 cm (7.25 in)	8.22
		R-38	23.5 cm (9.25 in)	9.17
		R-40	23.5 cm (9.25 in)	11.79
		R-45	28.58 cm (11.25 in)	9.56
		R-48	28.58 cm (11.25 in)	12.76
		R-55	33.66 cm (13.25 in)	13.14
		R-56	33.66 cm (13.25 in)	14.07
	TruComfort®	R-15	8.89 cm (3.5 in)	4.96
		R-23	13.97 cm (5.5 in)	7.79
		R-31	18.42 cm (7.25 in)	10.27
	OPTIMA®	R-14	8.89 cm (3.5 in)	2.97
		R-15	8.89 cm (3.5 in)	3.72
		R-21	13.97 cm (5.5 in)	4.67
		R-24	13.97 cm (5.5 in)	7.02
		R-29	18.42 cm (7.25 in)	6.16
		R-31	18.42 cm (7.25 in)	8.22
		R-40	24.13 cm (9.5 in)	10.77
		R-50	30.16 cm (11.875 in)	13.46
		R-59	35.56 cm (14 in)	15.87
		R-68	40.64 cm (16 in)	18.14

System Boundary

The life cycle analysis for the production of blowing wool insulation comprises the life cycle stages from cradle-to-grave. It begins with the production of blowing wool insulation (extraction of raw materials, product manufacturing and packaging), product shipping, installation and use, and end-of-life stages.

Table 7: System Boundary for Blowing Wool Insulation LCA

Description of the System Boundary (X=included in LCA: MND=module not declared)																
Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits & Loads Beyond System Boundaries
Raw Material Supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-construction demolition	Transport	Waste Processing	Disposal	Reuse-Recover-Recycling Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	MND	MND	X	X	X	X	MND

Assumptions

Life cycle assessment requires that assumptions are made to constrain the project boundary or model processes when little to no data is available. In this study of Blowing Wool Insulation, the following asumptions were made:

- 35% water evaporation rate during production
- Truck transportation of manufacturing waste to landfill 50 miles
- 0.003 kWh of energy used for installation using pneumatic equipment
- 1% installation waste, since installers commonly use scrap pieces to fill other gaps such that very little scrap remains

Cut-Off Rules

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories, for that a documented assumption is admissible.

For hazardous substances, as defined by the U.S. Resource Conservation and Recovery Act (RCRA), the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria since no known processes were neglected or excluded from this analysis. Capital items for the production processes (machines, buildings, etc.) were not taken into consideration.

Data Sources and Quality

For the data used in this LCA, the data quality is considered to be of good quality. The data and data sets cover all relevant process steps and technologies over the supply chain of the represented Blowing Wool Insulation products. The majority of secondary data sets are from the Thinkstep GaBi 8.2 database, with additional inputs from USLCI and Ecoinvent v3 when necessary. Wherever secondary data are used, the study adopts critically reviewed data where ever possible for consistency, precision, and reproducibliity to limit uncertainty. The data used are complete and representative of North America in terms of geographic and technological coverage and is of a recent vintage, i.e. ess than ten years old.

Period Under Review

The data used in the study refer to the production processes of the Athens, GA, Chowchilla, CA, and Kansas City, KS facilities from January 2017 through December 2017.

Allocation

Energy and water allocation for this study were based on the production mass volume at each facility. All three faciliities produce blowing wool insulation. Results were calculted based on a weighted average of the facilities.

LCA Scenarios and Additional Technical Information

Table 8: Transport to the Building Site (A4)

Transport to the Building Site	Unit	Value
Fuel type	-	Diesel
Liters of fuel	l/100km	30
Vehicle type	-	Standard Freight Trailer
Transport Distance	km	1770
Capacity utilization	%	40
Gross density of product transported	kg/m^3	144.3

Table 9: Installation into the Building (A5)

Installation into the Building	Unit	Value
Ancillary materials	kg	0
Net freshwater consumption	m^3	0
Other resources	kg	0
Electricity consumption	kWh	0.003
Other energy carriers	MJ	0
Product loss per functional unit	kg	0.020
Waste materials at the construction site before waste processing, generated by product installation	kg	0
Output materials resulting from on-site waste processing	kg	0
Biogenic carbon contained in packaging	kg CO_2	n/a
Direct emissions to ambient air, soil, and water	kg	0
VOC content	mg/m^3	< 0.22

Table 10: Reference Service Life

Parameter	Unit	Value
RSL	Years	75
Declared product properties		Thermal fiberglass insulation
Design application parameters	-	N/A
An assumed quality of work wen installed in accordance with manufacturer's instructions	-	N/A
Outdoor environment	-	N/A
Indoor environment	-	N/A
Use conditions	-	Interior use only
Maintenance	-	None required

Table 11: Maintenance (B2)

Parameter	Unit	Value
Maintenance process information	-	None required
Maintenance cycle	Number/RSL	0
Maintenance cycle	Number/ESL	0
New freshwater consumption	m^3	0
Ancillary materials	kg	0
Other resources	kg	0
Energy input	kWh	0
Other energy carriers	kWh	0
Power output of equipment	kW	0
Waste materials from maintenance	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions	-	N/A

Table 12: Repair (B3)

Parameter	Unit	Value
Repair process information	-	None required
Inspection process information	-	None required
Repair cycle	Number/RSL	0
Repair cycle	Number/ESL	0
Net freshwater consumption	m^3	0
Ancillary materials	kg	0
Energy input	kWh	0
Waste materials from repair	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions	-	N/A

Table 13: Replacement (B4)

Parameter	Unit	Value
Replacement cycle	Number/RSL	0
Replacement cycle	Number/ESL	0
Energy input	kWh	0
New freshwater consumption	m^3	0
Ancillary materials	kg	0
Replacement of worn parts	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions	-	N/A

Table 14: Refurbishment (B5)

Parameter	Unit	Value
Refurbishment process description	-	None required
Replacement cycle	Number/RSL	0
Replacement cycle	Number/ESL	0
Energy input	kWh	0
Net freshwater consumption	m^3	0
Material input for refurbishment	kg	0
Waste material	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions	-	N/A

Table 15: End of Life (C1-C4)

Parameter		Unit	Value
Assumptions for scenario development		-	Deconstruction by hand, disposal inert in landfill transported by truck
Collection process	Collected separately	kg	1.865
	Collected with mixed construction waste	kg	0
Recovery	Reuse	kg	0
	Recycling	kg	0
	Landfill	kg	0
	Incineration	kg	0
	Incinerations with energy recovery	kg	0
	Energy conversion efficiency rate	-	0
Disposal	Product or material for final deposition	kg	1.865
	Removals of biogenic carbon (excluding packaging)	kg CO_2	0

LCA Results

Use of Material and Energy Resources

Table 16: Primary Energy & Material Resource Use for Sustainable Blowing Wool Insulation

Parameter	Unit	Blowing Wool Insulation
RPR_E: Renewable primary energy used as energy carrier (fuel)	MJ	1.52E+00
RPR_M: Renewable primary resources with energy content used as material	MJ	1.36E-02
RPR_T: Total use of renewable primary resources with energy content	MJ	1.53E+00
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ	2.22E+01
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ	2.56E-04
$NRPR_T$: Total use of non-renewable primary resources with energy content	MJ	2.22E+01
SM: Secondary materials	kg	7.21E-01
RSF: Renewable secondary fuels	MJ	0.00E+00
NRSF: Non-renewable secondary fuels	MJ	0.00E+00
RE: Recovered energy	MJ	0.00E+00
FW: Use of net fresh water resources	m^3	8.01E-03

Figure 3: Renewable Energy by Source for Blowing Wool Insulation

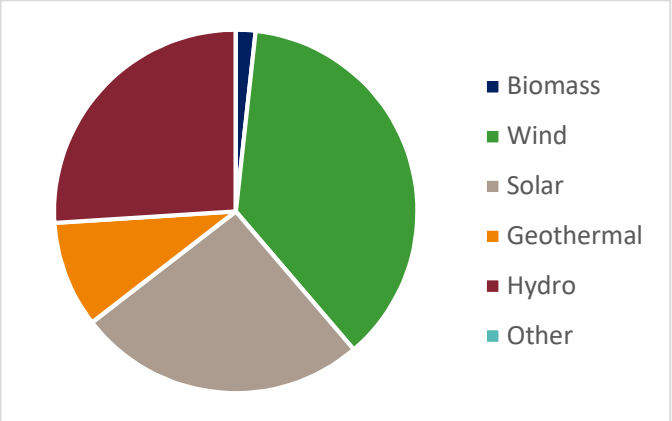


Figure 4: Non-Renewable Energy by Source for Blowing Wool Insulation

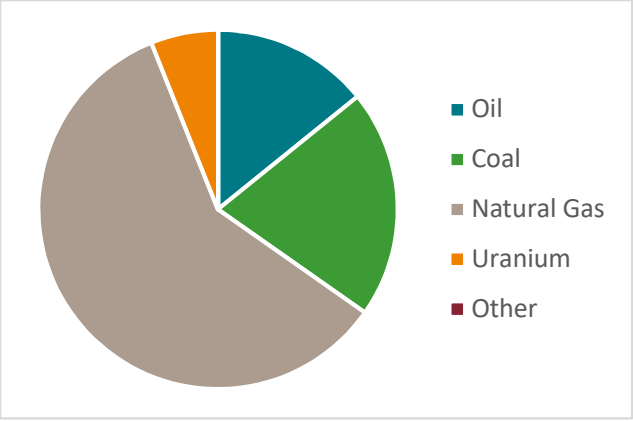
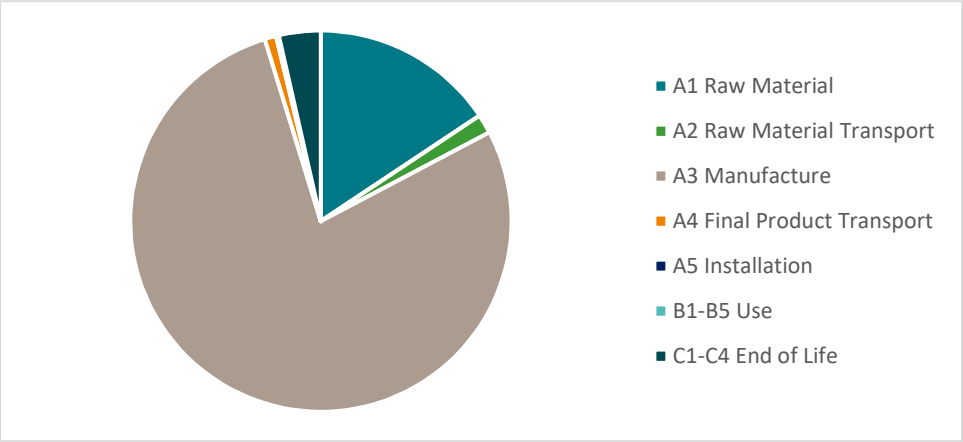


Figure 5: Primary Energy by Life Cycle Stage for Blowing Wool Insulation



Output Flows and Waste Categories

Table 17: Output Flows and Waste Categories for Blowing Wool Insulation

Parameter	Unit	Blowing Wool Insulation
Hazardous waste disposed	kg	2.72E-08
Non-hazardous waste disposed	kg	6.89E-01
High level radioactive waste, conditioned, to final repository	kg	4.95E-04
Intermediate and low level radioactive waste, conditioned, to final repository	kg	0.00E+00
Components for re-use	kg	0.00E+00
Materials for recycling	kg	0.00E+00
Materials for energy recovery	kg	0.00E+00
Exported energy	MJ	0.00E+00

Life Cycle Impact Assessment

Table 18: TRACI Environmental Impact Potentials for Blowing Wool Insulation (North America)

Impact Category	Unit	Raw Materials	Raw Material Transport	Manufacture	Final Product Shipping	Installation	End of Life Transport	End of Life Disposal
		A1	A2	A3	A4	A5	C2	C4
GWP (T)	kg CO_2 eq	2.41E-01	3.56E-02	1.01E+00	7.55E-02	1.41E-02	3.43E-03	2.56E-02
ODP (T)	kg CFC 11 eq	2.02E-08	3.10E-13	1.26E-10	6.69E-13	2.03E-10	3.04E-14	3.92E-13
AP (T)	kg SO_2 eq	1.14E-03	2.85E-04	1.80E-03	3.52E-04	3.78E-05	1.60E-05	1.17E-04
EP (T)	kg N eq	1.90E-04	1.75E-05	1.82E-04	2.90E-05	3.47E-06	1.32E-06	5.96E-06
POCP (T)	kg O_3 eq	1.19E-02	7.85E-03	3.07E-02	1.16E-02	6.46E-04	5.29E-04	2.32E-03
ADP_{fossil} (T)	MJ	3.00E-01	6.73E-02	1.85E+00	1.44E-01	2.46E-02	6.53E-03	5.04E-02

Table 19: CML Environmental Impact Potentials for Blowing Wool Insulation (Europe)

Impact Category	Unit	Raw Materials	Raw Material Transport	Manufacture	Final Product Shipping	Installation	End of Life Transport	End of Life Disposal
		A1	A2	A3	A4	A5	C2	C4
GWP (C)	kg CO_2 eq	2.42E-01	3.58E-02	1.01E+00	7.57E-02	1.42E-02	3.44E-03	2.58E-02
ODP (C)	kg CFC 11 eq	1.95E-08	2.92E-13	1.19E-10	6.29E-13	1.96E-10	2.86E-14	3.69E-13
AP (C)	kg SO_2 eq	1.07E-03	2.34E-04	1.67E-03	2.62E-04	3.46E-05	1.19E-05	1.08E-04
EP (C)	kg (PO4)3 eq	1.66E-04	4.53E-05	2.53E-04	7.03E-05	4.89E-06	3.20E-06	1.39E-05
POCP (C)	kg ethane eq	7.62E-05	1.89E-05	1.40E-04	2.69E-05	2.79E-06	1.22E-06	9.29E-06
$ADP_{elements}$ (C)	kg Sb eq	8.60E-05	6.02E-09	4.14E-07	1.29E-08	8.64E-07	5.88E-10	1.05E-08
ADP_{fossil} (C)	MJ	3.23E+00	5.00E-01	1.54E+01	1.07E+00	2.10E-01	4.85E-02	3.93E-01

Figure 6: TRACI Environmental Impact Potentials for Blowing Wool Insulation (North America)

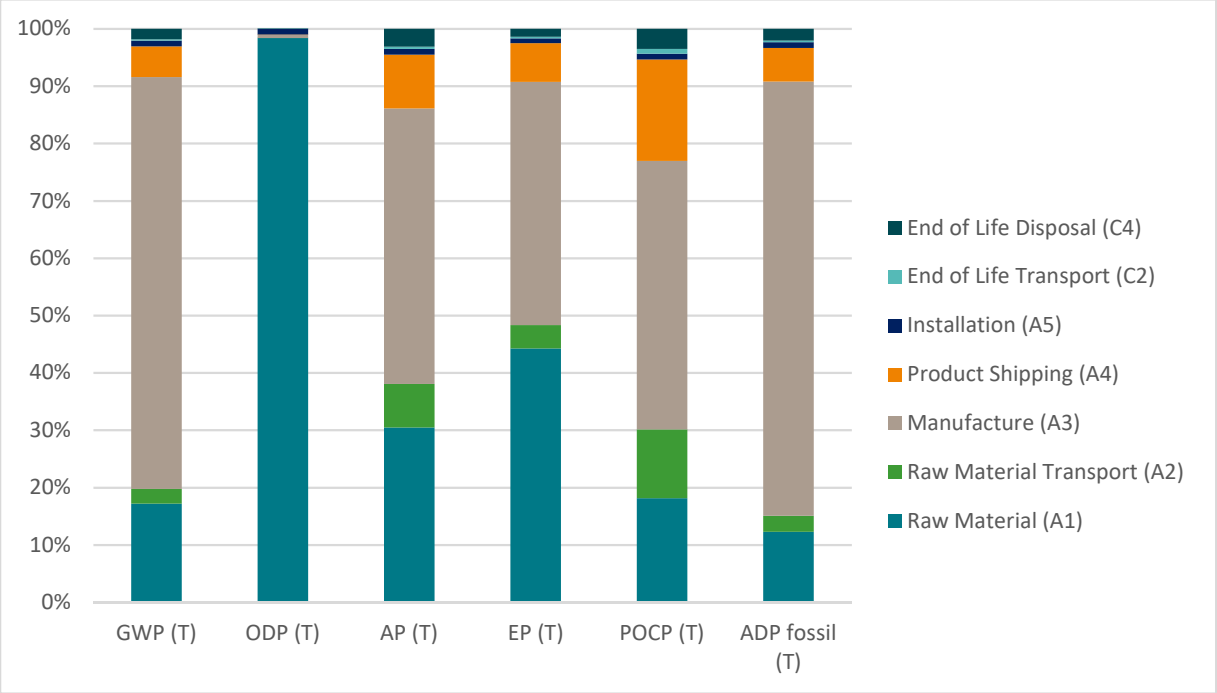
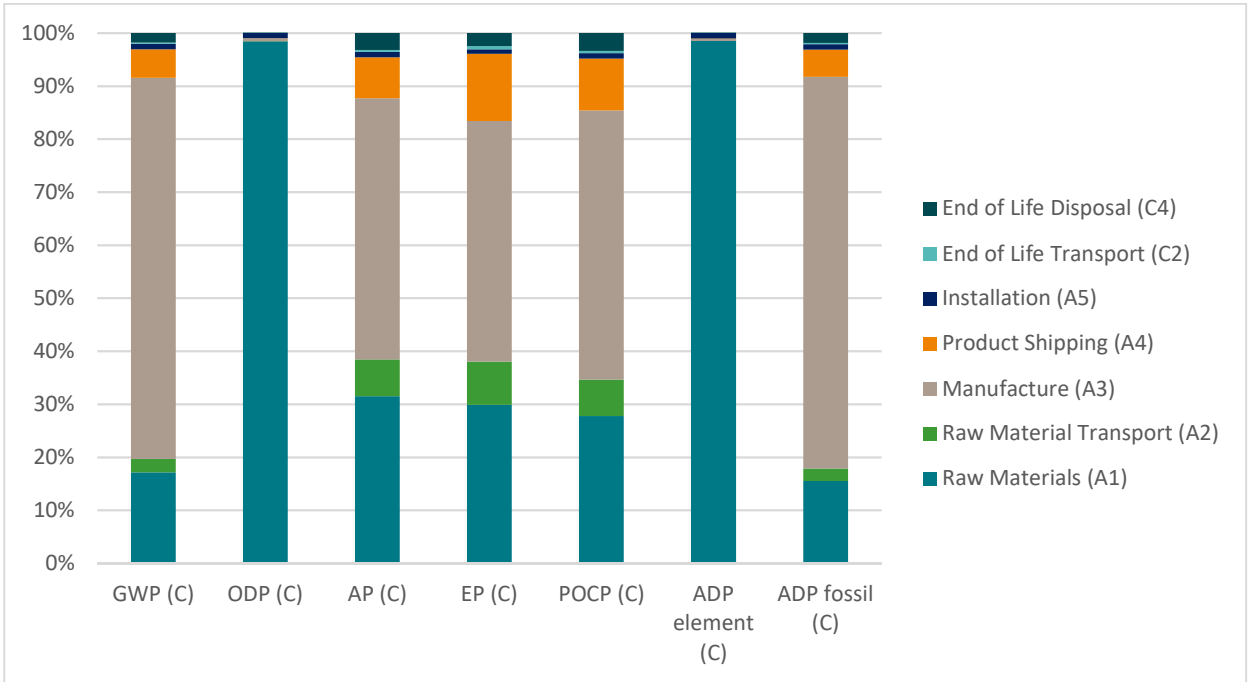


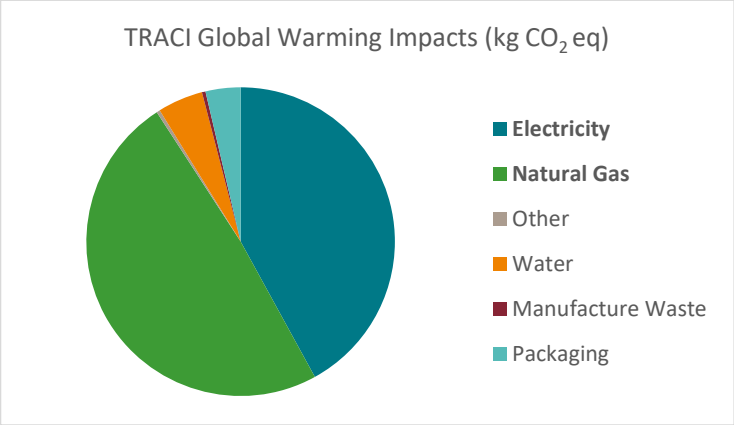
Figure 7: CML Environmental Impact Potentials for Blowing Wool Insulation (Europe)



LCA Interpretation

The life cycle impacts are strongly driven by the manufacturing process, Module A3. This is due to the high energy use needed for the melting of the glass used in the fiberglass process.

Figure 8: Global Warming Impacts within the Manufacture (A3) process for Blowing Wool Insulation



Optional Environmental Information

- GREENGUARD Gold Certification
- Green Circle Certified
- National Green Building Standard certified by the Home Innovation Research Center
- CertainTeed is an Energy Star Seal and Insulate Preferred Product

Building Use Stage Benefits

Blowing Wool Insulation requires no additional energy or maintenance in order to perform during the service life. In addition, insulation reduces the energy burden associated with heating and cooling a building. To demonstrate the use stage benefits of CertainTeed Blowing Wool Insulation, an energy analysis was conducted using the Home Energy Saver (HES) web-based energy audit tool developed by the U.S. Department of Energy's Lawrence Berkeley National Laboratory. The cities analyzed were Houston, TX, Richmond, VA, and Minneapolis, MN. The following table shows the projected annual and 75 year use phase whole house energy savings and global warming savings when installing CertainTeed Blowing Wool Insulation in a two-story, 2400 square foot house.

Table 20: Use Stage Analysis for Blowing Wool Insulation

	Houston, TX	Richmond, VA	Minneapolis, MN
Annual Energy Savings (MJ)	4.01E+04	4.19E+04	1.60E+05
Annual Global Warming Savings (kg CO_2 eq)	2.94E+03	5.47E+03	8.87E+03
Energy Savings over 75 year Use Phase (MJ)	3.01E+06	3.15E+06	1.20E+07
Global Warming Savings over 75 year Use Phase (kg CO_2 eq)	2.20E+05	4.10E+05	6.66E+05
Total Life Cycle Energy for Insulation Used (MJ)	2.58E+04	2.58E+04	2.58E+04
Total Life Cycle Global Warming Potential for Insulation Used (kg CO_2 eq)	1.53E+03	1.53E+03	1.53E+03
Overall Energy Savings (MJ)	2.98E+06	3.12E+06	1.20E+07
Overall Global Warming Savings (kg CO2 eq)	2.19E+05	4.09E+05	6.64E+05

References

- Product Category Rules for Building-Related Product and Services: Part A – Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2 2018. UL Environment.
- Product Category Rule Guidance for Building Related Products and Services: Part B – Building Envelope Thermal Insulation EPD Requirements. Version 2.0, 2018. UL Environment.
- ISO 14040: 2006 Series – Environmental Management – Life Cycle Assessment
- ISO 21930:2017 – Sustainability in building construction – Environmental declaration of building products
- EN 15804 – Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products
- Home Energy Saver, US. Department of Energy: http://hes.lbl.gov/
- ASTM Standard Specification C553 – 11 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- ASTM Standard Specification C665 – 12 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
- ASTM Standard Specification E84 – 12 Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM Standard Specification E790 – 08 Standard Test Method for Residual Moisture in a Refuse-Derived Fuel Analysis Sample
- ASTM Standard Specificiation E136 – 12 Standard Tesh Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
- ASMT Standard Specification C518-10 Standard Test Method for Steady-State Thermal Transmission properties of means of Heat Flow Meter Apparatus

LCA Development

This EPD and the corresponding LCA were prepared by Saint-Gobain North America in Malvern, PA

Contact CertainTeed

For more information, please visit http://www.certainteed.com/insulation