Environmental Product Declaration

Blowing Wool Fiberglass Insulation

CERTAINTEED INSULATION

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 and fiber cement 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 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.

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

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ENVIRONMENTAL PRODUCT DECLARATION
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ENVIRONMENTAL PRODUCT DECLARATION

CertainTeed
SAINT-GOBAIN

Blowing Wool Insulation – InsulSafe®SP, TrueComfort®, UltraComfort®, OPTIMA®, InsulSafe® XC

According to ISO 14025

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 Environment
DECLARATION HOLDER	CertainTeed Insulation Group
DECLARATION NUMBER	4786083511.108.1
DECLARED PRODUCT	Blowing Wool Fiberglass Insulation- InsulSafe® SP, TrueComfort®, UltraComfort®, OPTIMA®, InsulSafe® XC
REFERENCE PCR	PCR Building Envelope Thermal Insulation v1.2

DATE OF ISSUE	November 11, 2013
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 was approved by Panel
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This declaration was independently verified by Underwriters Laboratories in accordance with ISO 14025 ☐ INTERNAL ☒ EXTERNAL	
	Paul Firth
This life cycle assessment was independently verified by in accordance with ISO 14044 and the reference PCR	
	Tom Gloria

Environment

InsulSafe SP UltraComfort
OPTIMA TrueComfort
InsulSafe XC

Product Definition and Information

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 insulation is made of fiber glass that consists of 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.

The functional unit of the products reported in this document is 1 square meter of insulation material with a thickness that provides an average thermal resistance R_{SI}= 1 m^2K/W (R_{US}=5.68) with a building service life of 60 years.

Product Line

Manufacturing Locations

CertainTeed manufacturing facilities that produce blowing wool insulation are:

Athens, GA Plant	Chowchilla, CA Plant
425 Athena Drive, Athens, GA 30601	17775 Ave 23 1/2, Chowchilla, CA 93610

These facilities provided the primary data for this assessment and the results are based on the weighted average of production.

Features and Benefits

CertainTeed Blowing Wool is ideal for open (attic) and closed (floor/sidewalls) construction cavities in residential and commercial settings. Our blowing wool products 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 fungus growth
- Made with recycled content (GreenCircle Certified)
- Helps create a healthy indoor environment (GREENGUARD certified)
- Durable, easy to install, zero maintenance
- Contributes to LEED® points

Application and Uses

CertainTeed blowing wool fiberglass insulation is for residential and commercial use. InsulSafe® SP, TrueComfort®, UltraComfort® and InsulSafe® XC are fiberglass blowing insulation used as thermal and sound absorbing insulation. It is designed for pneumatic installation in open (attic) and closed (sidewalls/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. This product is designed for pneumatic installation in closed-cavity applications only.

Installation

All CertainTeed blowing wool products are made for easy handling and installation. When installed with pneumatic equipment, 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, not across, the joists, as shown in Figure 1.

Figure 1- Installation of blowing wool in open cavity application.

The OPTIMA System requires that OPTIMA insulation be pneumatically installed 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 2. 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.

Material Content

Table 1. Specification of product construction

Component	Weight Percent	Recycled Resource	Mineral Resource	Renewable	Origin	Transportation Distance (km)
Glass Batch						
Cullet	25% - 50%	Y			North America	50 - 1000
Sand	15% - 50%		Y		North America	150 - 350
Soda Ash	<15%		Y		North America	100 - 3,000
Borates	<15%		Y		North America	300 - 3,000
Quicklime	<10%		Y		North America	100 - 500
Manganese Dioxide	<2%		Y		North America	700 - 3,200
Feldspar	<25%		Y		North America	100 - 350
Add-ons						
Mineral Oil	<2%			Y	North America	150 - 750
Silanes	<2%			Y	North America	100 – 2,200
Antistat	<2%			Y	North America	200 - 300

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

Manufacturing Process

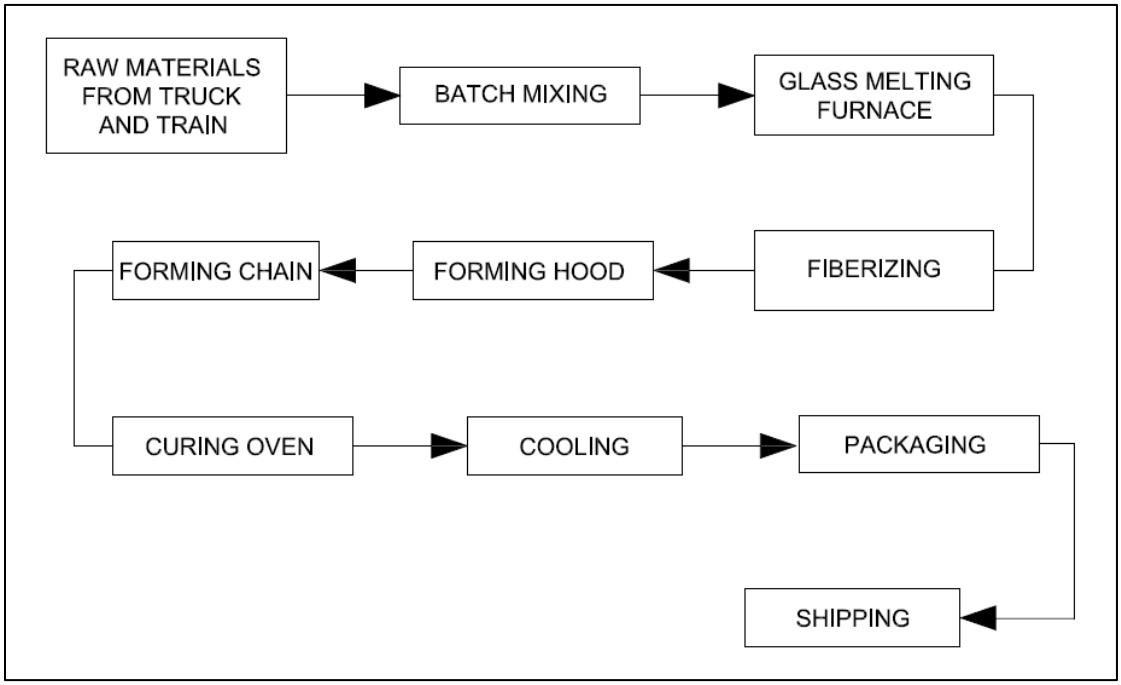


Figure 3. Process Flow of CertainTeed blowing Wool

Health, Safety, and Environmental Aspects during Production

CertainTeed Insulation Group 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.

Figure 4 - Manufacturing process of blowing wool insulation

Life Cycle Assessment

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 square meter of insulation with a thickness that provides and average thermal resistance (R_{SI}) of 1 m^2K/W and a building service life of 60 years. In US customary units, the equivalent area is 10.76 square feet with thermal resistance (R_{US}) of 5.68 ft^2h^0F/Btu. Environmental declarations from different programs may not be comparable.

Life Cycle Stages Assessed

1. Production includes raw material production and shipping, insulation manufacturing, and final product packaging.
2. Construction includes:
    a. Final Product Shipping which is the transportation of the final product from the manufacturing facilities to retailers and distributers.
    b. Installation which includes energy consumption of insulation blowing machines (negligible scrap assumed to be generated).
3. Use (estimated building energy savings reported separately).
4. End of Life.

System Boundaries

The life cycle analysis for the production of blowing wool insulation comprises the life cycle stages from cradle-to-grave. It begins with the consideration of the blowing wool insulation production (extraction of raw materials, product manufacturing and packaging), product shipping to installation and use, and end-of-life stages, as shown in Figure 6 to the right. Manufacturing overhead

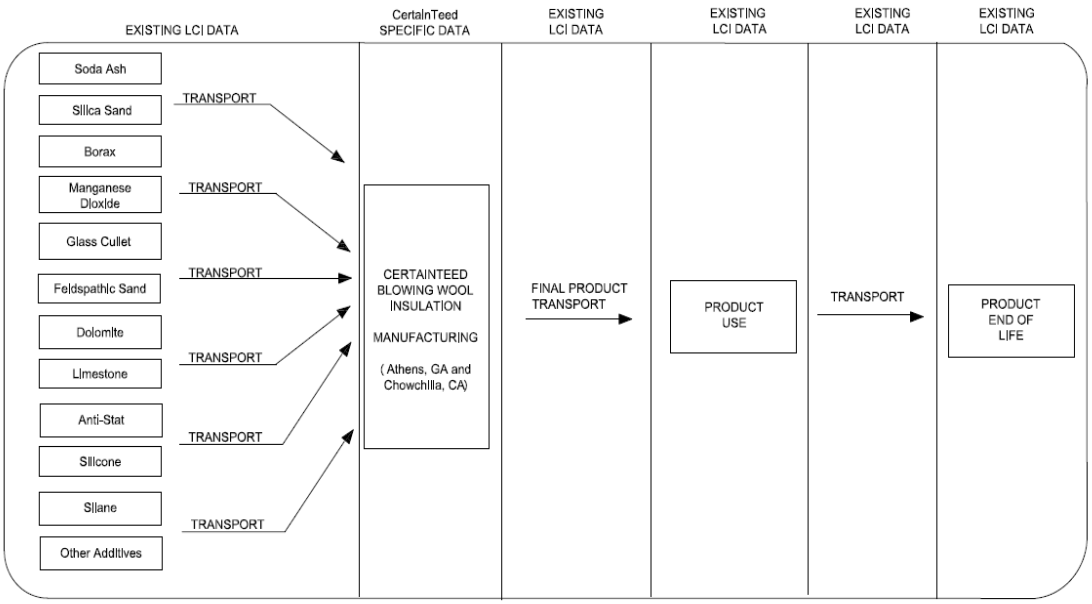


Figure 5. System Boundaries

(heating & lighting) was excluded in the system boundary.

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 CertainTeed blowing wool insulation, the following assumptions were made:

- Off-spec materials are disposed of in a landfill.
- Installation is performed by the recommended insulation blowing machines. This energy is included.
- Installation is assumed to have a negligible scrap rate.

Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 2% can be neglected. Energy flows may be excluded if less than 1% of the cumulative energy and of the selected impact categories.

The sum of the neglected processes may not exceed 5% by mass or of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances, as defined by the U.S. EPA 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. No processes were neglected or excluded. Capital items for the production processes (machines, buildings, etc.) were not taken into consideration.

Transportation

Both the Athens and Chowchilla facilities provided shipping distances of all raw materials which were used in this study. The final product is typically sold within the continental United States and transported by truck. The average distance the product was shipped was accounted for in this study.

Period under Consideration

The data used refer to the production processes of the Athens and Chowchilla facilities from July 2011-December 2012.

Background Data

For life cycle modeling the SimaPro v7.3 Software System for Life Cycle Engineering, a recognized LCA modeling software program, was used. All background data sets relevant for production and disposal were taken from this software.

Data Quality

For the data used in this LCA, the data quality is considered to be good to high quality. The data and data sets cover all relevant process steps and technologies over the supply chain of the represented blowing wool products. The majority of secondary data sets are from the SimaPro v7.3 database and wherever secondary data are used, the study adopts critically reviewed data where ever possible for consistency, precision, and reproducibility to limit uncertainty. The data used are complete and representative of North America in terms of the geographic and technological coverage and is of a recent vintage, i.e. less than ten years old.

Allocation

Energy and water allocation for the Athens facility is based on the process line energy allocation. Energy and water allocation for the Chowchilla facility is based on production. Due to the low density of the product, product shipment amounts are restricted by volume. Sensitivity analysis was performed by varying the final product transportation weight by +/- 25%. The overall life cycle was influenced by less than 2.0%.

Both facilities produce blowing wool insulation. Results were calculated based on a weighted average of the facilities. This manufacturing flow data was combined with resource extraction, processing, transportation, installation, use, and disposition to landfill.

Use Stage

The useful life of this product is 60 years, and CertainTeed provides a Lifetime Limited Insulation Warranty on all fiber glass building insulation products. The energy savings benefits of CertainTeed Blowing Wool Insulation are reported separately.

End-of-Life

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

Life Cycle Assessment

Use of Material and Energy Resources

Table 2. Total Primary Energy Use per Functional Unit.

Total Primary Energy	Unit	Blowing Wool
Nonrenewable, fossil	MJ-Eq	1.6E+01
Nonrenewable, nuclear	MJ-Eq	2.5E-01
Renewable, biomass	MJ-Eq	1.4E-02
Renewable wind, solar, geothermal	MJ-Eq	1.0E-03
Renewable, water	MJ-Eq	2.7E-02
Total	**MJ-Eq**	**1.6E+01**

Table 3. Total Primary Energy by Source Type per Functional Unit.

Nonrenewable Primary Energy Source	Energy Use	Unit	Renewable Primary Energy Source	Energy Use	Unit
Fossil Oil	1.7E+00	MJ-Eq	**Hydropower**	2.7E-02	MJ-Eq
Natural Gas	8.4E+00	MJ-Eq	**Wind Power**	9.8E-04	MJ-Eq
Coal	5.7E+00	MJ-Eq	**Solar Power**	3.9E-05	MJ-Eq
Uranium	2.5E-01	MJ-Eq	**Biomass**	1.4E-02	MJ-Eq
Total	**1.6E+01**	**MJ-Eq**	**Total**	**4.1E-02**	**MJ-Eq**

Figure 6. Nonrenewable Energy by Source for Blowing Wool

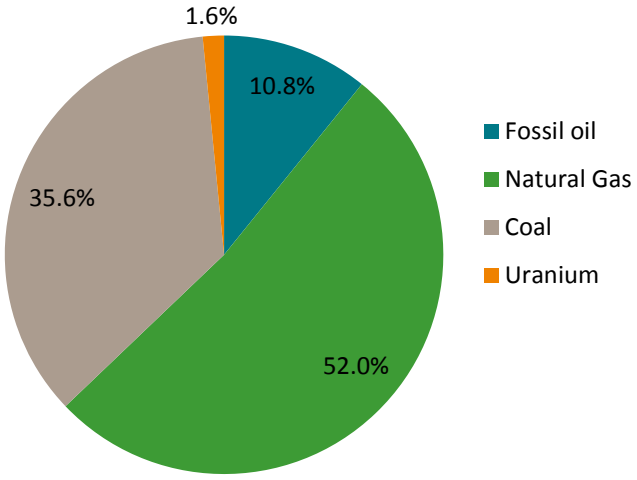
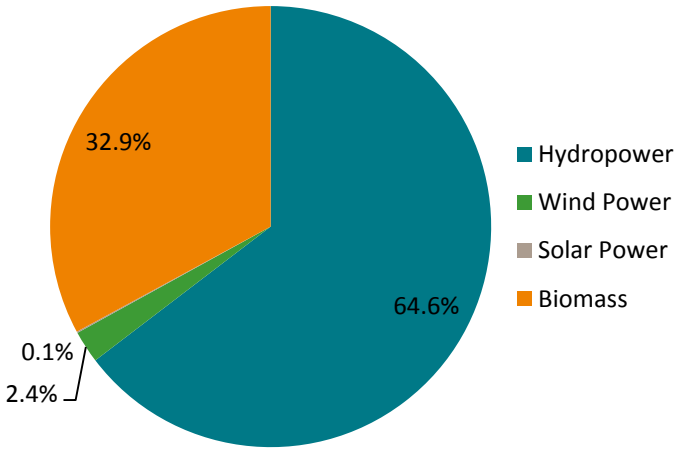


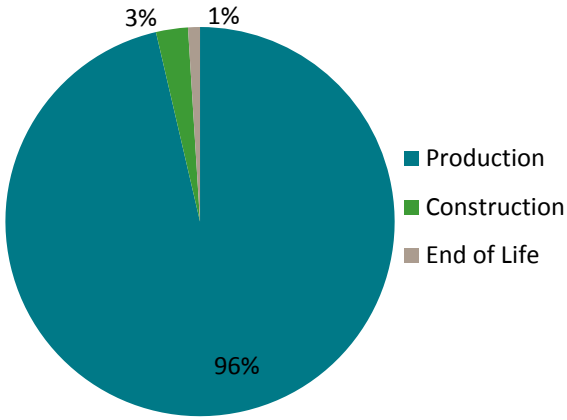
Figure 7. Renewable Energy by Source for Blowing Wool



Primary Energy by Life Cycle Stage

The pie chart on the right shows that the production process is the most energy intensive stage of the CertainTeed Blowing Wool Insulation Life Cycle. Production includes raw materials, raw materials transportation, manufacturing and packaging. The use phase of insulation accounts for none of the primary energy use because it is a passive product.

Figure 8. Primary Energy by Life Cycle Stage



Life Cycle Impact Assessment

The environmental impacts listed below were assessed throughout the life cycle of CertainTeed Blowing Wool Insulation – including production, final product shipping, installation, and end-of-life as defined above.

Table 4. Life Cycle Impact Category Values for the Functional Unit of One Square Meter, R_{SI}=1

Impact Category	Units	Production	Construction	End-of-Life	Total*
Global warming	kg CO_2 eq	1.0E+00	3.1E-02	8.5E-03	1.1E+00
Acidification	mol H+ eq	4.1E-01	1.0E-02	3.1E-03	4.3E-01
Eutrophication	kg PO_4 eq	4.0E-04	1.0E-05	6.1E-06	4.2E-04
Smog	kg O_3 eq	5.2E-02	4.9E-03	1.5E-03	5.8E-02
Ozone Depletion	kg CFC-11 eq	1.5E-08	1.2E-10	1.3E-09	1.7E-08
Waste to Landfill	kg	6.1E-02	3.0E-06	4.6E-01	5.2E-01
Metered Water	kg	4.0E+00	2.3E-03	1.0E-01	4.1E+00
Energy	MJ-eq	1.6E+01	4.3E-01	1.6E-01	1.6E+01

*May not sum due to rounding

Scaling Factors for Determining Impacts for Various R-Values

To determine the impacts for various R-values, the environmental impacts presented above can be multiplied by the following scaling factors to determine impacts per square meter of product. These impacts were determined based on the density of the product per area.

Table 5. R-value Scaling Factors for Open Attic Blowing wool Applications

Open (Attic) Cavity Impacts =

R-value Scaling Factor – Open Attic			
Product Customary R-Value	InsulSafe®SP	TrueComfort®	UltraComfort®
11	1.87	1.91	1.91
13	2.20	2.25	2.25
19	3.30	3.30	3.30
22	3.83	3.83	3.83
26	4.56	4.53	4.53
30	5.29	5.24	5.24
38	6.77	6.69	6.69
44	7.96	7.79	7.79
49	8.94	8.72	8.72
60	11.14	10.85	10.85

X

Environmental Impacts	
Environmental Impact	Impact
Global Warming Potential (kg CO_2 eq)	1.1E+00
Acidification (mol H+ eq)	4.3E-01
Eutrophication (kg PO4 eq)	4.2E-04
Smog (kg O_3 eq)	5.8E-02
Ozone Depletion (kg CFC-11 eq)	1.7E-08
Waste to Landfill (kg)	5.2E-01
Metered Water (kg)	4.1E+00
Cumulative Energy Demand (MJ)	1.6E+01

Table 6 -R-value Scaling Factors for Open Attic Canadian Blowing wool product lines

Open Cavity (Attic) impacts =

Insulsafe® XC		
Product Customary R-Value	Insulsafe® XC	TrueComfort® Canada
12	2.23	2.23
16	2.96	2.96
20	3.71	3.71
24	4.44	4.44
28	5.19	5.19
30	5.62	5.62
32	5.92	5.92
36	6.67	6.67
40	7.40	7.40
44	8.16	8.16
48	8.88	8.88
50	9.31	9.31
52	9.64	9.64
56	10.36	10.36
60	11.12	11.12

X

Environmental Impacts	
Environmental Impact	Impact
Global Warming Potential (kg CO_2 eq)	1.1E+00
Acidification (mol H+ eq)	4.3E-01
Eutrophication (kg PO4 eq)	4.2E-04
Smog (kg O_3 eq)	5.8E-02
Ozone Depletion (kg CFC-11 eq)	1.7E-08
Waste to Landfill (kg)	5.2E-01
Metered Water (kg)	4.1E+00
Cumulative Energy Demand (MJ)	1.6E+01

Table 7. R-value Scaling Factors for Closed Cavity Blowing wool Applications

Closed (Sidewall /Floor) Cavity Impacts =

R-value Scaling Factor – Closed Cavity				
Product Customary R-Value	InsulSafe®SP	TrueComfort®	UltraComfort®	OPTIMA®
14	5.35	-	-	-
15	5.73	6.68	6.68	6.01
16	6.11	-	-	-
22	8.40	-	-	-
23	-	10.51	10.51	9.45
29	11.08	-	-	-
30	-	-	-	12.47
31	-	13.84	13.84	-
39	-	-	-	15.90
46	-	-	-	19.34
56	-	-	-	22.78

X

Environmental Impacts	
Environmental Impact	Impact
Global Warming Potential (kg CO_2 eq)	1.1E+00
Acidification (mol H+ eq)	4.3E-01
Eutrophication (kg PO_4 eq)	4.2E-04
Smog (kg O_3 eq)	5.8E-02
Ozone Depletion (kg CFC-11 eq)	1.7E-08
Waste to Landfill (kg)	5.2E-01
Metered Water (kg)	4.1E+00
Cumulative Energy Demand (MJ)	1.6E+01

Nonhazardous Waste and Water Consumption

Table 8. Waste and Water Usage per Functional Unit of 1 m^2, RSI=1

	Production	Product Shipping	End of Life	Total*
Nonhazardous Waste (kg/R_{SI}-m^2)	0.06	0.00	0.46	0.52
Hazardous Waste (kg/R_{SI}-m^2)	4.8E-04	2.7E-09	3.8E-08	4.8E-04
Waste to Energy (MJ/ R_{SI}-m^2)	6.1E-05	2.0E-09	3.2E-07	6.1E-05
Water Consumption (gallon/ R_{SI}-m^2)	1.05	0.00	0.03	1.08

Optional Environmental Information

Indoor Environmental

- CertainTeed Premium Blowing Wool (InsulSafe® SP, Insulsafe® XC, TrueComfort® Canada) products have achieved GREENGUARD Gold Certification.

Other Environmental

- CertainTeed Premium Blowing Wool insulation contains recycled content as independently verified by GreenCircle Certified.

Table 9. Recycled Content of Blowing Wool Insulation

Facility	Pre-Consumer Recycled Content	Post-Consumer Recycled Content	Total Recycled Content
Athens, GA	29%	8%	37%
Chowchilla, CA	24%	17%	41%

- National Green Building Standard approved product #00048 certified by the Home Innovation Research Center.
- CertainTeed is an Energy Star Insulation Manufacturing Partner.

Cert. #00048

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 REM/Rate software of three climate zones in a typical new home constructed according to 2009 IECC energy codes. The cities analyzed were Houston, Richmond and Minneapolis. The following table compares the embodied impacts of CertainTeed insulation installed in a two-story, three-bedroom house with the impacts from one year of projected energy savings in that house. For example, in Houston the global warming potential saved from using insulation was offset around 3 times the estimated global warming potential of manufacturing and installing the insulation material.

	Annual Avoided Impacts from Energy Savings (whole-house)					
Energy Savings	**Houston**	**Richmond**	**Minneapolis**			
Electricity (kWh/yr)	4,228	1,928	2,028			
Natural Gas (therms/yr)	0	638	1,326	**CertainTeed Insulation (whole-house impacts)**		
Impact category	**Houston**	**Richmond**	**Minneapolis**	**Houston**	**Richmond**	**Minneapolis**
Ozone Depletion (kg CFC-11 eq)	3.1E-08	9.3E-04	1.9E-03	1.7E-05	1.9E-05	2.7E-05
Global Warming Potential (kg CO_2 eq)	2.9E+03	6.5E+03	1.2E+04	9.0E+02	1.1E+03	1.5E+03
Smog (kg O_3 eq)	1.3E+02	1.7E+02	2.8E+02	5.0E+01	5.8E+01	8.0E+01
Acidification (mol H+ eq)	1.3E+03	9.1E+02	1.4E+03	3.6E+02	4.2E+02	5.8E+02
Eutrophication (kg PO_4 eq)	3.0E-01	1.4E+00	2.7E+00	4.0E-01	4.6E-01	6.4E-01
Cumulative Energy Demand (MJ)	4.6E+04	1.1E+05	2.0E+05	1.4E+04	1.6E+04	2.3E+04

References

- V1.2 Product Category Rules for Preparing an Environmental Product Declaration (EPD) for Product Groups: Building Envelope Thermal Insulation, Version 1.0, dated October 29 , 2013
- EN ISO 14040, ISO 14040-2006 Environmental management – Life cycle assessment – Principles and framework.
- EN ISO, ISO 14044-2006 Environmental management – life cycle assessment – Requirements and Guidelines
- EN ISO, ISO 14001-2004 Environmental Management System
- EN ISO, ISO 9001-2000 Quality Management System
- ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- ASTM Standard Specification C518-10 Standard Test Method for Steady-State Thermal Transmission properties of means of Heat Flow Meter Apparatus.
- ASTM Standard Specification C687 - 12 Standard Specification for Determination of Thermal Resistance of Loose-Fill Building Insulation
- ASTM Standard Specification C764 - 11 Mineral Fiber Loose-Fill Thermal Insulation Type 1 – Pneumatic Application Properties
- ASTM C764 - 11 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation
- ASTM C1104 / C1104M - 13 Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation
- ASTM C1304 - 08 Standard Test Method for Determining the Odor Emission of Thermal Insulation Materials
- ASTM C1338 - 08 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- ASTM Standard Specification E970 - 10 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source
- ASTM Standard Specification E84/UL E723 - 12 Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E90 / E90M - 10 Standard Test Method for Laboratory Measurement of Airborne Sound Transmissions Loss of Building Partitions and Elements
- ASTM E96 / E96M - 10 Standard Test Methods for Water Vapor Transmission of Materials
- ASTM Standard Specification E136 - 12 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C for Combustion characteristics

LCA Development

This EPD and corresponding LCA were prepared by Sustainable Solutions Corporation of Royersford, Pennsylvania.

SustainableSolutions CORPORATION

Contact CertainTeed

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