

ENVIRONMENTAL PRODUCT DECLARATION

SUSTAINABLE INSULATION®

UNFACED AND KRAFT FACED BATTS



Sustainable Insulation is proven fiber glass technology with 21st century renewable, recycled, and formaldehyde-free ingredients.

CertainTeed
SAINT-GOBAIN
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 Sustainable 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. Sustainable Insulation can also improve overall occupant comfort through the reduced noise and privacy of increased acoustical performance.

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



ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Unfaced and Kraft Faced Batts

According to ISO 14025

This declaration is an environmental product declaration in accordance with ISO 14025 that describes the environmental characteristics of the aforementioned product. It promotes the development of sustainable products. This is a certified declaration and all relevant environmental information is disclosed.



PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	CertainTeed Insulation Group
DECLARATION NUMBER	12CA169994.107.1
DECLARED PRODUCT	Sustainable Insulation® Unfaced and Kraft Faced Batts
REFERENCE PCR	PCR Building Envelope Thermal Insulation (ULE 2011)

DATE OF ISSUE	25 June 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
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This declaration was independently verified by Underwriters Laboratories in accordance with ISO 14025: <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	
	Hilary Young

This life cycle assessment was independently verified by in accordance with ISO 14044 and the reference PCR:	
	Thomas Gloria, Life-Cycle Services, LLC



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. The CertainTeed Kraft Faced and Unfaced Sustainable Insulation® batt product line is an insulation material made of fiber glass that consists of rapidly renewable content, a high percentage of recycled glass, and a new plant-based binder that has no formaldehyde, harsh acrylics, dyes or unnecessary fire retardants added. The Kraft Faced batts also have one side covered with kraft paper, which is adhered with asphalt. Batt sizes from R-11 to R-38 are included in this EPD.

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 $R_{SI} = 1 \text{ m}^2\text{K/W}$ ($R_{US} = 5.68$) with a building service life of 60 years.

Product Line



Features and Benefits

Sustainable Batt Insulation is ideal for floors, walls and ceilings in residential, commercial and institutional settings.

- Made in the USA
- Made using a rapidly renewable plant-based binder
- Made with recycled content (GreenCircle Certified)
- Helps create a healthy indoor environment (GREENGUARD certified)
- Fire-retardant and high-temperature resistant
- Durable, easy to install, zero maintenance
- Contributes to LEED® points

Manufacturing Locations

CertainTeed manufacturing facilities that produce Sustainable Insulation batts are:

<p>Athens, GA Plant 425 Athena Drive, Athens, GA 30601</p>	<p>Chowchilla, CA Plant 17775 Ave 23 1/2, Chowchilla, CA 93610</p>
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These facilities provided the primary data for this assessment and the results are based on the weighted average of production.

Application and Uses

Sustainable Insulation is for residential and commercial use. CertainTeed Sustainable Batt Insulation is available in both Kraft Faced and Unfaced insulation in a variety of R-values ranging from 11 to 38 and cathedral ceiling batts available in R-30C and R-38C with thicknesses ranging from 3 ½ to 10 ¼ inches. CertainTeed Sustainable Batt Insulation acts as both thermal and acoustical insulation in ceilings, walls and floors.

The Kraft Faced Sustainable Batt Insulation Products act as a vapor retarder to prevent the movement of vapor to colder surfaces where it can condense to water.

Installation

All CertainTeed Sustainable Batt Insulation is made for easy handling and installation. For small or irregularly shaped spaces, all trimming can be simply accomplished with a utility knife. For cathedral ceiling products, an air space between the insulation and roof sheathing, ventilated at ridge and soffit is desirable.

Unfaced Sustainable Batt Insulation is made to be easily installed by pressure fitting between framing, with no fastening required.

Kraft Faced Sustainable Batt Insulation fits between wooden studs and joists with facing toward the interior of the building, and is then meant to be pulled taut and stapled every 8 to 12 inches. Between metal studs, faced insulation is friction fit, and stapling flanges should be folded in, or SpeedyR™ tableless batts should be used.



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.

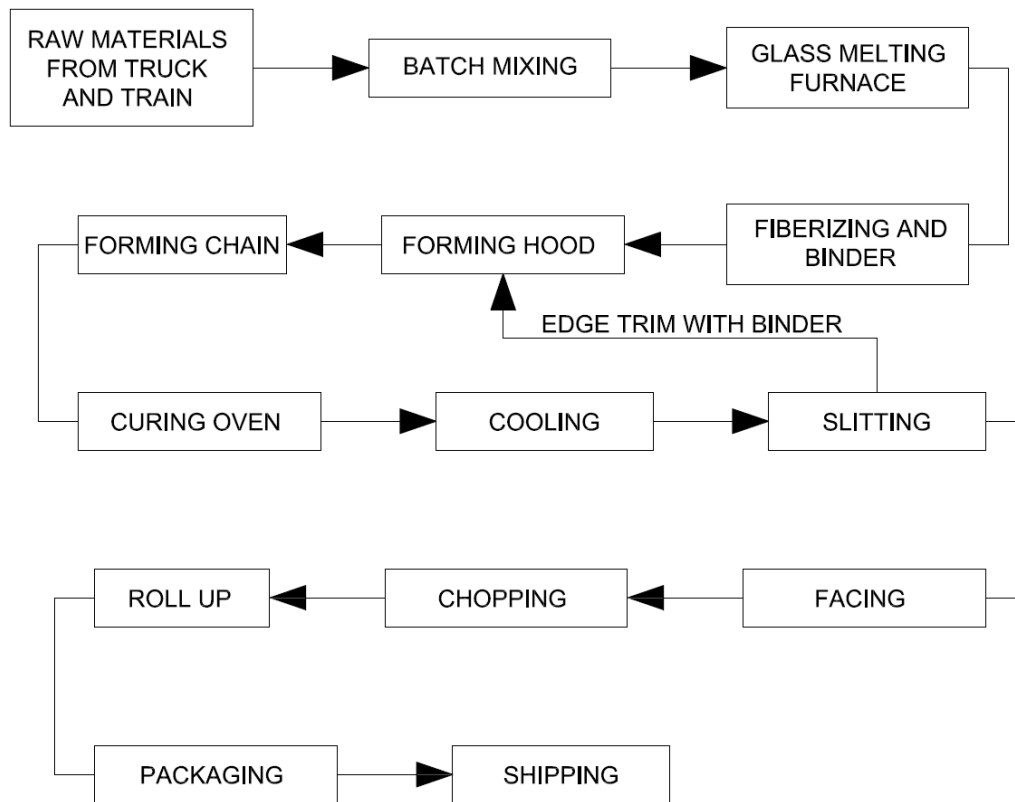
Material Content

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
Binder						
Bio-Based Polycarboxylic Acid	0% - 50%			Y	North America	50 - 900
Sugars	0% - 50%			Y	North America	800 - 3,300
Bio-Based Polyol	10% - 30%			Y	North America	800 - 3,300
Mineral Oil	8% - 12%				North America	800 - 3,300
Silane	0% - 2%				North America	800 - 3,300
Additives	0% - 6%				North America	800 - 3,300
Unfaced		Faced		Facing		
Asphalt Coating	-	0% - 17%			North America	100 - 2,500
Kraft Paper	-	0% - 9%		Y	North America	100 - 350

The main components of insulation are the fiberglass, binder and, if applicable, facing. Fiberglass is primarily made from a variety of inorganic minerals. CertainTeed's Green Binder is organic and plant based. The binder contains no added formaldehyde, harsh acrylics, dyes or unnecessary fire retardant chemicals. For faced insulation, asphalt coated kraft paper is used to provide a vapor retarder.

Manufacturing Process



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.



Manufacturing process of Sustainable Insulation batts.

Life Cycle Assessment

Functional Unit

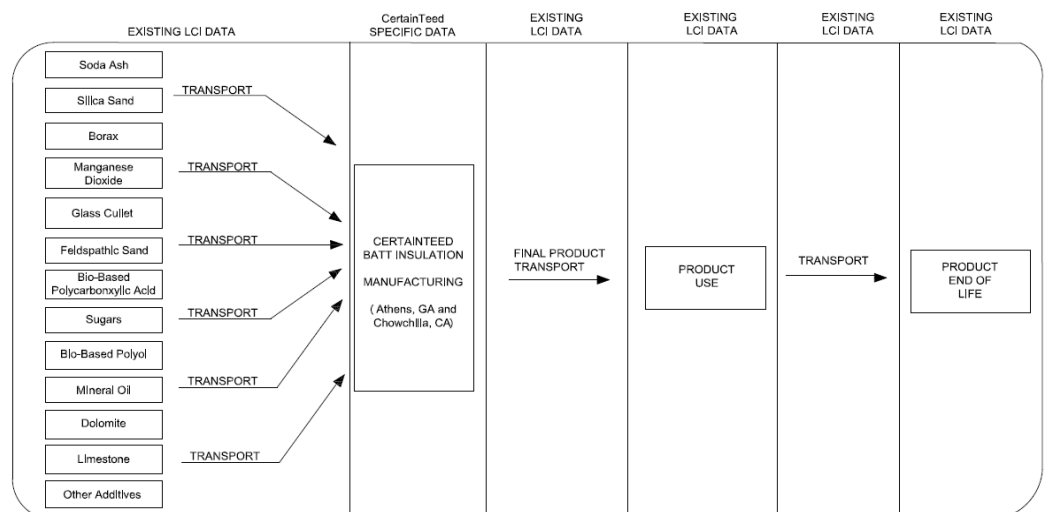
Environmental impacts are reported per functional unit of a product and the functional unit is the basis for comparison in an LCA. For building insulation, the functional unit is defined as 1 square meter of insulation with a thickness that provides an average thermal resistance (R_{SI}) of $1 \text{ m}^2\text{K/W}$ 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 $5.68 \text{ ft}^2\text{h}^0\text{F/Btu}$.

Life Cycle Stages Assessed

1. Production includes raw material production and shipping, insulation manufacturing, and final product packaging.
2. Final Product Shipping is the transportation of the final product from the manufacturing facilities to retailers and distributors.
3. Installation (no impacts due to manual process and no scrap assumed to be generated).
4. Use (estimated building energy savings reported separately).
5. End of Life.

System Boundaries

The life cycle analysis for the production of batt insulation comprises the life cycle stages from cradle-to-grave. It begins with the consideration of the batt 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 (heating & lighting) was included 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 Sustainable Batt Insulation, the following assumptions were made:

- Off-spec materials are disposed of in a landfill.
- Installation is done by hand, so requires no external energy input.

- Installation is assumed to have a 0% scrap rate, since installers commonly use scrap pieces to fill other gaps such that very little to no scrap remains.

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 of the considered impact categories. For that a documented assumption is admissible.

For Hazardous Substances, as defined by the U.S. Occupational Health and Safety Act, 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 Chowchilla facility from July 2011-June 2012 and for the Athens facility from January 2012-June 2012 (the Athens facility started production later than Chowchilla). During the data collection period, Athens produced about 50% Sustainable Insulation, so the Athens data was allocated by run time.

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 Sustainable Batt Insulation 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 run time. 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 1.5%.

Both facilities produce sustainable 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 Sustainable Batt Insulation are reported separately.

End-of-Life

The batt insulation is usually deconstructed 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

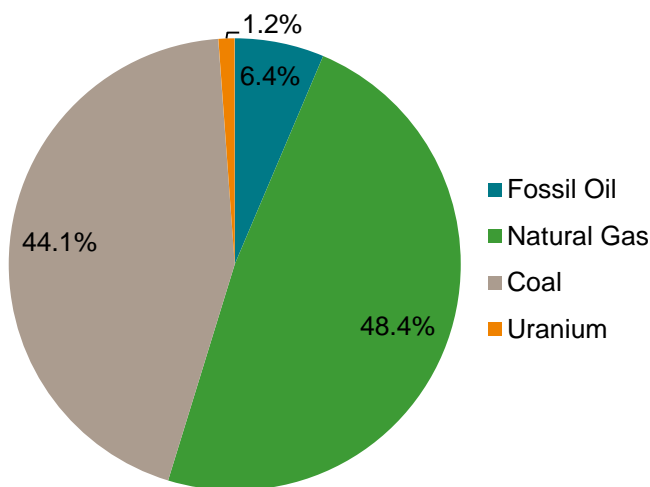
Table 2: Total Primary Energy Use per Functional Unit.

Total Primary Energy	Unit	Unfaced Sustainable Batt Insulation	Kraft Faced Sustainable Batt Insulation
Nonrenewable, fossil	MJ-Eq	1.4E+01	1.6E+01
Nonrenewable, nuclear	MJ-Eq	2.1E-01	2.9E-01
Renewable, biomass	MJ-Eq	1.6E-02	8.7E-01
Renewable wind, solar, geothermal	MJ-Eq	5.4E-01	5.0E-01
Renewable, water	MJ-Eq	4.4E-02	5.2E-02
Total	MJ-Eq	1.5E+01	1.8E+01

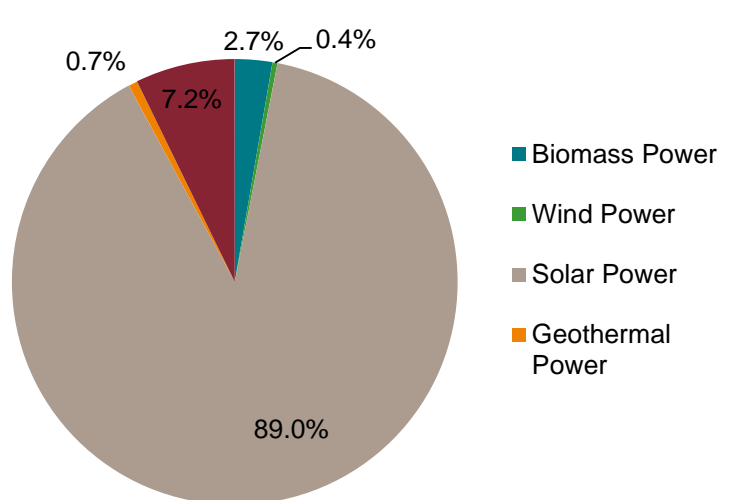
Table 3: Total Primary Energy Detail By Source Type per Functional Unit.

Product	Unit	Nonrenewable Primary Energy Source	Energy Use	Renewable Primary Energy Source	Energy Use
Unfaced	MJ-Eq	Fossil Oil	1.6E+00	Hydropower	7.3E-02
Kraft Faced			2.8E+00		5.2E-02
Unfaced	MJ-Eq	Natural Gas	8.9E+00	Wind Power	2.2E-03
Kraft Faced			7.6E+00		2.7E-03
Unfaced	MJ-Eq	Coal	3.6E+00	Solar Power	5.4E-01
Kraft Faced			5.6E+00		5.0E-01
Unfaced	MJ-Eq	Uranium	2.1E-01	Biomass	1.6E-02
Kraft Faced			2.9E-01		8.7E-01
Unfaced	MJ-Eq	Total	1.4E+01	Total	6.3E-01
Kraft Faced			1.6E+01		1.4E+00

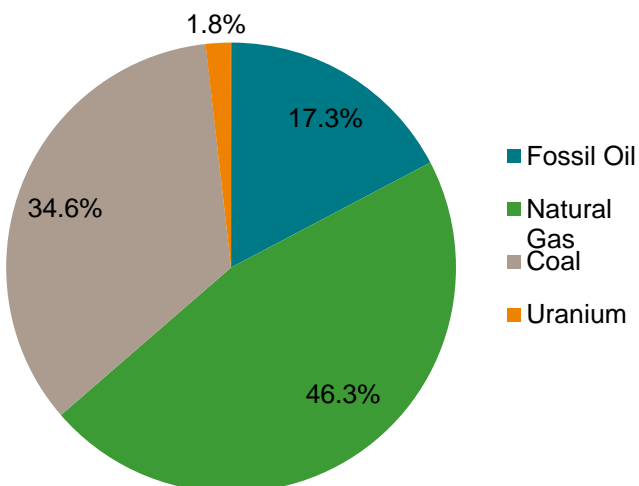
Nonrenewable Energy by Source for Unfaced Batts



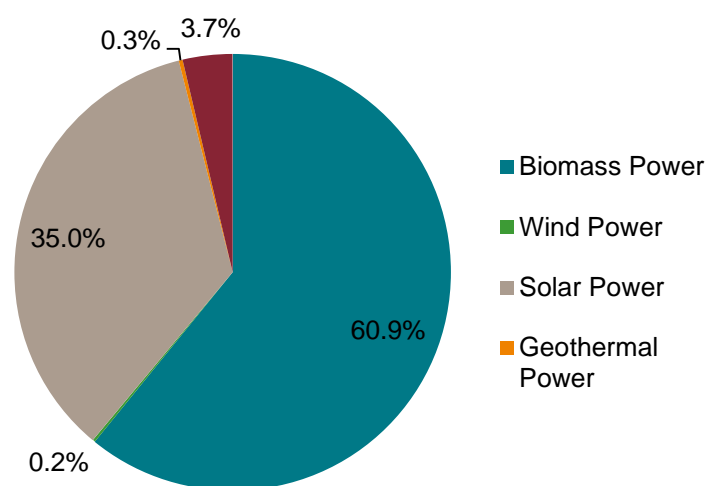
Renewable Energy by Source for Unfaced Batts



Nonrenewable Energy by Source for Kraft Faced Batts

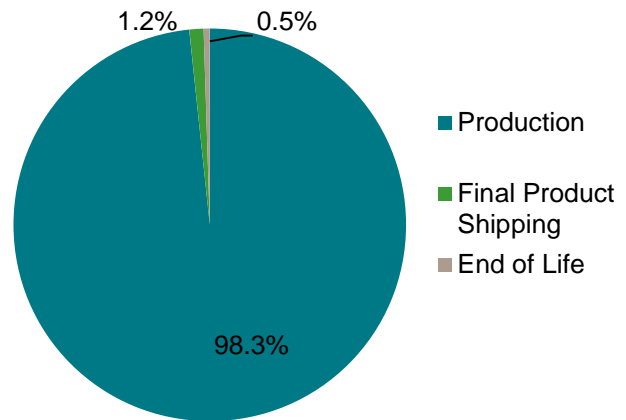


Renewable Energy by Source for Kraft Faced Batts



Primary Energy by Life Cycle Stages

The pie chart on the right shows that the production process is the most energy intensive stage of the CertainTeed Sustainable Batt 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.



Life Cycle Impact Assessment

The environmental impacts listed below were assessed throughout the life cycle of Sustainable Batt 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	Product	Production	Final Product Shipping	End-of-Life	Total*
Global warming	kg CO ₂ eq	Unfaced	1.2E+00	5.2E-03	1.3E-03	1.2E+00
		Kraft Faced	1.2E+00	1.4E-02	3.2E-03	1.2E+00
Acidification	mol H+ eq	Unfaced	3.6E-01	1.2E-03	3.8E-04	3.6E-01
		Kraft Faced	3.9E-01	4.5E-03	1.3E-03	4.0E-01
Eutrophication	kg PO ₄ eq	Unfaced	3.1E-04	4.2E-06	3.7E-06	3.2E-04
		Kraft Faced	4.5E-04	4.5E-06	4.1E-06	4.6E-04
Smog	kg O ₃ eq	Unfaced	4.6E-02	3.6E-03	1.0E-03	5.1E-02
		Kraft Faced	5.4E-02	2.2E-03	6.5E-04	5.7E-02
Ozone Depletion	kg CFC-11 eq	Unfaced	1.3E-08	5.3E-13	1.2E-09	1.4E-08
		Kraft Faced	3.2E-08	5.2E-13	1.2E-09	3.3E-08
Waste to Landfill	kg	Unfaced	3.3E-02	0.0E+00	3.7E-01	4.1E-01
		Kraft Faced	4.2E-02	0.0E+00	4.2E-01	4.6E-01
Metered Water	kg	Unfaced	3.5E+00	0.0E+00	8.3E-02	3.5E+00
		Kraft Faced	7.5E+00	0.0E+00	9.2E-02	7.6E+00
Energy	MJ-eq	Unfaced	1.5E+01	1.7E-01	7.5E-02	1.5E+01
		Kraft Faced	1.7E+01	1.8E-01	8.1E-02	1.8E+01

*May not sum to total 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. For kraft faced products, since facing weight does not scale proportionately with R values, facing impacts should be added to the result, as illustrated below.

Kraft Faced Impacts	R-value Scaling Factor		X	Environmental Impacts		
	Product Customary R-Value	Impact Scaling Factor		Environmental Impact	Unfaced Product	Facing
	R-11	2.05		Global Warming Potential	1.2E+00	4.7E-01
	R-13	3.00		Acidification	3.6E-01	1.6E-01
	R-15	3.09		Eutrophication	3.2E-04	5.4E-04
	R-19	3.35		Smog	5.1E-02	2.4E-02
	R-21	4.99		Ozone Depletion	1.4E-08	5.3E-08
	R-30	5.10		Waste to Landfill	4.1E-01	9.0E-02
	R-30C	6.43		Metered Water	3.5E+00	1.2E-02
	R-38	6.89		Cumulative Energy Demand	1.5E+01	1.2E+01
	R-38C	9.60				

Nonhazardous Waste and Water Consumption

Table 5: Nonhazardous Waste and Water Usage per Functional Unit of 1 m², RSI=1

	Product	Production	Product Shipping	End of Life	Total*
Nonhazardous Waste (kg/m ²)	Unfaced	0.03	-	0.37	0.41
	Kraft Faced	0.04	-	0.42	0.46
Water Consumption (gallon/m ²)	Unfaced	0.91	-	0.02	0.93
	Kraft Faced	1.97	-	0.02	2.00

*May not sum to total due to rounding

Optional Environmental Information

Indoor Environment

Sustainable Insulation® has achieved GREENGUARD Gold Certification.



Kraft Faced Sustainable Insulation®
 Unfaced Sustainable Insulation®

According to ISO 14025

Additional Environmental Information

- Sustainable Insulation® contains recycled content as independently verified by GreenCircle Certified.

Facility	Facing	Pre-Consumer Recycled Content	Post-Consumer Recycled Content	Total Recycled Content
Athens, GA	Unfaced	28%	7%	35%
	Kraft Faced	23%	6%	29%
Chowchilla, CA	Unfaced	23%	16%	39%
	Kraft Faced	19%	13%	32%

- National Green Building Standard approved product #00187 certified by the Home Innovation Research Center.
- Kraft facing is certified by the Sustainable Forestry Initiative (SFI).
- CertainTeed is an Energy Star Insulation Manufacturing Partner.



Building Use Stage Benefits

Sustainable 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 Sustainable 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.

Energy Savings	Annual Avoided Impacts from Energy Savings (whole-house)			CertainTeed Insulation (whole-house impacts)		
	Houston	Richmond	Minneapolis			
Electricity (kWh/yr)	4,228	1,928	2,028			
Natural Gas (therms/yr)	0	638	1,326			
Impact category	Houston	Richmond	Minneapolis	Houston	Richmond	Minneapolis
Ozone depletion	1.8E-06	9.3E-04	1.9E-03	3.2E-05	3.7E-05	4.4E-05
Global warming	2.9E+03	6.5E+03	1.2E+04	1.3E+03	1.5E+03	1.8E+03
Smog	1.3E+02	1.7E+02	2.8E+02	6.6E+01	7.7E+01	9.1E+01
Acidification	1.3E+03	9.1E+02	1.4E+03	4.4E+02	5.2E+02	6.1E+02
Eutrophication	3.0E-01	1.4E+00	2.7E+00	5.2E-01	6.1E-01	7.2E-01
Energy Demand	4.6E+04	1.1E+05	2.0E+05	1.9E+04	2.2E+04	2.6E+04

References

- Product Category Rules for Preparing an Environmental Product Declaration (EPD) for Product Groups: Building Envelope Thermal Insulation, Version 1.0, dated September 23, 2011
- 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 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 Specification E136 - 12 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
- ASTM Standard Specification C518-10 Standard Test Method for Steady-State Thermal Transmission properties of means of Heat Flow Meter Apparatus.
- ASTM C1104 / C1104M - 00(2006) Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation
- ASTM E96 / E96M - 10 Standard Test Methods for Water Vapor Transmission of Materials
- ASTM C1338 - 08 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- ASTM D6866 - 12 Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis

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>.