

ENVIRONMENTAL PRODUCT DECLARATION

SUSTAINABLE INSULATION®

FIBERGLASS BUILDING INSULATION BATTS, CANADA



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

CertainTeed
SAINT-GOBAIN

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 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


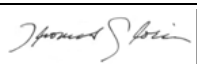


Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025 and ISO 21930:2007

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
DECLARATION NUMBER	4787358622.101.1
DECLARED PRODUCT	Sustainable Insulation® Fiberglass Building Insulation Batts - Canada
REFERENCE PCR	UL PCR for Building Envelope Thermal Insulation v 1.3, 2014
DATE OF ISSUE	September 12, 2016
PERIOD OF VALIDITY	5 Years
EXTENSION DATE	June 30, 2022
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 Review Panel
	epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Wade Stout, UL Environment
	 Thomas Gloria, Industrial Ecology Consultants

This EPD conforms with ISO 21930:2007

ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

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 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. Batt sizes from R-5.8 to R-40 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 Canada
- 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 in Canada are:

Ottawa, ON Plant	Redcliff, AB Plant
Ottawa Fibre LP/CertainTeed Insulation Canada, Inc. 3985 Belgreen Drive, Ottawa, ON K1G 3N2	Redcliff LP/CertainTeed Insulation Canada, Inc. 101 1 ST Street Northeast, Redcliff, AB T0J 2P0

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

ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

Application and Uses

Sustainable Insulation is for residential and commercial use. CertainTeed Sustainable Batt Insulation is available in Unfaced insulation in a variety of R-values ranging from 5.8 to 40 with thicknesses ranging from 2 ¾ to 12 inches. CertainTeed Sustainable Batt Insulation acts as both thermal and acoustical insulation in ceilings, walls and floors.

Installation

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.



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.

ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

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 - 1000
Soda Ash	<15%		Y		North America	100 - 3,500
Borates	<15%		Y		North America and Europe	300 - 9,000
Quicklime	<10%		Y		North America	100 - 3000
Manganese Dioxide	<2%		Y		North America	700 - 3,500
Feldspar	<25%		Y		North America	100 - 3000
Binder						
Bio-Based Polycarboxylic Acid	0%- 50%			Y	Asia	50 – 22,000
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%				Asia	800 - 17,000
Additives	0% - 6%				North America, Europe, Asia	800 – 22,000

The main components of insulation are the fiberglass and binder. 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.



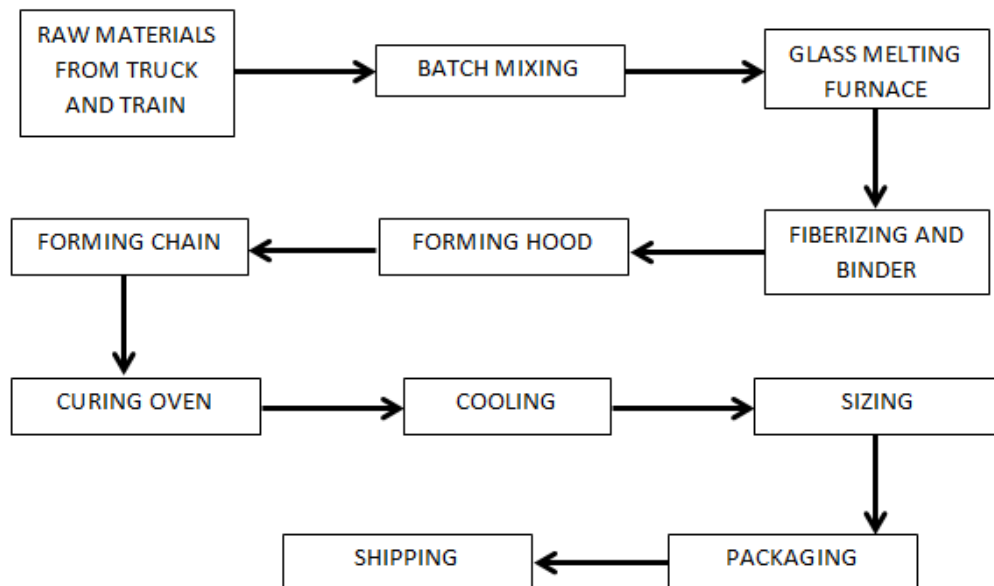
ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

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, health, and safety requirements are met or exceeded to ensure the health and safety of all employees and contractors.

Life Cycle Assessment

Functional Unit

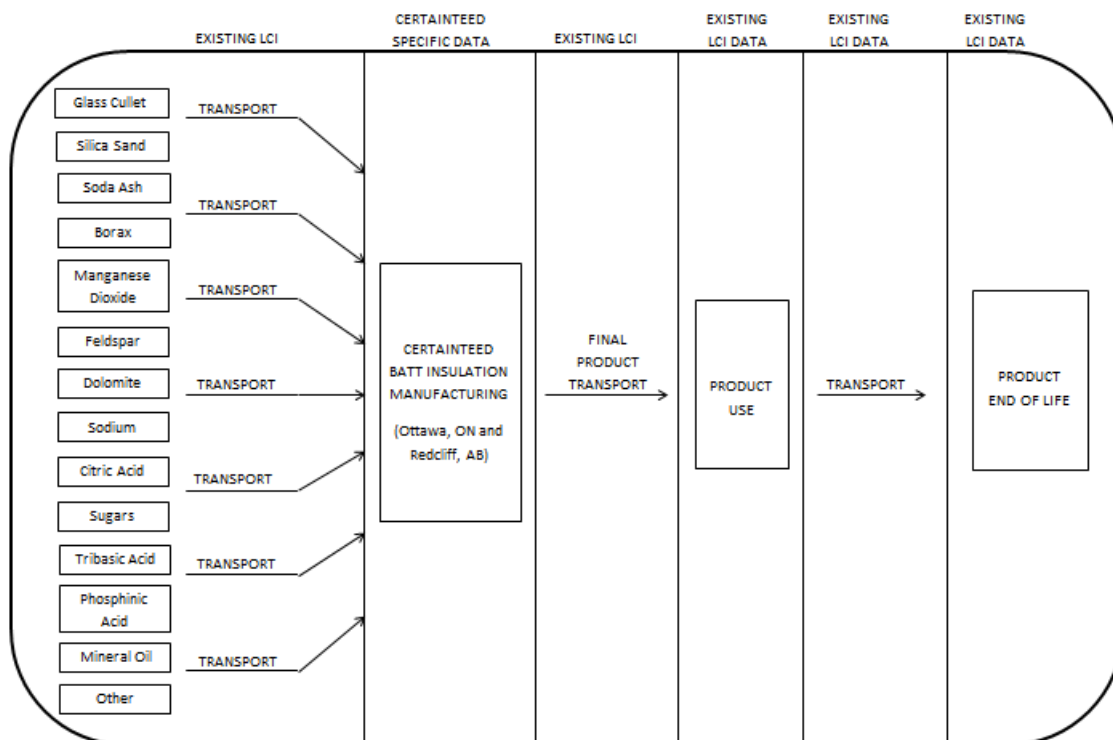
Environmental impacts are reported per functional unit of a product and the functional unit is the basis for comparison in an LCA. For building insulation, the functional unit is defined as 1 square meter of insulation with a thickness that provides an average thermal resistance (R_{SI}) of 1 m²K/W and 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 ft²h⁰F/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 5 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 – Canada, 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.
- End-of-life disposal of the product is assumed to be landfill.

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 Ottawa and Redcliff facilities provided shipping distances and modes of all raw materials which were used in this study. The final product is typically sold within Canadian boundaries and is 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 Ottawa and Redcliff facilities from January 2015 – December 2015.

Background Data

For life cycle modeling the SiimaPro v8.1 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.

ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

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 Insulation products. The majority of secondary data sets are from the SimaPro v8.1 database and wherever secondary data are used, the study adopts critically reviewed data wherever 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 both facilities is based on production mass. Both facilities produce sustainable insulation but sustainable insulation is not the only product made at each of the facilities. Production of the sustainable batt insulation at both facilities is based on mass of production. 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.

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%.

Use Stage

The useful life of this product is 60 years, and CertainTeed provides a Lifetime Limited Insulation Warranty on all fiberglass building insulation products. The energy savings benefits of CertainTeed Sustainable Batt Insulation – Canada 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 Results

Use of Material and Energy Resources

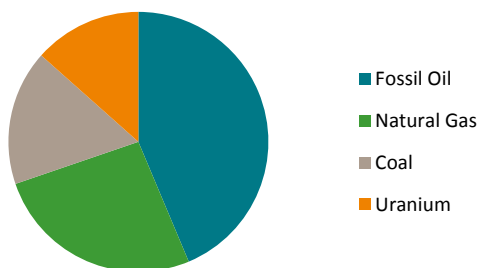
Table 2: Total Primary Energy Use and Material Resources per Functional Unit

Total Primary Energy	Unit	Sustainable Batt Insulation - Canada
Non-renewable primary energy	MJ-Eq	4.49E+00
Renewable primary energy	MJ-Eq	3.14E-01
Non-renewable materials	kg	2.04E-02
Renewable materials	kg	0.00E+00
Water use	m ³	1.92E-05

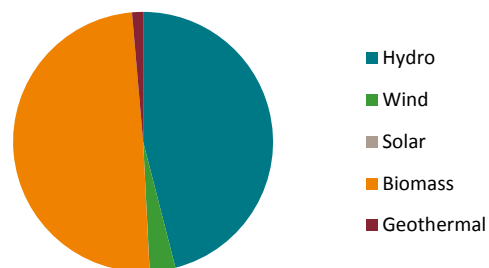
Table 3: Total Primary Energy Detail by Source Type per Functional Unit

Primary Energy Source	Unit	Sustainable Batt Insulation - Canada
Nonrenewable		
Fossil Oil	MJ-Eq	1.93E+00
Natural Gas	MJ-Eq	1.15E+00
Coal	MJ-Eq	7.45E-01
Uranium	MJ-Eq	5.94E-01
Renewable		
Hydropower	MJ-Eq	1.44E-01
Wind Power	MJ-Eq	1.00E-02
Solar Power	MJ-Eq	5.92E-05
Biomass	MJ-Eq	1.55E-01
Geothermal	MJ-Eq	4.27E-03

Non-Renewable Energy by Source for Sustainable Batt Insulation - Canada



Renewable Energy by Source for Sustainable Batt Insulation - Canada



ENVIRONMENTAL PRODUCT DECLARATION

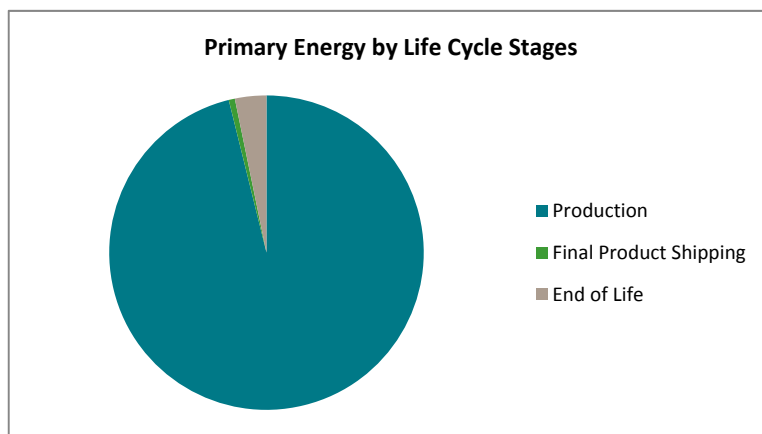


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Fiberglass Building Insulation Batts - Canada

According to ISO 14025

Primary Energy by Life Cycle Stages

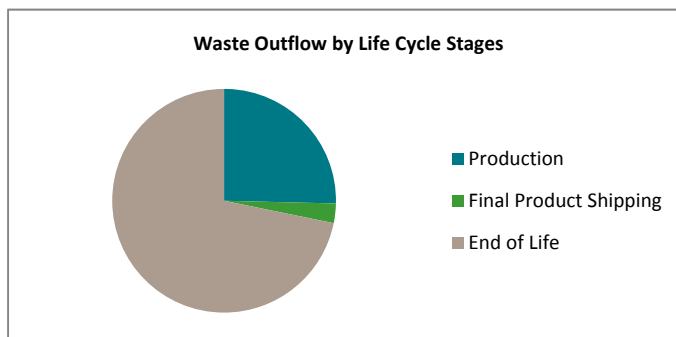
The pie chart on the right shows that the production process is the most energy intensive stage of the CertainTeed Sustainable Batt Insulation (Canada) Life Cycle. Production includes raw materials, raw material transportation, manufacturing, and packaging. The use phase of insulation accounts for none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



Life Cycle Waste to Disposal

Table 4: Total Waste Output for Sustainable Batt Insulation - Canada per Functional Unit

Waste Category	Unit	Production	Final Product Shipping	End of Life	Total
Hazardous waste	kg	2.97E-06	1.61E-08	8.37E-08	3.07E-06
Non Hazardous waste	kg	2.31E-02	2.57E-03	6.53E-02	9.09E-02
Radioactive waste	kg	1.40E-05	1.91E-07	9.75E-07	1.52E-05



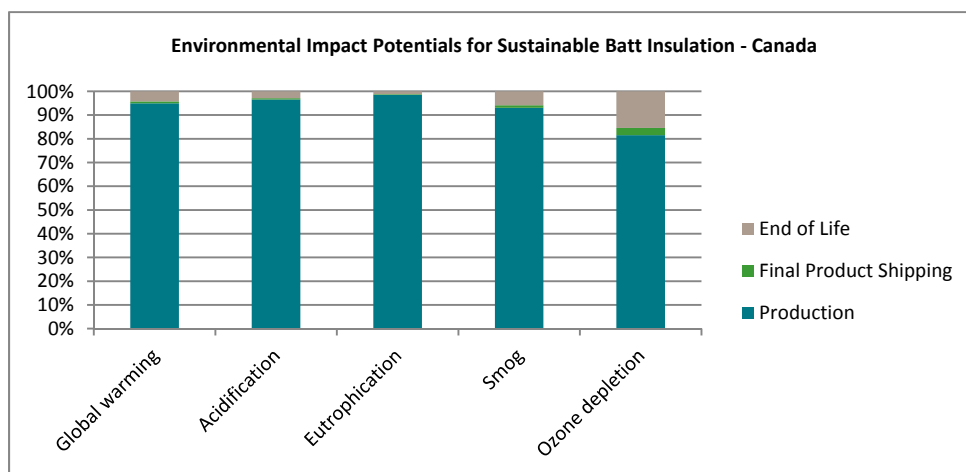
Life Cycle Impact Assessment

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

Table 5: Environmental Impact Potentials for Sustainable Batt Insulation – Canada per functional unit

Impact Category (US EPA TRACI 2.1)	Unit	Production	Final Product Shipping	End-of-Life	Total*
Global Warming Potential	kg CO ₂ equiv	2.01E-01	1.79E-03	8.92E-03	2.12E-01
Acidification Potential	mole H ⁺ equiv	1.22E-03	6.95E-06	3.65E-05	1.27E-03
Eutrophication Potential	kg N equiv	9.22E-04	2.22E-06	1.14E-05	9.36E-04
Smog Creation Potential	kg O ₃ equiv	1.20E-02	1.40E-04	7.48E-04	1.28E-02
Ozone Depletion Potential	kg CFC-11 equiv	1.21E-08	4.48E-10	2.29E-09	1.48E-08

*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.

Sustainable Batt
Insulation - Canada
Impacts

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R-value Scaling Factor	
Customary Product R-Value	Impact Scaling Factor
R-5.8	1.35
R-8	1.8
R-10	2.01
R-12	2.25
R-14	4.06
R-20	3.52
R-22	5.79
R-24	6.9
R-28	5.29
R-35	6.62
R-40	7.68

X

Environmental
Impact Potential
shown in Table 5
above.



ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

Optional Environmental Information

Indoor Environment

Sustainable Insulation® has achieved GREENGUARD Gold Certification.



Additional Environmental Information

- Sustainable Insulation® contains recycled content as independently verify by GreenCircle Certified.
- CertainTeed is an Energy Star Insulation Manufacturing Partner.

Facility	Pre-Consumer Recycled Content	Post-Consumer Recycled Content	Total Recycled Content
Ottawa, ON	45%	22%	67%
Redcliff, AB	0%	56%	56%



ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

Use Stage

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 (Canada), an energy analysis was conducted using REM/Rate software of three cities in Canada in a typical new home constructed according to 2009 IECC energy codes. The cities analyzed were Vancouver, BC, Churchill, MB, and Toronto, ON. The following table compares the embodied impacts of CertainTeed insulation installed in a two-story, single-family detached 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)		
	Vancouver, BC	Churchill, MB	Toronto, ON			
kWh/yr	46,060	154,009	66,059			
Impact Category	Vancouver, BC	Churchill, MB	Toronto, ON	Vancouver, BC	Churchill, MB	Toronto, ON
Global Warming	1.32E+04	3.99E+04	1.91E+04	1.02E+02	2.00E+02	1.02E+02
Acidification	2.70E+01	7.80E+01	5.01E+01	6.11E-01	1.20E+00	6.11E-01
Eutrophication	1.08E+01	3.12E+01	2.27E+01	4.51E-01	8.84E-01	4.51E-01
Smog Creation	2.15E+02	5.93E+02	3.66E+02	6.19E+00	1.21E+01	6.19E+00
Ozone Depletion	1.84E-03	5.55E-03	2.46E-03	7.15E-06	1.40E-05	7.15E-06



ENVIRONMENTAL PRODUCT DECLARATION



Sustainable Insulation®
Fiberglass Building Insulation Batts - Canada

According to ISO 14025

References

- Product Category Rules for Preparing an Environmental Product Declaration (EPD) for Product Groups: Building Envelope Thermal Insulation, Version 1.3, dated June 1, 2014
- EN ISO 14040, ISO 14040-2006 Environmental management – Life cycle assessment – Principles and framework
- EN ISO 14040, ISO 14044-2006 Environmental management – Life cycle assessment – Requirements and Guidelines
- Canada Mortgage and Housing Corporation
- Spray Polyurethane Foam Alliance
- ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers

Life Cycle Development

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

Contact CertainTeed

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

