ENVIRONMENTAL PRODUCT DECLARATION

SUSTAINABLE INSULATION ®

FIBERGLASS DUCT WRAP INSULATION

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

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

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

CertainTeed SAINT-GOBAIN

Sustainable Insulation ®
Fiberglass Duct Wrap Insulation

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
DECLARATION NUMBER	4787358622.103.1
DECLARED PRODUCT	Sustainable Insulation® Fiberglass Duct Wrap Insulation
REFERENCE PCR	UL PCR for Building Envelope Thermal Insulation v 1.3, 2014
DATE OF ISSUE	February 2, 2017
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 Review Panel
	epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Wade Stout, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas Gloria, Industrial Ecology Consultants

ENVIRONMENTAL PRODUCT DECLARATION

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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 Sustainable Insulation® Duct Wrap 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 duct wrap insulation products included in this EPD are: WideWrap Duct Wrap Insulation, SoftTouch Duct Wrap Insulation, and Marine Duct Wrap Insulation. The sizes for the products in this EPD range from 1 to 4 inches thick and 344 to 688 grams per cubic feet.

The declared unit of the products reported in this document is 1 kilogram of insulation material plus 1 square meter of facing with a building service life of 60 years.

Product Line

Features and Benefits

Sustainable Duct Wrap Insulation is ideal for residential, commercial and institutional settings to insulate rectangular and round heating, ventilating, and air conditioning duct work.

- Made in U.S.
- Made using a rapidly renewable plant-based binder
- Made with recycled content (GreenCircle Certified)
- Helps create a health 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 the Sustainable Blanket Insulation for this EPD are:

Athens, GA Plant	Chowchilla, CA Plant
CertainTeed Insulation	CertainTeed Insulation
425 Athena Drive, Athens, GA 30601	17775 Avenue 23 ½, Chowchilla, CA 93610

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

Application and Uses

Sustainable Insulation is for residential and commercial use. CertainTeed Sustainable Duct Wrap Insulation is available in Faced or Unfaced insulation in a variety of R-values ranging from 3.8 to 13.5 with thicknesses ranging from 1 to 4 inches. CertainTeed Sustainable Duct Wrap Insulation acts to insulate rectangular and round heating, ventilating, and air conditioning ductwork.

Installation

Sustainable Duct Wrap Insulation is made for easy handling and installation. CertainTeed Duct Wrap Insulation is installed by wrapping the insulation around the perimeter of the duct with the facing out. Adjacent sections of duct wrap are tightly butted with a 2” taping flap overlapping. Seams must be stapled with outward-clinching staples on approximately 6” centers.

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

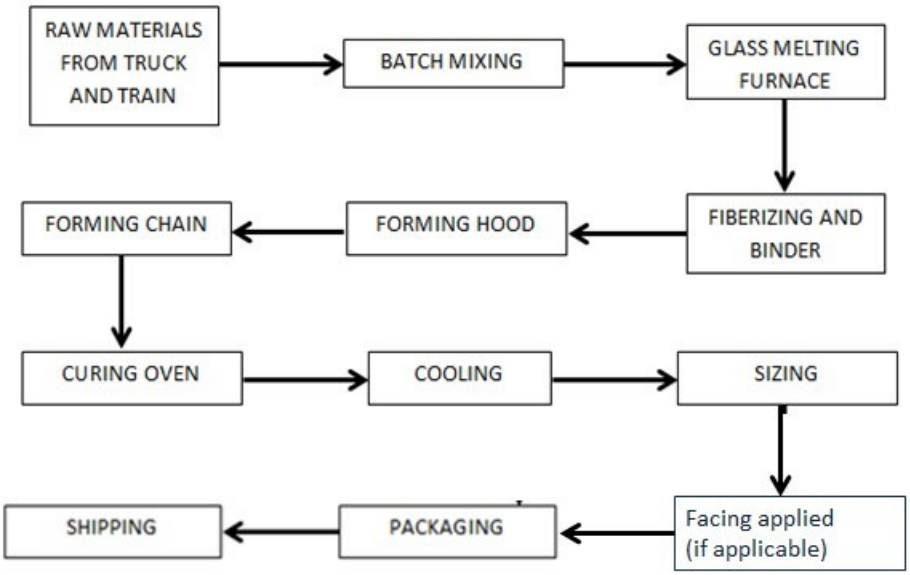
Table 1: Duct Wrap Insulation Product Specifications

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	200-400
Soda Ash	<15%		Y		North America	400-3000
Borates	<15%		Y		North America	300-3500
Limestone	<10%		Y		North America	150-400
Manganese Dioxide	<2%		Y		North America	700 - 3300
Feldspar	<25%		Y		North America	200-350
Binder						
Bio-Based Polycarboxylic Acid	0%- 50%			Y	North America	50 – 1000
Sugars	0% - 50%			Y	North America	1200-3300
Mineral Oil	6%- 30%				North America	200 - 4300
Silane	0% - 6%				North America	200 - 1400
Additives	0% - 8%				North America	60 – 400

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.

Manufacturing Process

Figure 1: Duct Wrap Insulation 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

Declared Unit

The environmental impacts are reported per declared unit of a product and the declared unit is the basis for comparison in an LCA. For mechanical insulation, the functional unit is defined as 1 kilogram of insulation plus 1 square meter of facing with a building service life of 60 years.

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 distributers.
3. Installation
4. Use (estimated building energy savings reported separately).
5. End of Life.

System Boundaries

The life cycle analysis for the production of duct wrap insulation comprises the life cycle stages from cradle-to-grave. It begins with the consideration of the duct wrap 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 2 to the right. Manufacturing overhead (heating & lighting) was included in the system boundary.

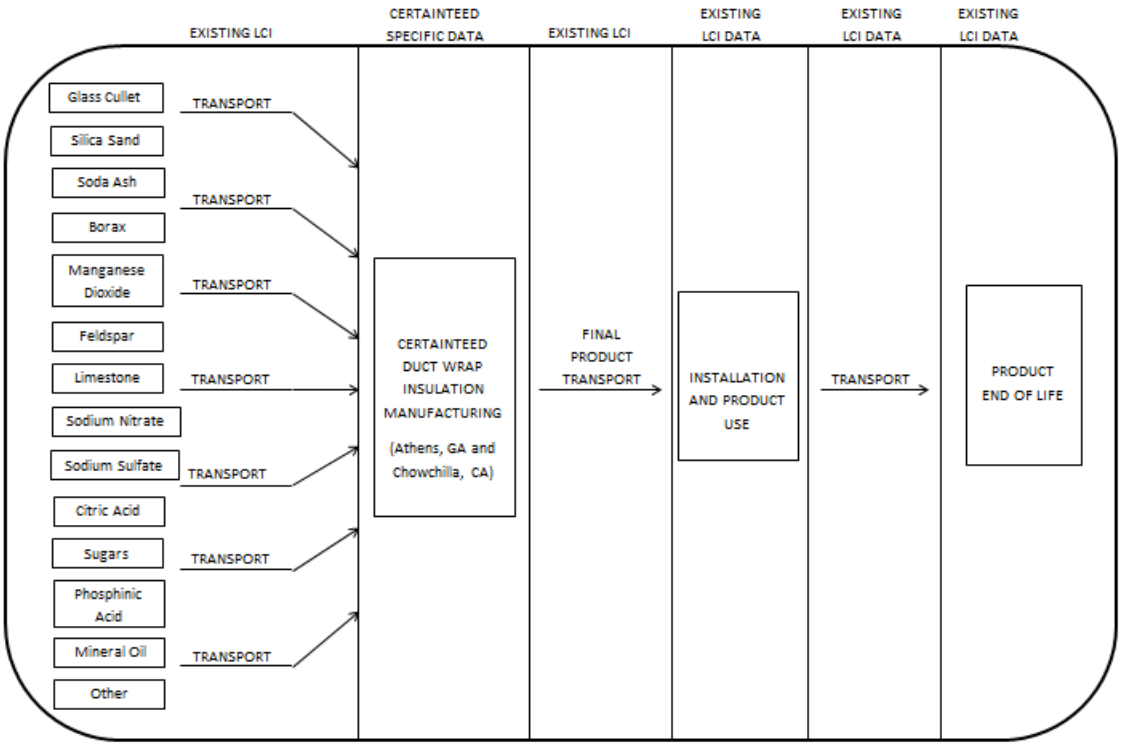


Figure 2: Duct Wrap Insulation System Boundaries

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 Duct Wrap 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.
- 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 Athens and Chowchilla facilities provided shipping distances and modes of all raw materials which were used in this study. The final product is typically sold within North American boundaries and is transported by truck. The average distance the product is 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 January 2015 – December 2015.

Background Data

For life cycle modeling the SimaPro 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.

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 duct wrap 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 1.0%.

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 Duct Wrap Insulation are reported separately.

End-of-Life

The duct wrap 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 Declared Unit

Total Primary Energy	Unit	Sustainable Duct Wrap Insulation (without Facing)	Sustainable Duct Wrap Insulation (with Facing)
Non-renewable primary energy	MJ-Eq	4.81E+01	5.16E+01
Renewable primary energy	MJ-Eq	4.19E+00	9.53E+00
Non-renewable materials	kg	8.91E-01	9.02E-01
Renewable materials	kg	0.00E+00	0.00E+00
Water use	m^3	1.76E-03	1.81E-03

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

Primary Energy Source	Unit	Sustainable Duct Wrap Insulation (without Facing)	Sustainable Duct Wrap Insulation (with Facing)
Nonrenewable			
Fossil Oil	MJ-Eq	8.76E+00	1.02E+01
Coal	MJ-Eq	8.13E+00	9.02E+00
Natural Gas	MJ-Eq	1.44E+01	1.50E+01
Uranium	MJ-Eq	2.87E+00	3.42E+00
Renewable			
Wind Power	MJ-Eq	6.92E-02	8.70E-02
Solar Power	MJ-Eq	7.26E-04	9.64E-04
Geothermal	MJ-Eq	9.62E-03	9.62E-03
Hydro Power	MJ-Eq	5.58E-01	6.11E-01
Biomass	MJ-Eq	3.50E+00	8.77E+00

Figure 3: Duct Wrap Insulation Non-Renewable Energy by Source, with and without Facing

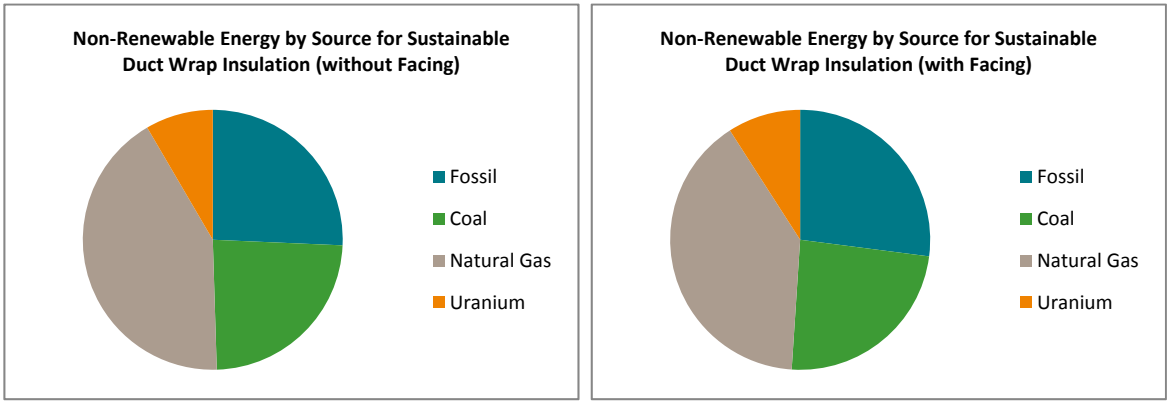
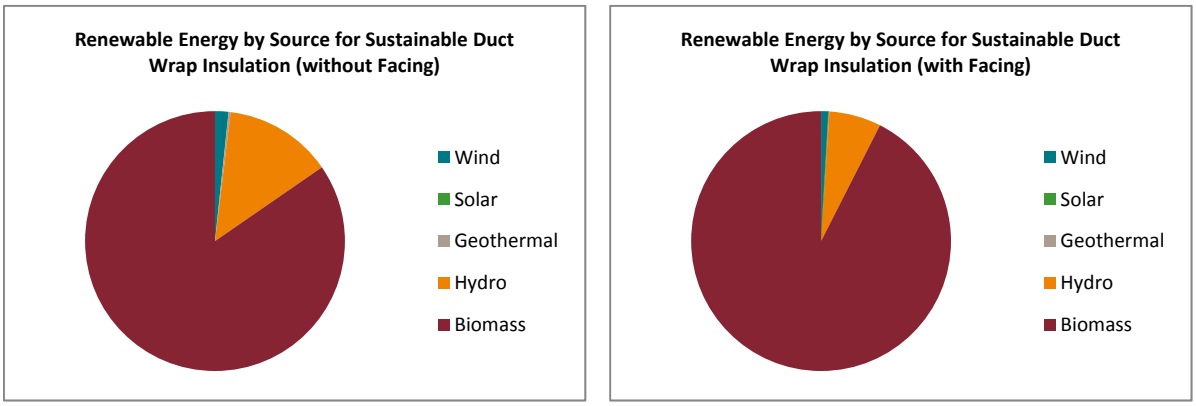


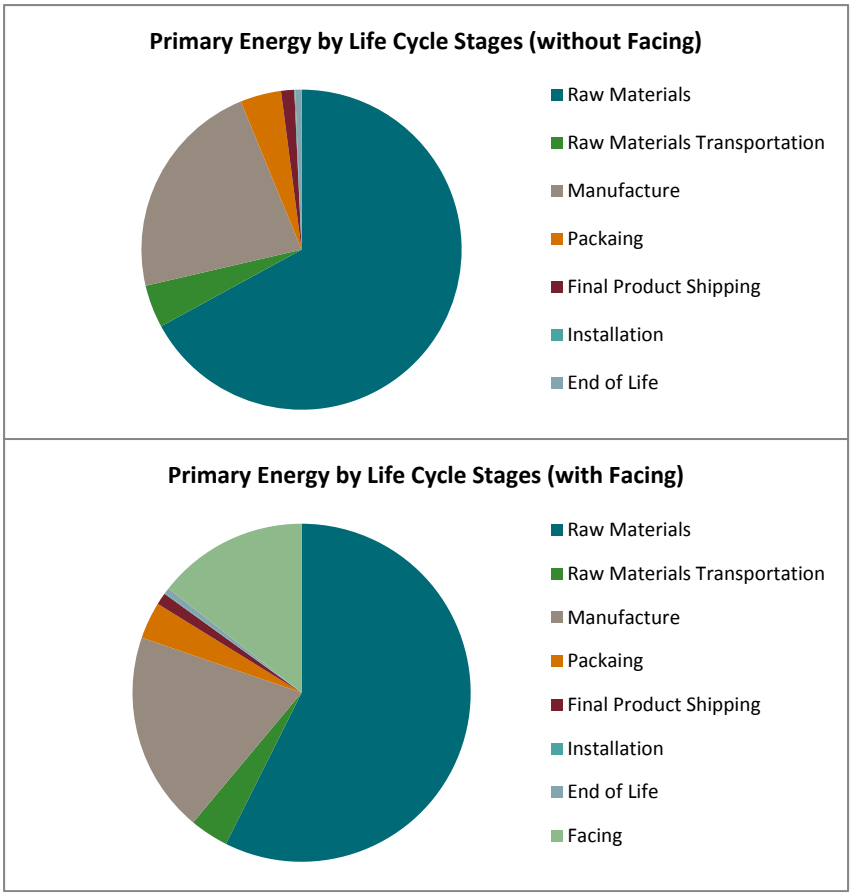
Figure 4: Duct Wrap Insulation Renewable Energy by Source, with and without Facing



Primary Energy by Life Cycle Stages

The pie chart on the right shows that the production process, which includes the raw materials, manufacture, and packaging is the most energy intensive stage of the CertainTeed Sustainable Duct Wrap Insulation Life Cycle. The use phase of insulation accounts for none of the primary energy use because it is a passive product.

Figure 5: Duct Wrap Insulation Primary Energy by Life Cycle Stage, with and without Facing



Life Cycle Waste to Disposal

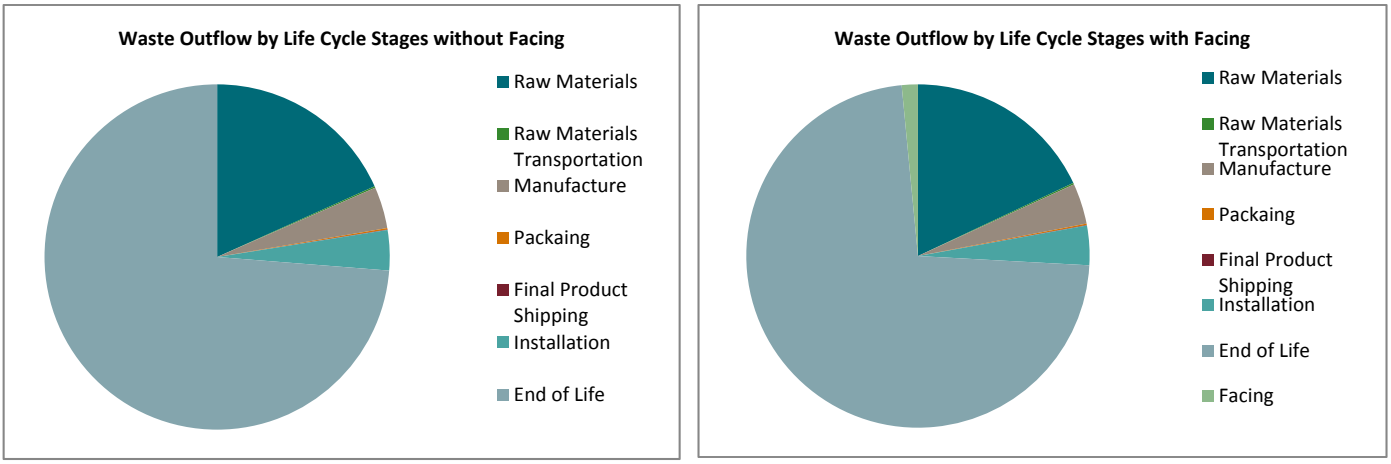
Table 4: Total Waste Output for Sustainable Duct Wrap Insulation per Declared Unit, without Facing

		Production Stage							
Waste Category	Unit	Raw Materials	Raw Materials Transportation	Manufacture	Packaging	Final Product Shipping	Install	End of Life	Total w/o Facing
Hazardous waste	kg	6.50E-03	3.05E-07	2.04E-06	1.21E-06	9.39E-08	2.07E-07	1.05E-07	6.50E-03
Non Hazardous waste	kg	2.41E-01	2.07E-03	5.26E-02	1.80E-03	6.39E-04	5.09E-02	1.00E+00	1.35E+00
Radioactive waste	kg	4.93E-05	2.89E-07	1.13E-06	5.95E-07	8.92E-08	3.63E-08	5.59E-08	5.15E-05

Table 5: Total Waste Output for Sustainable Duct Wrap Insulation per Declared Unit, with Facing

Waste Category	Unit	Total w/o Facing	+ 1m2 Facing	Total w/ Facing
Hazardous waste	kg	6.50E-03	2.51E-05	6.52E-03
Non Hazardous waste	kg	1.35E+00	2.09E-02	1.37E+00
Radioactive waste	kg	5.15E-05	5.01E-06	5.65E-05

Figure 6: Duct Wrap Insulation Waste Outflow by Life Cycle Stage, with and without Facing



Life Cycle Impact Assessment

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

Table 6: TRACI Environmental Impact Potentials for Sustainable Duct Wrap Insulation per Declared Unit (North America)

	Impact Category (TRACI)				
	Global Warming Potential	Acidification Potential	Eutrophication Potential	Smog Creation Potential	Ozone Depletion Potential
	kg CO2 eq	kg SO2 eq	kg N eq	kg O3 eq	kg CFC-11 eq
Raw Materials	1.49E+00	1.19E-02	4.49E-03	1.33E-01	2.13E-07
Raw Materials Transportation	1.67E-01	1.32E-03	1.13E-04	4.08E-02	2.95E-10
Manufacture	7.58E-01	6.19E-03	1.64E-04	3.47E-02	5.54E-09
Packaging	7.01E-02	2.82E-04	7.50E-05	3.81E-03	1.00E-09
Final Product Shipping	5.15E-02	2.85E-04	2.71E-05	8.21E-03	9.09E-11
Installation	3.24E-03	1.48E-05	1.17E-05	2.27E-04	2.36E-10
End of Life	1.71E-02	1.08E-04	1.40E-05	3.06E-03	2.84E-09
Total w/o Facing*	2.56E+00	2.01E-02	4.89E-03	2.24E-01	2.23E-07
1 m2 Facing	2.06E-01	1.42E-03	6.48E-04	2.27E-02	1.72E-08
Total w/ Facing*	2.76E+00	2.15E-02	5.54E-03	2.47E-01	2.41E-07

*May not sum to total due to rounding.

Figure 7: Duct Wrap Insulation Environmental Impact Potentials by Life Cycle Stage, without Facing (TRACI – North America)

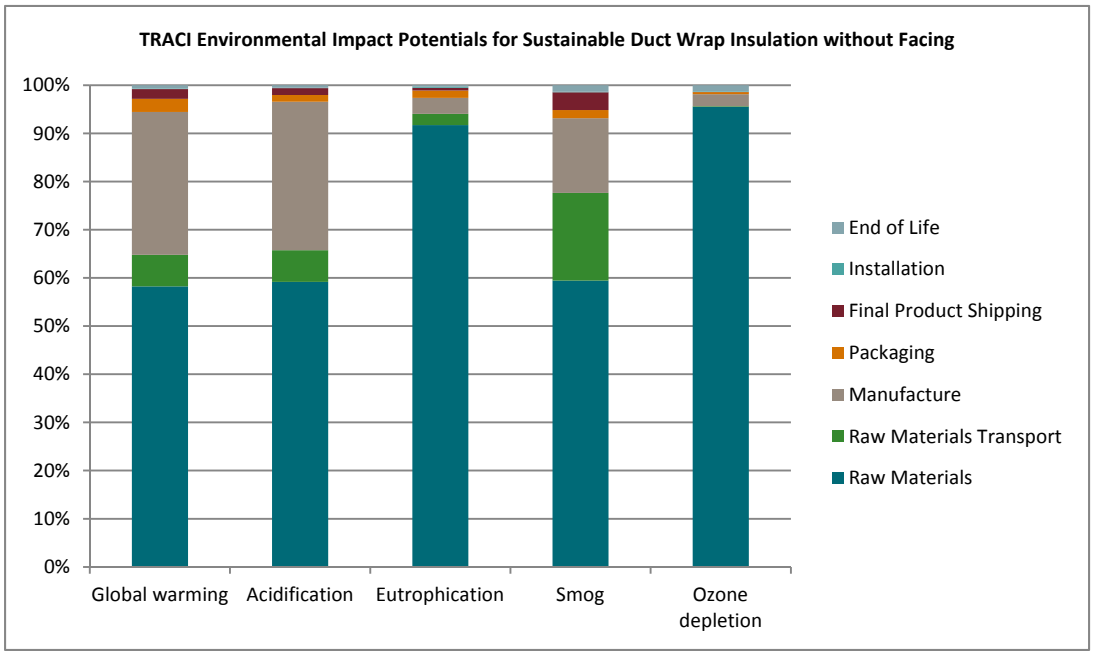


Figure 8: Duct Wrap Insulation Environmental Impact Potentials by Life Cycle Stage, with Facing (TRACI – North America)

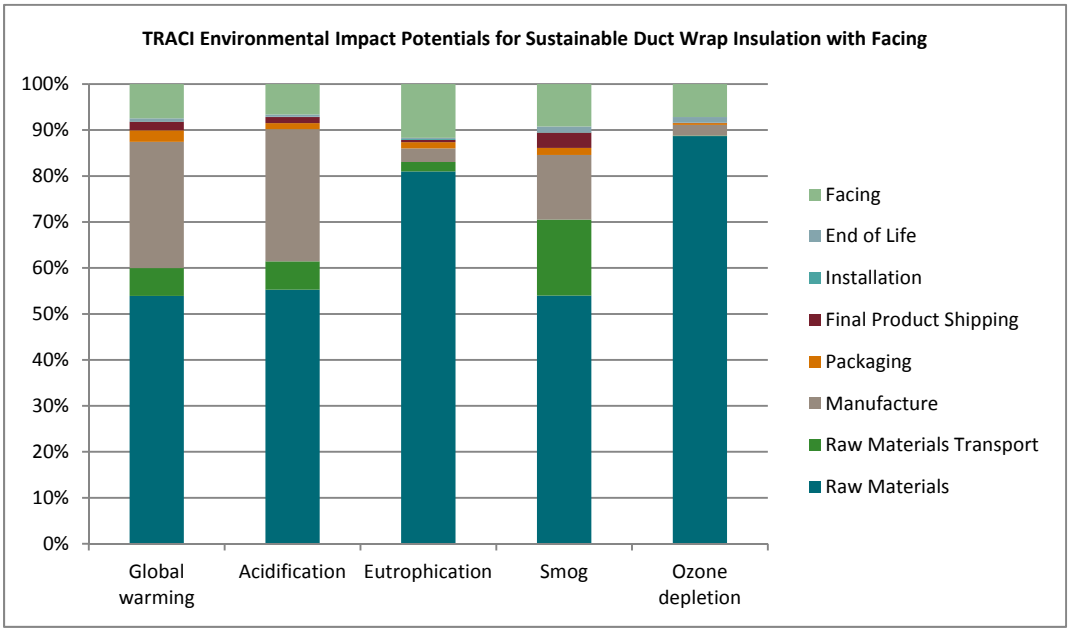


Table 7: CML Environmental Impact Potentials for Sustainable Duct Wrap Insulation per Declared Unit (Outside North America)

	Impact Category (CML)				
	Global Warming Potential	Acidification Potential	Eutrophication Potential	Photochemical oxidation Potential	Ozone Depletion Potential
	kg CO2 eq	kg SO2 eq	kg PO4 eq	kg C2H4 eq	kg CFC-11 eq
Raw Materials	1.49E+00	1.20E-02	2.56E-03	5.30E-04	1.73E-07
Raw Materials Transportation	1.67E-01	1.03E-03	2.30E-04	3.34E-05	1.85E-10
Manufacture	7.58E-01	6.84E-03	2.21E-04	2.82E-04	4.16E-09
Packaging	7.01E-02	2.80E-04	4.87E-05	1.37E-05	6.82E-10
Final Product Shipping	5.15E-02	2.29E-04	4.81E-05	1.01E-05	5.69E-11
Installation	3.24E-03	1.41E-05	5.91E-06	1.50E-06	1.73E-10
End of Life	1.71E-02	8.72E-05	1.92E-05	3.53E-06	2.13E-09
Total w/o Facing*	2.56E+00	2.05E-02	3.14E-03	8.73E-04	1.80E-07
1 m2 Facing	2.06E-01	1.35E-03	3.77E-04	5.84E-05	1.24E-08
Total w/ Facing*	2.76E+00	2.19E-02	3.51E-03	9.32E-04	1.92E-07

*May not sum to total due to rounding.

Figure 9: Duct Wrap Insulation Environmental Impact Potentials by Life Cycle Stage, without Facing (CML – Outside North America)

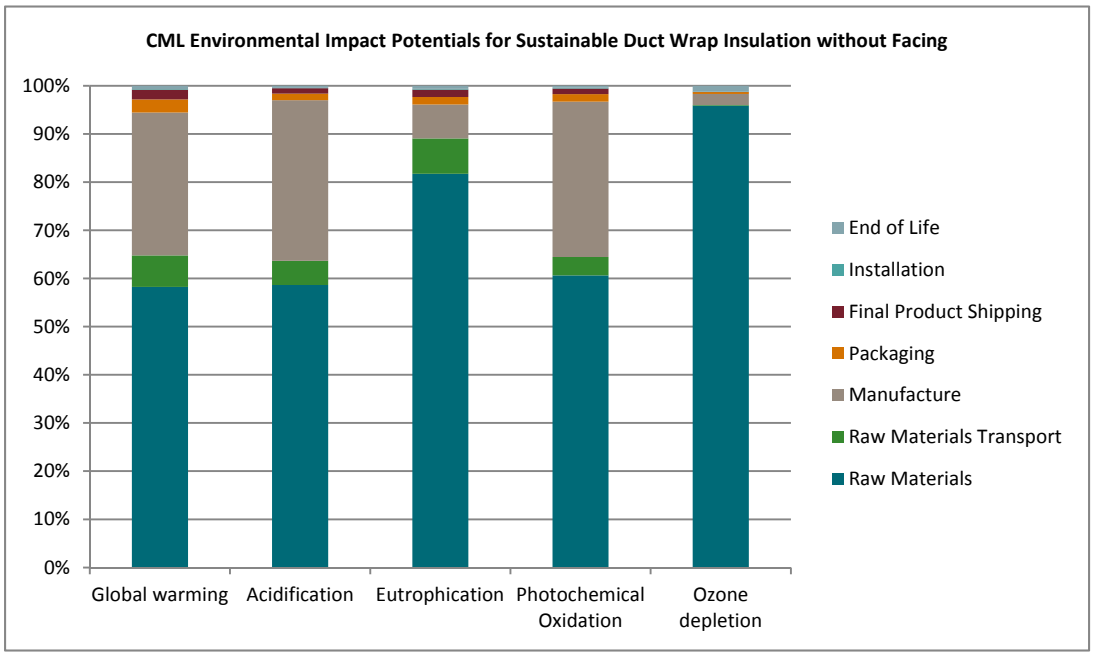
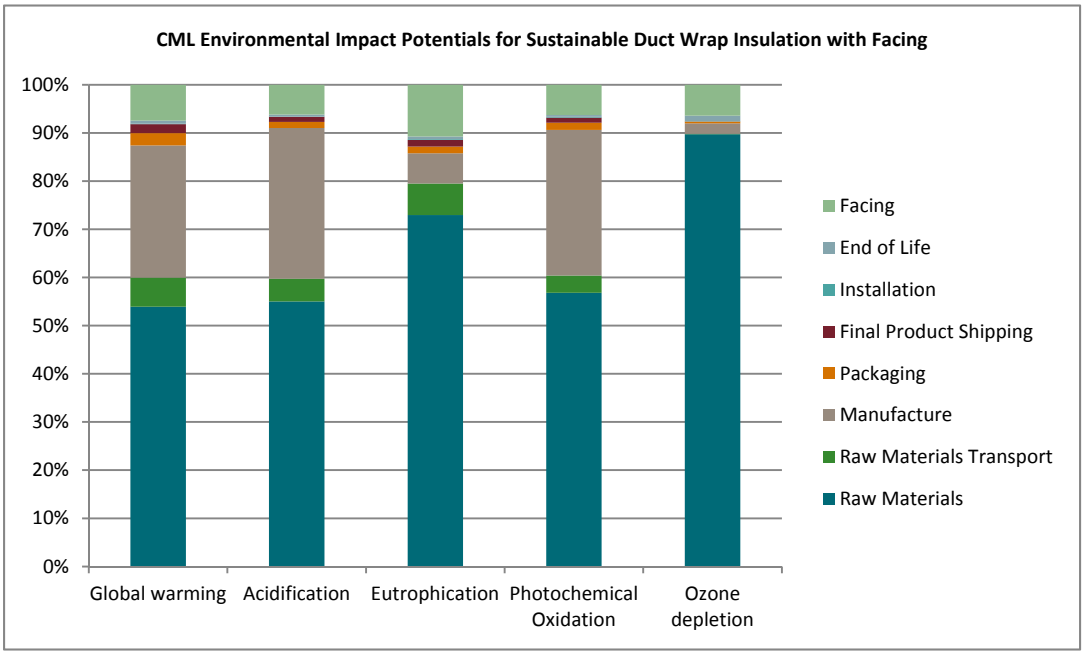


Figure 10: Duct Wrap Insulation Environmental Impact Potentials by Life Cycle Stage, with Facing (CML – Outside North America)



Scaling Factors for Determining Impacts for Various Sizes

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 11: Duct Wrap Insulation Calculation of Scaling Factors

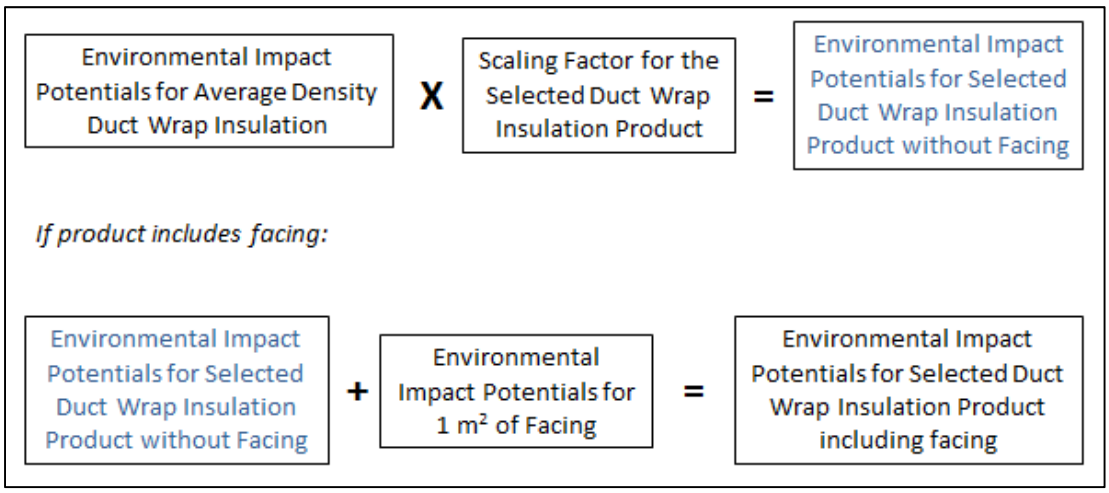


Table 8: Duct Wrap Insulation Scaling Factors

Duct Wrap Scaling Factors			
Customary Product Size and R-Value			**Impact Scaling Factor**
Type 75	1 in (25 mm)	R-3.8	1.183
	1.5 in (38 mm)	R-5.2	0.838
	2 in (51 mm)	R-6.9	0.727
	2.125 in (54 mm)	R-7.3	0.706
	3 in (76 mm)	R-10.2	0.756
	4 in (102 mm)	R-13.5	0.758
Type 100	1 in (25 mm)	R-3.8	1.183
	1.5 in (38 mm)	R-5.7	1.035
	2 in (51 mm)	R-7.6	0.998
Type 150	1.5 in (38 mm)	R-6.2	1.413
	2 in (51 mm)	R-8.3	1.405

Duct Wrap Insulation Impacts = (Duct Wrap Scaling Factors) X **Environmental Impact Potential shown in Table 6 or Table 7 above.**

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.

Table 9: CertainTeed Facility Recycled Content

Facility	Pre-Consumer Recycled Content	Post-Consumer Recycled Content	Total Recycled Content
Athens, GA	27%	18%	45%
Chowchilla, CA	19%	19%	38%

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, an energy analysis on the use phase of insulation was conducted using the 3E Plus Insulation Thickness program developed by the North American Insulation Manufacturers Association (NAIMA). The analysis compared the savings in heat loss per hour when using duct wrap insulation versus no insulation on pipes. The following tables show the savings in heat loss and CO2 for natural gas and electricity fuel types when using duct wrap insulation.

Table 10: Duct Wrap Insulation Heat Loss Savings

Duct Wrap Insulation Thickness	Type 75 Duct Wrap Insulation			Type 100 Duct Wrap Insulation			Type 150 Duct Wrap Insulation		
	Surface Temp (˚F)	Heat Loss (BTU/hr/ft)	Efficiency (%)	Surface Temp (˚F)	Heat Loss (BTU/hr/ft)	Efficiency (%)	Surface Temp (˚F)	Heat Loss (BTU/hr/ft)	Efficiency (%)
Bare (no insulation)	140.0	81.12		140.0	81.12		140.0	81.12	
0.5	90.2	21.16	73.92	89.4	19.87	75.51	88.2	17.93	77.89
1.0	83.7	14.16	82.55	83.1	13.22	83.70	82.4	11.83	85.42
1.5	80.8	11.06	86.37	80.4	10.30	87.30	79.9	9.19	88.67
2.0	79.3	9.36	88.46	79.0	8.71	89.26	78.6	7.75	90.44
2.5	78.4	8.32	89.74	78.2	7.74	90.46	77.9	6.88	91.52
3.0	77.8	7.58	90.65	77.6	7.05	91.31	77.4	6.26	92.28
3.5	77.4	7.03	91.34	77.2	6.53	91.95	77.0	5.80	92.85
4.0	77.0	6.54	91.94	76.9	6.07	92.51	76.7	5.39	93.35

Table 11: Duct Wrap Insulation CO2 Savings

Duct Wrap Insulation Thickness	Type 75 Duct Wrap Insulation		Type 100 Duct Wrap Insulation		Type 150 Duct Wrap Insulation	
	CO2 (lb/ft/yr) Fuel: Natural Gas	CO2 (lb/ft/yr) Fuel: Electricity	CO2 (lb/ft/yr) Fuel: Natural Gas	CO2 (lb/ft/yr) Fuel: Electricity	CO2 (lb/ft/yr) Fuel: Natural Gas	CO2 (lb/ft/yr) Fuel: Electricity
Bare (no insulation)	104.90	287.20	104.90	287.20	104.90	287.20
0.5	27.35	74.91	25.68	70.33	23.18	63.49
1.0	18.30	50.12	17.09	46.80	15.29	41.88
1.5	14.30	39.15	13.32	36.48	11.88	32.53
2.0	12.10	33.13	11.26	30.83	10.02	27.45
2.5	10.76	29.46	10.00	27.40	8.90	24.36
3.0	9.80	26.85	9.11	24.95	8.10	22.17
3.5	9.08	24.87	8.44	23.11	7.50	20.53
4.0	8.45	23.14	7.85	21.50	6.97	19.09

References

- Product Category Rules for Preparing an Environmental Product Declaration (EPD) for Product Groups: Building Envelope Thermal Insulation, Version 1.4, dated September 12, 2016
- 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
- Spray Polyurethane Foam Alliance

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.