Environmental Product Declaration

Owens Corning Unbonded Loosefill

Owens Corning Loosefill Insulation delivers enhanced performance, productivity, and versatility across a broad range of applications.

INNOVATIONS FOR LIVING®

Owens Corning, and its family of companies, are a leading global producer of residential and commercial building materials, glass-fiber reinforcements, and engineered materials for composite systems. Founded in 1938, Owens Corning has earned its reputation as a market-leading innovator of glass-fiber technology by consistently providing new solutions that deliver a strong combination of quality and value to its customers across the world.

Building Materials products – primarily roofing and insulation – are focused on making new and existing homes and buildings energy efficient, comfortable, and attractive. Owens Corning is committed to balancing economic growth with social progress and sustainable solutions to its building materials and composites customers around the world.

This Environmental Product Declaration is a component of our stated goal to provide life cycle information on all core products. **www.owenscorning.com.**

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION

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ENVIRONMENTAL PRODUCT DECLARATION

INNOVATIONS FOR LIVING®

Owens Corning Unbonded Loosefill Insulation

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	Owens Corning
DECLARATION NUMBER	12CA25418.101.1
DECLARED PRODUCT	Owens Corning Unbonded Loosefill Insulation. Manufactured by Owens Corning in the United States and Canada.
REFERENCE PCR	PCR Building Envelope Thermal Insulation (ULE 2011)

DATE OF ISSUE	October 29, 2012
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
	333 Pfingsten Road Northbrook, IL 60062 epd@ul.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL X EXTERNAL	
	Loretta Tam
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	
	Thomas P. Gloria

Environment

ENVIRONMENTAL PRODUCT DECLARATION

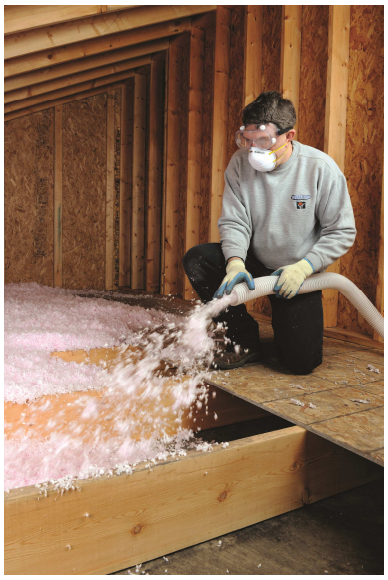
INNOVATIONS FOR LIVING®

Owens Corning Unbonded Loosefill Insulation

According to ISO 14025

Product Definition and Information

Product Description



Owens Corning's unbonded loosefill fiberglass insulation is manufactured under two trade names. AttiCat® Expanding Blown-In Insulation, which can be installed by either the professional insulation contractor or the DIY customer. **PRO**PINK®L77 PINK Fiberglas™ Unbonded Loosefill Insulation product is targeted toward the professional insulation contractor. The thermal resistance unbonded loosefill insulation provides is specific to the particular application. For an open blow attic application, unbonded loosefill is specified to provide a thermal resistance from R-13 to R-60, and for enclosed cavity applications, unbonded loosefill is specified to provide a thermal resistance from R-13 to R-24 for walls, R-31 to R-48 for floors, and R-28 to R-44 for cathedral ceilings.

The functional unit of the product as defined by the PCR is 1 square meter of insulation material with a thickness that gives an average thermal resistance RSI=1 m2K/W and with a building service life of 60 years.

The results of this declaration represent an average performance for a number of products and manufacturing plant locations.

Manufacturing Locations

Owens Corning North American Insulation Manufacturing Locations can be found across the United States and Canada.

Edmonton Plant* Edmonton, AB, Canada T6S1A1	Kansas City Plant Kansas City, KS 66115
Mt. Vernon Plant Mt. Vernon, OH 43050	Nephi Plant* Nephi, UT 84648
Lakeland Plant* Lakeland, FL 33810	Toronto Plant Scarborough, ON, Canada M1V1Z5

*Manufacturing location was not included in LCA for unbonded loosefill

Application and Uses

The **PRO**PINK®L77 and AttiCat® Expanding Blown-In Insulation products can be installed in new construction or existing buildings. In existing applications, loosefill fiberglass insulation can be applied in attics on top of existing insulation to increase the R-value of the building's insulation or applied in ceilings that have no insulation. Loosefill insulation can also be installed in any existing wall or enclosed floor cavity that lacks insulation. Flat ceiling applications are based on thickness in inches at a prescribed density. R-values for ceiling applications range from R-13 to R-60. Wall applications are based on installed density and have an R-value range of R-13 to R-24. For cathedral ceiling applications, the product is based on installed density with R-values of R-28 to R-44. For floor applications, the R-values can be from R-31 to R-48, when installed at the proper density.

Installation

To increase R-Value in a ceiling of an existing structure, simply apply additional loosefill fiberglass insulation on top of the existing layers of insulation as shown in picture on left. For installation in an existing structure where there is no insulation, fill the ceiling joist cavities to the thickness of the desire R-value as depicted in the picture below. Follow the manufacturer's coverage chart, with information on thickness and number of bags required, to achieve the desired R-value.

For existing structures that have no insulation in the wall or cathedral ceiling cavities, a hole is drilled into the surface and the blowing machine hose is inserted into the hole for filling the cavity. In most wall applications, filling the cavity from the exterior is preferred.

For new building installations, the process requires a non-woven fabric to be installed on the open side of the wall or cathedral ceiling. This non-woven fabric contains the loosefill blown-in fiberglass insulation until the finished surface is applied to the framing members – studs or rafters.

For ceiling installations on new structures, the application method would be as depicted above for a retrofit of an existing building.

ENVIRONMENTAL PRODUCT DECLARATION

INNOVATIONS FOR LIVING®

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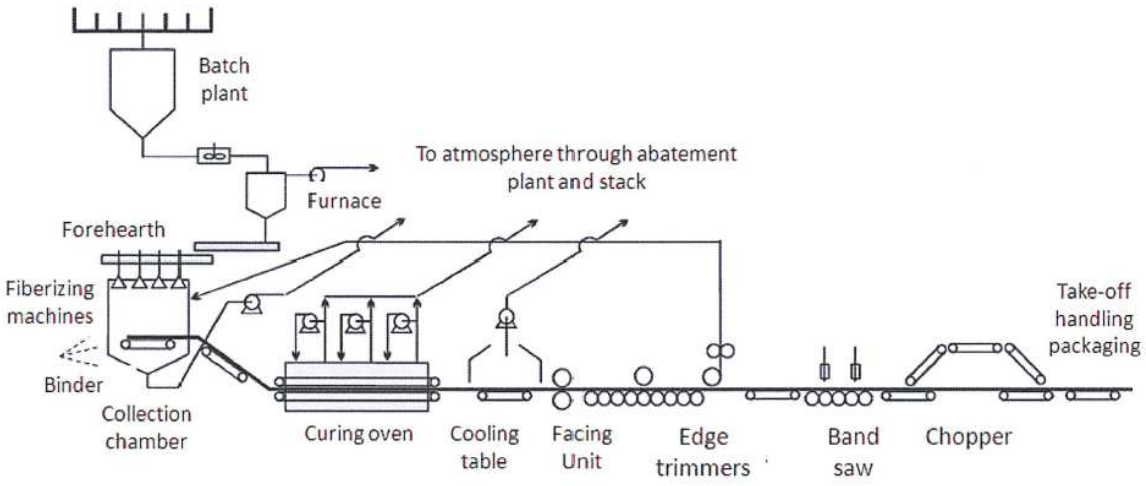
Material Content

PROPINK®L77 and AttiCat® Expanding Blown-In Insulation products consist of two major components, fiberglass, which nominally > 98% and the remainder being the add-on chemicals.

Materials	Function	Quantity (% by mass)	Non-Renewable	Renewable	Recycle Material	Origin	Transportation Mode	Transportation (Miles)
Cullet	Glass Batch	25-75%	■		■	North America	Rail/Truck	10-800
Sand	Glass Batch	8-25%		■		North America	Truck	10-250
Borates	Glass Batch	10-30%	■			Global	Ship/Rail/Truck	350-6200
Soda Ash	Glass Batch	0-10%	■			North America	Rail/Truck	350-2000
Other Oxides	Glass Batch	1-2%	■			North America	Rail/Truck	225-2000
Silicates	Glass Batch	0-5%	■			North America	Truck	125-200
Dusting Mineral Oil	Add-On	<2%	■			North America	Truck	196-928
Silanes	Add-On	<2%	■			North America	Truck	602-432
Antistat	Add-On	<2%	■			North America	Truck	1280-1599
Surfactant	Add-On	<2%	■			North America	Truck	280-878

Manufacturing Process



The process diagram above is representative for the manufacturing of a *bonded* fiberglass insulation product such as a batt or roll. However, for the manufacturing of unbonded loosefill fiberglass insulation, not all of the process steps depicted in the diagram are required. For example, equipment, that would otherwise be used for binder application, is used for chemical add-on. Furthermore, since the aqueous content of the chemical add-on is less than that of binder solutions, a curing oven is not needed. Additionally, the downstream equipment, which includes the edge trimmers, band saw, and choppper, would also not be needed. In place of these, however downstream equipment for milling is needed and used in the manufacturing of unbonded loosefill.

Environmental Product Declaration

Use of Material and Energy Resources

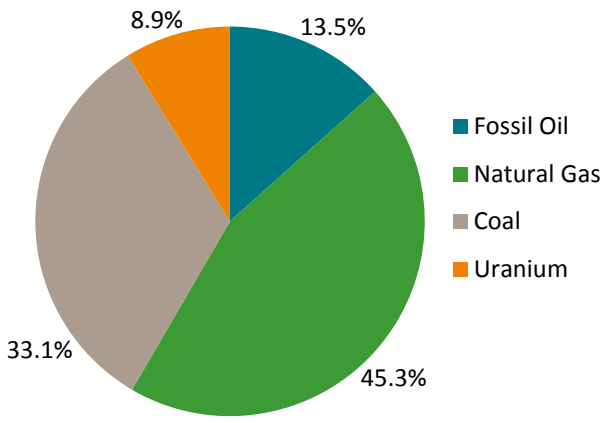
Table 1: Total Primary Energy

Total Primary Energy	Unit	Total
Non renewable, fossil	MJ-Eq	14.52
Non-renewable, nuclear	MJ-Eq	1.40
Renewable, biomass	MJ-Eq	0.13
Renewable, wind, solar, geothermal	MJ-Eq	0.0039
Renewable, water	MJ-Eq	0.51

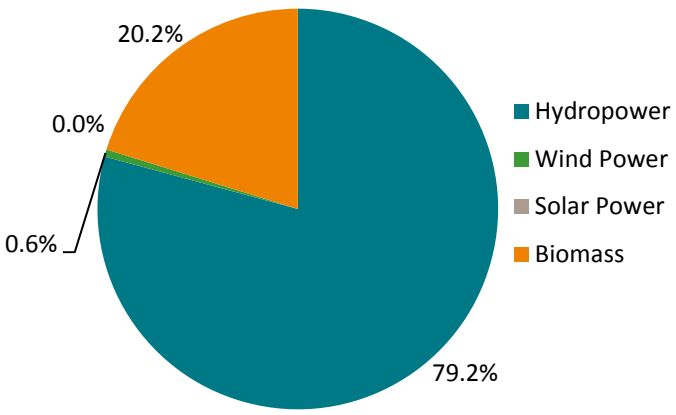
Table 2: Total Primary Energy Detail by Source Type

Non-Renewable Primary Energy Source	Unit	Total	Renewable Primary Energy Source	Unit	Total
Fossil Oil	MJ-Eq	2.13	Hydropower	MJ-Eq	0.51
Natural Gas	MJ-Eq	7.16	Wind Power	MJ-Eq	0.0038
Coal	MJ-Eq	5.22	Solar Power	MJ-Eq	1.00E-04
Uranium	MJ-Eq	1.4	Biomass	MJ-Eq	0.13

Non-Renewable Energy by Source

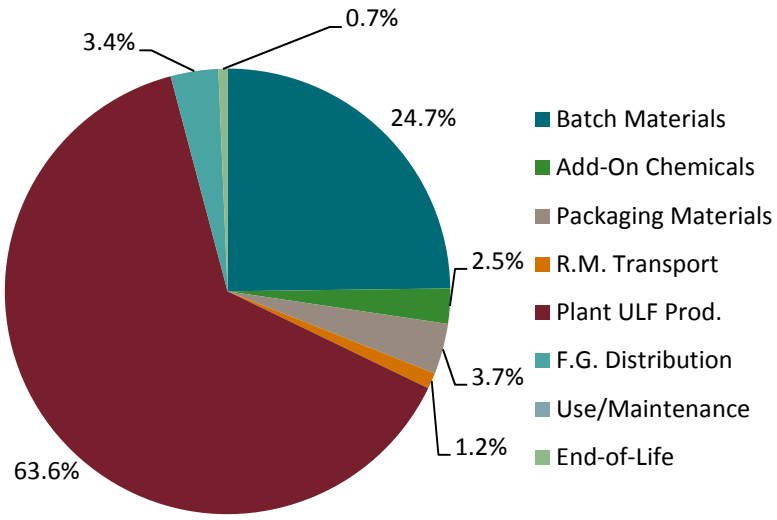


Renewable Energy by Source



Use of Material and Energy Resources

As shown by the pie chart, the fiberglass manufacturing process is energy intensive but since insulation is a passive device, the use phase consumes zero primary energy, and in fact actually saves energy in a building



Life Cycle Assessment-Product System and Modeling of Life Cycle

Functional Unit

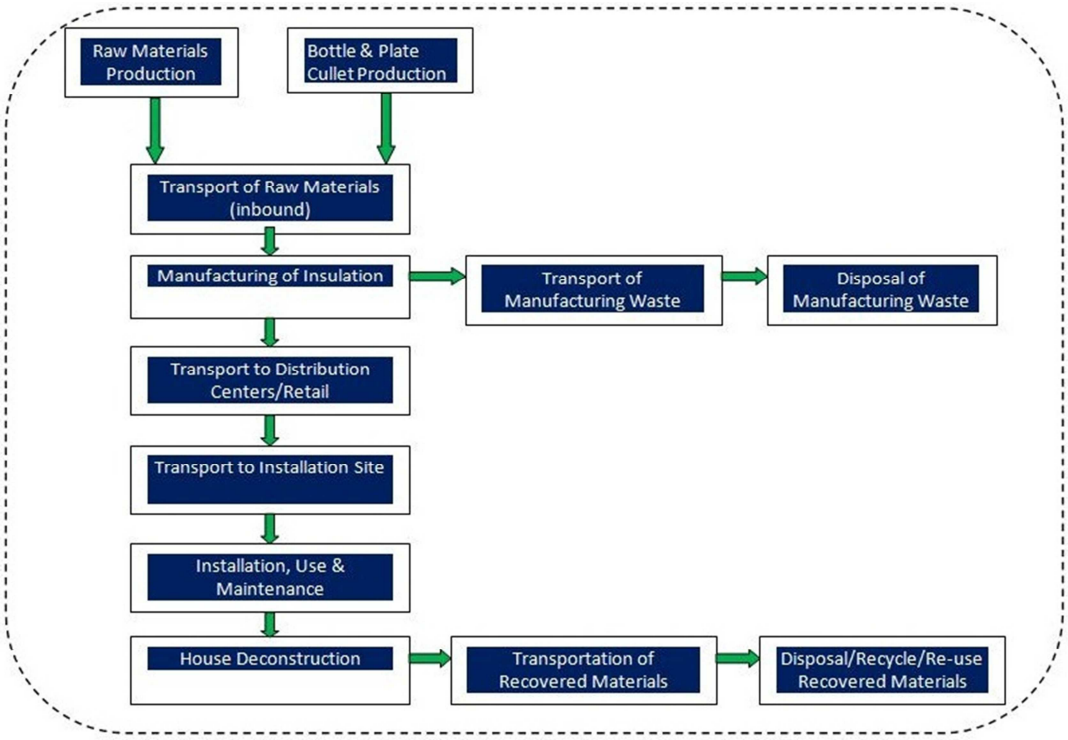
The functional unit of the product as defined by the PCR is 1 square meter of insulation material with a thickness that gives an average thermal resistance RSI=1 m2K/W and with a building service life of 60 years.

Life Cycle Stages Assessed

The EcoTouch® Insulation study for the manufacturing of unfaced fiberglass batts and rolls was a cradle-to grave analysis, which included the following:

- Raw material production including extraction of primary raw materials, raw material manufacturing, raw materials for packaging, recycle cullet collection and processing,
- All raw material, packaging material and recycle cullet material to manufacturing locations.
- Fiberglass manufacturing
- Packaging of Finished Goods.
- Finished Good Transportation from Manufacturing Facilities to Distribution centers, and Retailers.
- End-of-Life; Decommissioned material transportation to Waste Landfill and Landfill.

System Boundaries



Assumptions

Assumptions are critical in conducting a life cycle assessment. For this cradle-to-grave life cycle, a major assumption is for the installation, use and maintenance phase. Installing unbonded loosefill fiberglass insulation is performed with the use of a “wool” blowing machine. The energy associated with the motor on the blower was determined to be less than one percent of the total life cycle energy of the system. Therefore the energy associated with the blowing machine can be ignored as per ISO-14044 standard. During the sixty-year life of the home as defined in the study, the loosefill would require no other utility source to operate (passive device). Finally, unless some type of serious damage occurred to the wall of a home, maintenance on the loosefill fiberglass insulation would not be required. In conclusion, for this study, a use/maintenance phase had zero impact value for the life cycle. The major benefit of insulation is that it saves energy over the life of the home. See section on “Additional Environmental Benefits” for energy savings for homes due to insulation of walls, ceilings, floors and foundations.

All data reported is a North American weighted averaged for three North American, Owens Corning plants that produced 74% of the unbonded loosefill fiberglass insulation for the year 2011.

Cut-Off Criteria

The cut-off criteria for the study are as follows:

- Mass – If a flow is less than 2% of the cumulative mass of the model, it may be excluded, providing it

environmental relevance is not a concern.

- Energy – If a flow is less than 1% of the cumulative energy of the model, it may be excluded, providing its environmental relevance is not a concern,
- Environmental Relevance – Materials of omission that may have a relevant contribution will be justified if applicable, by a sensitivity analysis.
- The sum of the excluded material flows must not exceed 5% of mass, energy, or environmental relevance.

Transportation

Each participating plant supplied the transportation distances for the shipment of all raw materials to their respective facility by the data input questionnaires as used in the study. Owens Corning's Corporate Transportation Analyst provided the finished good shipments to distributors, retail stores and other customers.

Period under Consideration

All Owens Corning primary data for the facilities used in the study were from the fiscal year of 2011.

Secondary (Background) Data

The LCA modeling was created using SimaPro 7.3.2 software for life cycle engineering as developed by PRé Consultants. Secondary data was obtained using the SimaPro database for the raw materials and processes.

Data Quality

Data quality factors of temporal, geographical, and technology are very important in analyzing the primary information for the study. The three Owens Corning facilities chosen for this study represents the current technology in use geographically cover the United States and Canada, and the data is from the year 2011.

The secondary data used from the SimaPro database was the most appropriate and current data available. When production data was not available for a specific material in use, available LCI data on similar materials were analyzed to determine the best surrogate.

Allocation

Allocation where applicable was carried out by mass, except in transportation where the product is volume limited and not mass limited. Sensitivity analysis should be initiated if a deviation of 20% is foreseen. Since fiberglass products are volume limited for finished goods-transportation, a sensitivity analysis was performed for this study. The finish goods transportation (ton-miles) was changed by +/- 25% for the sensitivity analysis. All of the environmental impact categories changed by less than 1% except for the impact category of smog potential. With a 25% increase in finished good transportation ton-miles, there is a 2% increase in the smog potential value.

Use Stage

As stated in the Assumptions' Section above, for this study, the environmental impacts are negligible for the study.

End-of-Life

For end of life, it was assumed that all materials removed from the decommissioning of a building were taken to a local construction waste landfill, using 100 miles as the average distance to landfill.

Life Cycle Assessment-Product

The LCA Results are documented separately for the following stages:

- Batch Materials: mining and manufacturing of batch minerals as used in glass batch.
- Add-On Chemicals: extraction and manufacturing of chemicals as used in add-on process.
- Cradle to gate manufacturing of packaging materials.
- Raw Material Transportation: Transport distances for batch, add-on chemicals, and packaging materials to each respective Owens Corning facility.
- Plant Operations: energy and environmental flows associated with the conversion of batch and add-on materials and the packaging operation of finished goods for the production of unbonded loosefill fiberglass insulation.
- F.G. Distribution: Transportation (Ton-Miles) for shipment of finished goods from Owens Corning facilities to the distribution, retail centers and other customers.
- End-of-Life: the transportation of decommissioned fiberglass materials and landfill burden.

Table3: Life cycle Impact Category Values for the Functional Unit of One Square Meter, RSI=1

Impact category	Unit	**Total** ULF 1 Sq.Meter RSI=1	Batch Material	Add-on Chemicals	Packaging	Raw Material Transport	Plant Ops. ULF Mfg.	F.G. Distribution	End-of-Life
Global warming	kg CO2 eq	1.07E+00	2.66E-01	9.52E-03	1.83E-02	1.54E-02	7.06E-01	4.62E-02	8.94E-03
Acidification	mol H+ eq	4.06E-01	5.70E-02	3.27E-03	1.43E-02	6.80E-03	3.06E-01	1.54E-02	2.97E-03
Eutrophication	kg N eq	2.69E-04	1.62E-04	5.20E-06	4.65E-06	6.76E-06	7.31E-05	1.47E-05	2.84E-06
Smog	kg O3 eq	6.38E-02	1.30E-02	7.24E-04	2.29E-03	3.55E-03	3.53E-02	7.53E-03	1.46E-03
Ozone depletion	kg CFC-11 eq	3.89E-08	2.72E-08	1.13E-08	1.97E-11	6.72E-13	2.99E-10	2.02E-12	3.91E-13
Respiratory effects	kg PM2.5 eq	3.09E-02	7.85E-03	2.45E-05	7.80E-05	9.74E-05	2.27E-02	1.22E-04	2.36E-05
Waste to Landfill	kg	6.35E-01	3.48E-02	3.78E-04	6.91E-04	0.00E+00	1.93E-04	0.00E+00	5.99E-01
Metered Water	kg	6.41E+00	4.18E+00	5.68E-01	3.86E-01	0.00E+00	1.28E+00	0.00E+00	0.00E+00
Energy	MJ-Eq	1.66E+01	4.11E+00	4.23E-01	6.10E-01	1.91E-01	1.06E+01	5.72E-01	1.11E-01

How to Calculate Environmental Impact Values for "R" Values other than the Functional Unit.

The functional unit for the study is in metric units of RSI=1, which is equivalent to R=5.68 in U.S Customary Units, which is the value one would find stated on the label of an insulation package as sold in North America. In order to determine the burden for the desired R-value of product sold, the scaling factor for the appropriate R-value as listed in the charts below should be used to multiply the impact category value as listed for the functional unit, in Table 3 above.

Scaling Factors for Determining Impact Category Values for R-Values in North America

Ceiling Application				Wall Application			
R Value (conventional)	Install Thickness for AttiCat® (inches)	Install Thickness for PROPINK®L77 PINK Fiberglas™ (inches)	Multiplier RSI Value times	R Value (conventional)	Install Thickness for AttiCat® (inches)	Install Thickness for PROPINK®L77 PINK Fiberglas™ (inches)	Multiplier RSI Value times
R-13	4.50	4.75	1.53	R-13	3.50	3.50	3.10
R-19	6.50	6.75	2.19	R-15	3.50	3.50	3.59
R-22	7.50	7.75	2.58	R-21	5.50	3.50	4.89
R-25*	8.75	9.00	2.94	R-24	5.50	3.50	6.77
R-30	10.25	10.25	3.56				
R-38	13.00	12.75	4.52				
R-44	14.75	14.75	5.33				
R-49	16.50	16.25	5.99				
R-60	20.00	19.50	7.47				

*Ceiling Application Install Thickness for PROPINK®L77 PINK Fiberglas™ (inches) is listed for R-26

Scaling Factors for Determining Impact Category Values for R-Values in North America (cont'd)

Floors				Cathedral Ceilings			
R Value (conventional)	Install Thickness for AttiCat® (inches)	Install Thickness for PROPINK®L77 PINK Fiberglas™ (inches)	Multiplier RSI Value times	R Value (conventional)	Install Thickness for AttiCat® (inches)	Install Thickness for PROPINK®L77 PINK Fiberglas™ (inches)	Multiplier RSI Value times
R-31	8.00	8.00	6.90	R-28	8.00	8.00	6.40
R-39	10.00	10.00	8.80	R-36	10.00	10.00	8.17
R-48	12.00	12.00	11.46	R-44	12.00	12.00	9.94

Example: Environmental Burden for ULF Wall, R-13, Based on Functional Unit RSI=1 Results

In the table below, the results of the study's functional unit are multiplied by 3.1 to obtain the impact category values for unbonded loosefill fiberglass insulation, rated at R=13.

Impact category TRACI 2.0	Unit	Functional Unit R=1 (metric)	Values for R=13 Customary Values
Global warming	kg CO2 eq	1.07E+00	3.32E+00
Acidification	mol H+ eq	4.06E-01	1.26E+00
Eutrophication	kg N eq	2.69E-04	8.34E-04
Smog	kg O3 eq	6.38E-02	1.98E-01
Ozone depletion	kg CFC-11 eq	3.89E-08	1.21E-07
Respiratory effects	kg PM2.5 eq	3.09E-02	9.59E-02
Waste to Landfill	kg	6.35E-01	1.97E+00
Metered Water	kg	6.41E+00	1.99E+01
Energy	MJ-Eq	1.66E+01	5.14E+01

Non-hazardous Waste and Water Consumption

Table 4 Non-hazardous Waste and Water Usage per Functional Unit of Material – 1 Sq. Meter

	Raw Materials Production	Fiberglass Production	End-of-Life
Non-Hazardous Waste (kg/Square Meter)	3.56e-02	1.94e-04	5.99e-01
Water Consumption (Gal./Square Meter)	1.36	0.39	0

Optional Environmental Information

Indoor Environmental

- AttiCat® Expanding Blown-In Insulation has achieved GREENGUARD Children & Schools™ Certification and is verified to be formaldehyde free.
- **PRO**PINK®L77 Loosefill Insulation has achieved GREENGUARD Children and Schools™ Certification and is verified to be formaldehyde free.

Other Environmental

- Product Recycle content for all North American Loosefill Facilities as certified by SCS Scientific Certification System is 65% minimum overall and 41% from post consumer.
- UL Environment EcoLogoCM CCD-016 has listed product as a sustainable certified product.
- Product is listed for NAHB Research Center GREEN Certification.
- **PRO**PINK®L77 Loosefill Insulation is MBDC Cradle-to-Cradle Certified^{CM} at the Silver Level.
- Product qualifies for the Seal & Insulate with ENERGY STAR program label.

Building Use Stage Benefits

Insulation is a passive device that requires no extra utilities to operate over its useful life. Insulation of a building is responsible for reducing the energy burden associated with heating and cooling of a building. The example below provides the net energy savings (energy saved minus life cycle energy of fiberglass).

Examples Basis:

- A two story 2400 square foot home located in Chicago, Illinois and insulated with unbonded loosefill fiberglass insulation to meet the 2006 International Energy conservation Code. The methodology used for the energy analysis is ASHRAE Standard 90.2
- A two story 2400 square foot home located in Phoenix, Arizona and insulated with unbonded loosefill fiberglass insulation with exception to the floor, as noted below, to meet the 2006 International Energy conservation Code. The methodology used for the energy analysis is ASHRAE Standard 90.2

Table 5: Energy Saved in Homes for First Year and 60 Year Life

Home Location	Total Life Cycle MJ for Insulation Products used in Home	Total MJ Energy Saved for an Insulated Home vs. Non-Insulated Home	Net MJ Saved = Total MJ saved minus Total LC MJ	Payback Time (Days) for Energy Saved	MJ Saved over the 60 Year Use Phase of building
Chicago, Illinois (a)	27,939	261,695	233,756	39.0	1.56E+07
Phoenix, Arizona (b)	13,788	145,547	131,759	34.6	8.72E+06

(a) For the Chicago location, due to required densities for product application, the fiberglass loosefill insulation was applied at R21 for the wall and R31 for the floor. Actual MJ savings are understated.
(b) For the Phoenix location, due to required densities for product application, the fiberglass unfaced batt was used for the floor application.

The energy saved for a properly insulated home over a non-insulated home has a 39.4-day payback for a home in Chicago and a 34.6-day payback for a home in Arizona for the life cycle energy burden associated with the manufacturing of EcoTouch® Insulation.

Based on the USEPA Greenhouse Gas Equivalent Calculator, the 60-year energy savings for Chicago (i.e. the energy savings due to the fiberglass insulation) is equivalent to the annual savings of greenhouse gases from 10 automobiles for each of the 60 years. For Arizona, the energy saving due to the fiberglass insulation is equivalent to the annual savings of greenhouse gases from 5 automobiles for each of the 60 years.

For building energy savings in other areas of North America, please call 1-800-GET-PINK®

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 14025:2006, Environmental labels and declarations – Type III – environmental declarations – Principles and procedures.
- 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.
- ASTM C764 - 11 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation
- ASTM C687, Standard Practice for Determining Thermal Resistance of Loose-Fill, thermal Insulation
- ASHRAE Standard 90-2-2007, Energy-Efficient Design Low-Rise Residential Buildings
  IECC-2006, International Energy Conservation Code.

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