



## Earthwool® 1000° Pipe Insulation

Knauf Insulation Earthwool 1000° pipe insulation is a molded, one-piece insulation made from inorganic glass mineral wool bonded with ECOSE® Technology. It is produced in 3' lengths with or without a factory-applied jacket. ASJ+ is the newest generation all-service jacket composed of aluminum foil, reinforced with a glass scrim bonded to a kraft paper interleaving, with an outer film layer. This jacket leaves no paper exposed, allowing for easier cleaning. Earthwool is the only glass mineral wool pipe insulation in the market that is formaldehyde-free.



### Performance dashboard

#### Features & functionality

- Excellent resistance to heat loss or gain, saving energy and lowering operating costs
- Fast and easy installation reduces labor costs
- ASJ+ facing is cleanable with a soapy wet cloth and has a self-sealing lap, which eliminates the need for additional material and tools
- UL Environment validated formaldehyde-free

[Visit Knauf for more product information](#)

#### Environment & materials

- Improved by:**
  - Utilization of recycled glass
  - Knauf's original plant-based ECOSE binder technology
  - Optimized compression packaging
- Certification & rating systems:**
  - Declare, Red List Free
  - UL GREENGUARD Gold certified
  - UL Validated recycled content & formaldehyde-free
  - Audited, European Certification Board for Mineral Wool Products exoneration process

CSI MasterFormat® #MF 23 07 19

[Thermal Insulation Guide Specification](#)

For spec help, contact us or call 317 421 8727

[See LCA, interpretation & rating systems](#)

[See materials, interpretation & rating systems](#)



## SM Transparency Report™ + Material Health Overview™

VERIFICATION	LCA
3rd party reviewed	
Transparency Report	
3rd party verified	
Material evaluation	
Self-declared	

Validity: 11/07/17 – 11/07/22  
KNA – 11072017 – 004

This declaration was independently verified by NSF to the UL Environment PCR and ISO 14025.

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317 398 4434

Contact us

## LCA & material health results & interpretation

Earthwool® 1000®

Life cycle assessment

Material health

### Scope and summary

Cradle to gate  Cradle to gate with options  Cradle to grave

#### Application

Used to insulate iron and copper piping in industrial applications and in commercial and institutional buildings. It is suitable for hot, cold, concealed, and exposed piping systems operating at temperatures from 0°F to 1000°F. Additional weather protection is needed outdoors.

#### Declared unit

**Reference service life: 60 years.** 1 kg of insulation material, packaging included, plus one square meter of facing over a period of 60 years.

#### Manufacturing data

**Reporting period: October 2015 – September 2016**  
**Location: Shelbyville, IN**

#### Default installation and maintenance phase scenario

At the installation site, insulation products are unpackaged and installed. No material is lost or wasted because scraps are typically used to fill corners or crevices. Packaging waste is sent to landfill, and no maintenance or replacement is required to achieve the product's life span.

### What's causing the greatest impacts

#### All life cycle stages

**The manufacturing stage dominates the results for all impact categories.**

The raw material acquisition stage is the second highest contributor for most impact categories, but it is the third highest for ecotoxicity and fourth highest for non-carcinogenics. The impact of the raw material acquisition stage is mostly due to the borax, manganese oxide, and soda ash in the batch and the dextrose in the binder. The manufacturing stage shows major contributions to all impact categories. The contributions to outbound transportation are caused by the use of trucks and rail transport. For ecotoxicity, outbound transportation is the second highest contributor to the impacts. The landfilling of the discarded product contributes to the disposal stage. The only impacts associated with installation and maintenance are due to the disposal of packaging waste, which is a small contributor except for the non-carcinogenics impact category, where installation and maintenance is the second highest contributor to the results.

#### Manufacturing stage

**The energy required to melt the glass and produce the glass fibers is the largest contributor to the manufacturing stage for all impact categories.**

#### Sensitivity analysis

There are no sensitivity results that lead to variations greater than 10% in the LCA results.




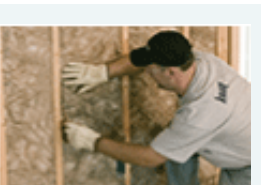
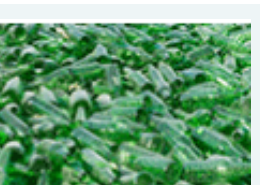
### How we're making it greener

**Knauf is committed to providing products that conserve energy and preserve natural resources.**

- This product uses ECOSE® Technology, which is a plant-based binder adhesive instead of a fossil fuel based binder. ECOSE Technology represents a fossil fuel avoidance equivalent of 100,000 barrels of oil a year for Knauf products.
- Earthwool® pipe is the only formaldehyde-free glass fiber pipe insulation available in the market today.
- Our product contains a high degree of recycled content, which translates to 20% less glass melting energy and a 25% reduction in embodied carbon.
- Our utilization of recycled content reduces mining impacts by 60%. In fact, Knauf recycles 10 railcars of recycled glass a day.
- Earthwool®'s glass is audited by a 3rd party to ensure biosoluble chemistry from a health and safety standpoint.

[See how we make it greener](#)

### LCA results

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/REUSE/RECYCLING
<b>Information modules: Included</b>   Excluded*	<b>A1 Raw Materials</b>	<b>A3 Manufacturing</b>	<b>A4 Transportation/Delivery</b>	<b>A5 Construction/Installation</b>	<b>C1 Deconstruction/Demolition</b>
*In the installation and maintenance phase, packaging waste in module A5 is the only contributor to the potential impacts.	<b>A2 Transportation</b>			<b>B1 Use</b>	<b>C2 Transportation</b>
				<b>B2 Maintenance</b>	<b>C3 Waste Processing</b>
				<b>B3 Repair</b>	<b>C4 Disposal</b>
				<b>B4 Replacement</b>	
				<b>B5 Refurbishment</b>	
				<b>B6 Operational energy use</b>	
				<b>B7 Operational water use</b>	
					

### SM 2013 [Learn about SM Single Score results](#)

Impacts per 60 years of service	2.33E-01 mPts	2.35E+00 mPts	4.29E-03 mPts	2.99E-03 mPts	1.02E-02 mPts
<b>Materials or processes contributing &gt;20% to total impacts in each life cycle stage</b>	Batch material and binder material production.	Energy required to melt the glass and produce the glass fibers.	Truck and rail transportation used to transport product to building site.	Transportation to landfill and landfilling of packaging materials.	Transportation to landfill and landfilling of product.

### TRACI v2.1 results per declared unit

LIFE CYCLE STAGE	RAW MATERIAL ACQUISITION	MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	DISPOSAL/REUSE/RECYCLING
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#### Ecological damage

Impact category	Unit						
<b>Acidification</b>	kg SO <sub>2</sub> eq	?	5.96E-03	1.11E-02	7.04E-04	5.44E-04	3.63E-04
<b>Eutrophication</b>	kg N eq	?	5.98E-04	7.29E-04	4.48E-05	1.15E-04	6.45E-05
<b>Global warming</b>	kg CO <sub>2</sub> eq	?	1.15E+00	4.07E+00	5.37E-01	1.70E-01	1.01E-01
<b>Ozone depletion</b>	kg CFC-11 eq	?	2.38E-10	1.30E-09	1.57E-11	1.11E-12	6.25E-12

#### Human health damage

Impact category	Unit						
<b>Carcinogenics</b>	CTU <sub>h</sub>	?	3.23E-11	1.88E-10	7.49E-13	1.84E-11	6.13E-12
<b>Non-carcinogenics</b>	CTU <sub>h</sub>	?	1.64E-12	1.13E-11	3.33E-13	1.09E-11	3.27E-12
<b>Respiratory effects</b>	kg PM <sub>2.5</sub> eq	?	4.00E-03	4.09E-02	4.27E-05	4.23E-05	1.73E-04
<b>Smog</b>	kg O <sub>3</sub> eq	?	6.62E-02	1.61E-01	1.21E-02	2.41E-03	3.86E-03

#### Additional environmental information

Impact category	Unit						
<b>Ecotoxicity</b>	CTU <sub>e</sub>	?	2.77E-04	5.46E-04	2.88E-04	1.20E-05	2.13E-05
<b>Fossil fuel depletion</b>	MJ surplus	?	1.67E+00	5.25E+00	1.09E+00	1.89E-02	1.07E-01

See the additional EPD content required by the UL Environment PCR on page 4 of the [Transparency Report PDF](#).

### References

#### LCA Background Report

Knauf Insulation Products LCA Background Report (public version), Knauf 2017

#### ULE PCR for Building Envelope Thermal Insulation and Mechanical Insulation

PCR review conducted by Wayne Trusty, Andre Desjarlais, and Susan Fredholm Murphy.

[Download PDF](#) SM Transparency Report/Material Health Overview, which includes the additional EPD content required by the UL Environment PCR.

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. They are designed to present information transparently to make the limitations of comparability more understandable. TRs/EPDs of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore, cannot be used as comparative assertions unless the conditions defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied.

### Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

#### LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

#### Environmental product declarations

- Industry-wide (generic) EPD ½ product
- Product-specific Type III EPD 1 product

#### Green Globes for New Construction and Sustainable Interiors

#### Materials and resources

- NC 3.5.1.2 Path B: Prescriptive Path for Building Core and Shell
- C 3.5.2.2 and SI 4.1.2 Path B: Prescriptive Path for Interior Fit-outs

#### Collaborative for High Performance Schools National Criteria

#### MW 7.1 – Environmental Product Declarations

- Third-party certified type III EPD 2 points

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# LCA & material health results & interpretation

Earthwool® 1000°

Life cycle assessment

**Material health**

## Evaluation programs

### Declare

**Declare** labels are issued to products disclosing ingredient inventory, sourcing and end of life options. Declare labels are based on the Manufacturers Guide to Declare, administered by the International Living Future Institute.

### How it works

Material ingredients are inventoried and screened against the [Living Building Challenge](#) (LBC) Red List which represents the 'worst in class' materials, chemicals, and elements known to pose serious risks to human health and the greater ecosystem.

### The Health Product Declaration®

The HPD Open Standard provides a consistent, and transparent format to accurately disclose the material contents and associated hazard classifications for a building product.

### How it works

Material ingredients are screened and categorized according to the hazards that international governmental bodies and toxicology experts have associated with them, based on two listings:

- Authoritative lists maintained or recognized by government bodies
- Screening lists, which include chemicals that government bodies determined need further scrutiny, as well as chemical lists not recognized by any government body.

## Assessment scope and results

### Declare™

Inventory threshold: 100 ppm

#### Declare level:

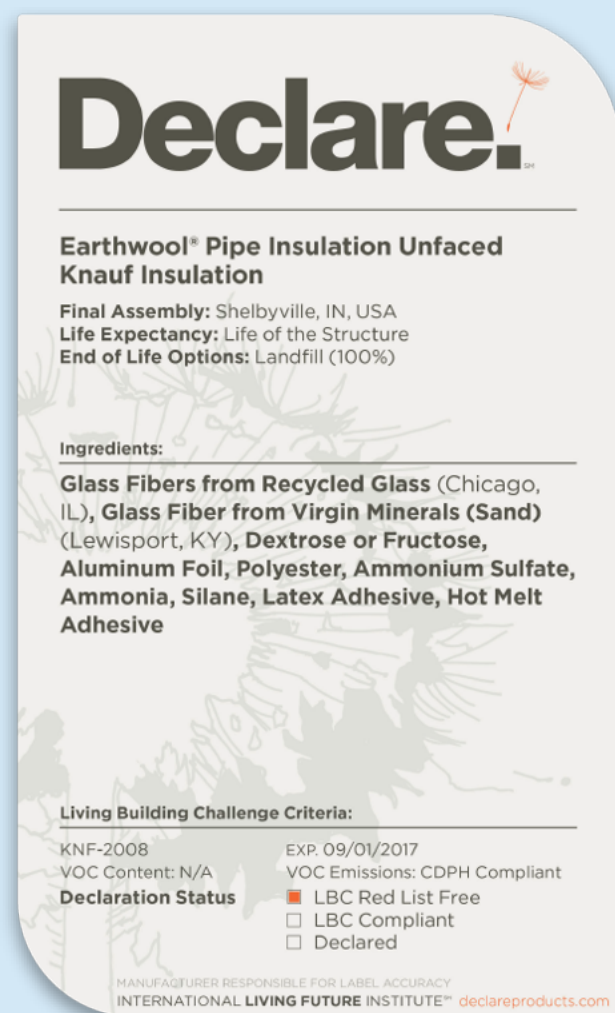
The Declare product database and label are used to select products that meet the LBC's stringent materials requirements, streamlining the materials specification and certification process.

- LBC Red List Free ?
- LBC Compliant ?
- Declared ?



Click the label to see the full declaration.

#### ● Earthwool® Pipe Insulation Unfaced



## What's in this product and why

### Declare level

**Earthwool® Pipe without a facer is Red List free.** The Red List is a list of chemicals that are not allowed in Living Building Challenge buildings. Being Red List free is our design benchmark at Knauf.

**Earthwool** utilizes a bio-based binder chemistry derived from corn that is formaldehyde-free (FF) and more interior friendly than phenol-formaldehyde (P/F) systems. It is the only FF glass fiber pipe insulation in the marketplace today.

### What's in the product and why

**The ingredients of most Earthwool Pipe variants avoid the 800+ chemicals of the Living Building Challenge Red List.** This is primarily because of its bio-based binder adhesive chemistry known as ECOSE® Technology. ECOSE is based on dextrose or high fructose corn syrup instead of phenol and formaldehyde. Dextrose and fructose can be used interchangeably. The ECOSE binder allows the product to be validated by the UL Environment as formaldehyde-free. Formaldehyde is a Red List chemical.

Earthwool Pipe Insulation with the ASJ+ facer does not meet Red List free status because the facer contains a halogenated fire retardant (HFR). This is why we disclose the ingredients in an HPD rather than Declare used for the unfaced variant.

Red List free is our development benchmark and we constantly challenge ourselves on elimination of Red List chemicals. An HFR is used on the ASJ+ variant because the product is for exposed applications and must meet stringent fire performance requirements. We are very aware of the concerns associated with HFRs and continually work with vendors on this issue. At the same time, fire performance is critical and current events relating to fire performance of building materials only support the importance of fire-safe products. materials, but we will one day find a solution.

**What's been done in the design and manufacture in consideration of the potential human health impacts in the use stage Knauf led the industry in bio-based development to avoid phenol and formaldehyde in our processes beginning in 2008.** This development was likely the largest green chemistry disruption of our era. Today, our competitors have followed or are striving to meet this benchmark.

The primary ingredient in this product is recycled glass. While recycled content may vary from year to year, the recycled content is currently greater than 60% by weight. The second largest content is silica sand which is sourced as locally as possible. The third largest ingredient is corn-based syrup (dextrose or fructose). As a result of using plant-based binders, the VOC profile of this product is very interior friendly.

The emission from our factories is also much better for our communities. We ensure our glass formulations have no serious health concerns by allowing our processes to be audited to meet European Certification Board for Mineral Wool Products (EUCEB) biosolubility requirements.

### Where it goes at the end of its life

**At this time, the product is landfilled at end of life.** We take extended producer responsibility very seriously and have active programs to address end of life. There is no option other than landfills at this time.

## How we're making it healthier

**Knauf engages very closely with its vendors to eliminate and avoid chemicals of concern.** No competitor has as many Red List free products as Knauf Insulation. We continually reduce our environmental impacts through recycled content and optimize our products by designing them to be transformative.

[See how we make it greener](#)

## Health Product Declaration®

### Earthwool® Pipe Insulation with ASJ+

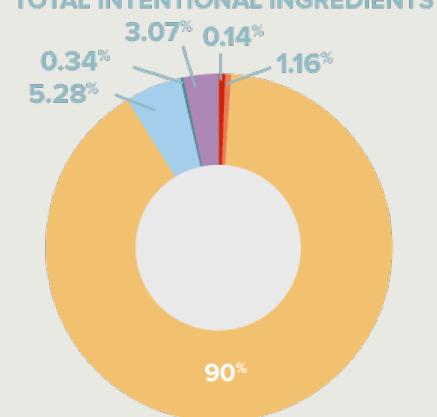
Inventory threshold: 100 ppm

Full disclosure known hazards: Yes

Based on the selected content inventory threshold:

- Characterized  Screened  Identified

#### TOTAL INTENTIONAL INGREDIENTS



#### GreenScreen® List Translator Scores

- List Translator Likely Benchmark 1 / Benchmark 1 ?
- List Translator Possible Benchmark 1 ?
- List Translator Benchmark Unknown ?
- Benchmark 3 ?
- Benchmark 3 ?
- Benchmark 4 ?
- No GS data available ?

[Learn about the GreenScreen® List Translator](#)

#### Total VOC Content ?

VOC Content data is not applicable for this product category.

## References

### Declare

Earthwool® Pipe Insulation Unfaced

### Manufacturer's Guide to Declare

A comprehensive guide providing information about the program, the assessment methodology, how to submit material data to obtain a Declare label and how they are used to meet the Health & Happiness and Materials Petals of the Living Building Challenge.

### Health Product Declaration®

Earthwool® 1000° Pipe Insulation with ASJ+

### Health Product Declaration Open Standard v2.1

The standard provides guidance to accurately disclose the material contents of a building product using a standard, consistent, and transparent format.

## Rating systems

### LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization

#### Material Ingredients

Credit value options 1 product each

1. Reporting  2. Optimization  3. Supply Chain Optimization

### Living Building Challenge 3.0

#### Materials petals imperatives

10. Red List Free  12. Responsible Industry  13. Living Economy Sourcing

### Well Building Standard®

#### Air and Mind Features

- Air, 26. Enhanced Material Safety  
 Mind, 97. Material Transparency  Mind, 98. Organizational Transparency

### Collaborative for High Performance Schools National Criteria

#### MW 10.1 — Building Product Health Related Information Reporting

- Product Health Related Information Report 1 point

## SM Transparency Report™ + Material Health Overview™

### VERIFICATION

Self-declared

Material evaluation



KNA – 11072017 – 004

The material health evaluation is self-declared and done in accordance with the HPD Open Standard 2.1

**HPD Collaborative**  
401 Edgewater Place, Suite 600  
Wakefield, MA 01880  
www.hpd-collaborative.org  
781.876.8871

The material living evaluation is self-declared and done in accordance with the Manufacturers Guide to Declare.

**International Living Future Institute**  
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206 223 2028

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Contact us





## How we make it greener

Earthwool® 1000®

Collapse all See LCA results by life cycle stage

### RAW MATERIAL ACQUISITION



#### Utilize recycled content

Our plants use 60 – 80% recycled content – which translates to about 10 railcars of recycled glass cullet a day. By leveraging so much recycled content, we reduce the energy required to form glass fibers by 20%. If we use even 60% recycled content, then mining impacts are reduced proportionately.

#### Pursue sequestration potential

Knauf's bio-based ECOSE Technology is derived from corn. The Knauf Family Farm produces the same amount of corn we use on an annual basis, which is equal to 15,000 acres. While growing our own corn is not currently part of the life cycle assessment of our products in North America, we have the potential of growing the very corn that we use in our products. Life cycle analysis suggests about a 9% reduction in our manufacturing operation from the sequestration impacts of the corn growth cycle. If that corn and stubble were completely used in our ECOSE formulation, then corn absorption of carbon might be a plausible approach to help meet the zero carbon goals of our company.

### MANUFACTURING

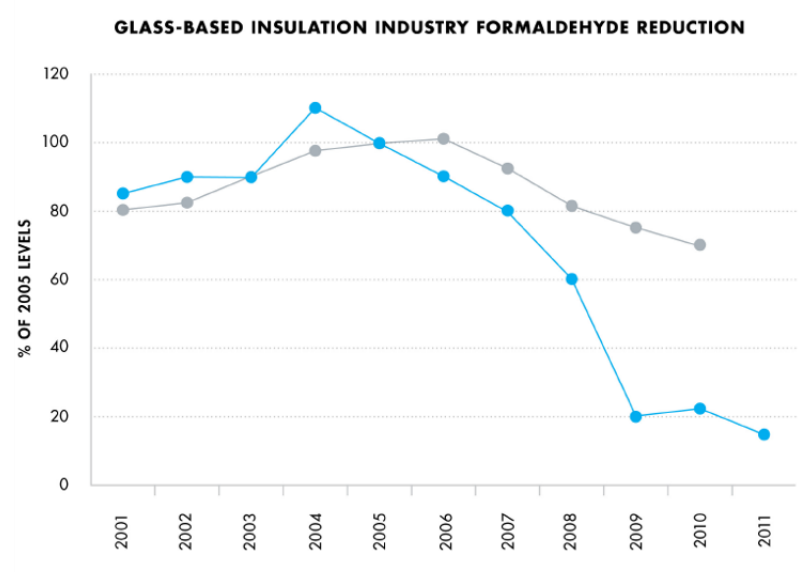
#### Develop bio-based formaldehyde-free binder

In 2008, Knauf Insulation launched perhaps the nation's largest formaldehyde-free green chemistry initiative called ECOSE Technology. Offering this into the building materials marketplace quickly transformed the entire glass mineral fiber industry toward bio-based chemistries. Today phenol-formaldehyde (PF) based resins are largely a thing of the past with regard to large volume mineral fiber based insulation products. Knauf has also launched a new business venture to assist other industries in accessing ECOSE Technology for their processes.

In a given year, using corn-based ECOSE Technology instead of phenol & formaldehyde avoids the equivalent of more than 100,000 barrels of oil in North America alone.

#### Lead green chemistry efforts

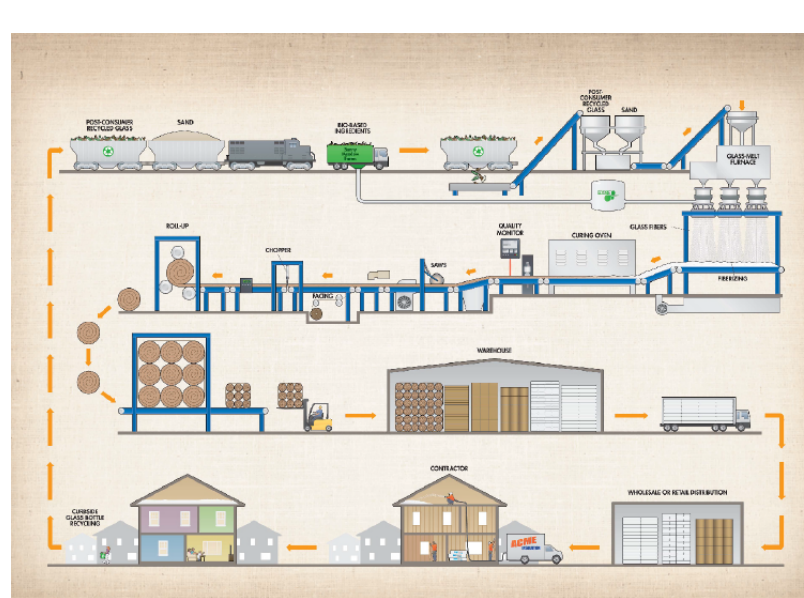
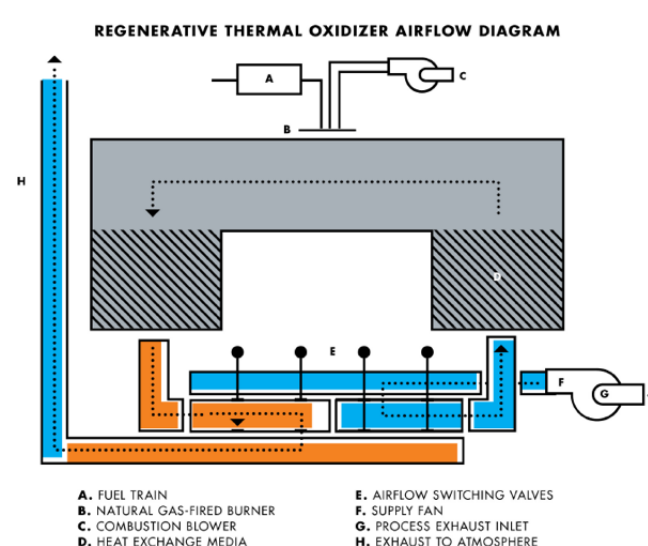
Following the launch of our ECOSE Technology in 2009, we had transformed all of our products and processes to this new technology. Using our bio-based ECOSE Technology has removed phenol and formaldehyde from our stack emissions. By 2012, the entire industry had followed our lead. This initiative not only established Knauf Insulation in a leadership position, but it had a transformative impact on our industry in general.



#### Green manufacturing Processes

**1. Regenerative thermal oxidizers** Knauf Insulation uses regenerative thermal oxidizers (RTO) to capture and recycle much of the energy we used to cure our products. RTO is equipment used for the treatment of exhaust air. Our ovens exhaust into a ceramic heat exchange media to capture and reuse the heat in the exhausted air. Therefore, the amount of energy required to cure our product is reduced substantially.

**2. Recycling** As you can see below, everything we do starts with recycling. Our plant uses as much as 80% recycled content. While our only option is to landfill our products at end of life, that doesn't stop us from encouraging consumers to recycle other products, particularly glass bottles.



#### Continuous Improvement

Continuous improvement is key to our sustainable development. Globally, our company maintains the following Bureau Veritas certifications: ISO 9000, 14000, and 50001. These certifications relate to quality management systems, energy management and environmental management efforts. For more information on our current continuous improvement efforts, please review the Knauf Insulation global sustainability report.

### TRANSPORTATION



#### Leverage compression packaging

Glass is a high modulus material, which helps to facilitate compression packaging. We compress our insulation to fit up to five times more product on every truck. This compression means:

- More material can fit on one truck when compared to other insulation materials
- Fewer packages on a job
- Fewer deliveries needed

### INSTALLATION AND MAINTENANCE



#### Be confident in glass mineral wool's safety

In the past, a label regarding the carcinogenic potential of insulation made from glass fibers was required on all packaging. Following forty years of research, glass mineral wool has been exonerated entirely. Glass mineral wool is comprised of fibers that are biosoluble, meaning that the fibers dissolve in the body in a short period of time and exit the body with normal bodily functions. The scrutiny glass mineral wool has undergone is now seen as proof of its safety.

#### Meet and exceed green standards

**GREENGUARD certified** On the forefront of indoor air quality, Knauf Insulation was the first GREENGUARD certified product in 2002. This achievement led us to understand the impact our formaldehyde-free products could have on the indoor environment. Today, we have the largest offering of interior friendly products available in the mineral fiber market, meeting the GREENGUARD Gold designation. The formaldehyde-free claim is third party validated by UL Environment.

**Red List Free** Since 2012, Knauf Insulation North America has used the Living Building Challenge (LBC) Red List as our developmental benchmark. The Red List is a list of chemicals that are avoided in material imperative for the construction of LBC buildings. Formaldehyde is just one of about 800 chemicals on the Red List. Today, no other insulation company comes close to the sustainable development achieved by Knauf in this regard.

**EUCEB tested** Glass fiber is perhaps the most widely studied building material available today. All of our processes and formulations are voluntarily third-party audited for compliance with the health and safety exonerated criteria for glass and rock based fiber through the European Certification Board for Mineral Wool Products (EUCEB) exonerated process. This guarantees the formulations are biosoluble and pose no serious health concerns. While competing insulation technologies other than glass and rock fiber might claim they are safer, the reality is that they have not been tested. We consider the scrutiny once given our technology to be a differentiator.

#### Green building rating systems

Our products offer a vast array of potential credits for major green building rating systems, including: WELL, LEED v4, International Green Construction Code, Green Guide for Health Care, NAHB Green Building Standard and more.

Visit the [green building rating systems page](#) to see all the credits you can earn using Knauf Insulation products.

### DISPOSAL



#### Promote Recycling

Knauf is a recycling advocate. We take every opportunity to advocate for recycling and financially support the Glass Recycling Coalition (GRC). We feel that a comprehensive understanding of the benefits of recycling will lead to greater recycling adoption and more promotion by state and local governments. While our only option is to landfill our products at end of life, that doesn't stop us from encouraging consumers to recycle other products, particularly glass bottles.



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Additional EPD content required by:  
ULE PCR for Building Envelope Thermal Insulation and Mechanical Insulation

Earthwool Pipe

Environmental parameters derived from LCA  
per functional unit

**Total material resources**

Parameter	Unit	Total
Non-renewable material resources	kg	9.00
Renewable material resources	kg	33.6

**Total primary energy**

Parameter	Unit	Total
Non-renewable, fossil	MJ	17.0
Non-renewable, coal	MJ	25.8
Non-renewable, natural gas	MJ	36.5
Non-renewable, uranium	MJ	8.83
Renewable, biomass	MJ	0.0444
Renewable, geothermal	MJ	0.0222
Renewable, hydro power	MJ	1.49
Renewable, solar power	MJ	13.1
Renewable, wind power	MJ	0.635

**Total water**

Parameter	Unit	Total
Fresh water	L	2944

**Waste**

Parameter	Unit	Total
Non hazardous waste	kg	1.37
Hazardous waste	kg	0
Waste to energy	kg	0

TRACI v2.0 acidification results per functional unit

Parameter	Unit	Raw material acquisition	Manufacturing	Transportation	Installation and maintenance	Disposal/reuse/recycling
Acidification, TRACI 2.0	mole H+ eq	3.01E-01	5.84E-01	3.78E-02	2.80E-02	1.91E-02

Scenarios and additional technical information

PARAMETER	VALUE	UNIT
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**Transport to the building site [A4]**

Average distance from Shelbyville to installation site	680	mi
Capacity utilization by mass	27	%




**Installation into the building [A5]**

Distance from installation site to landfill	100	mi
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**Disposal/reuse/recycling [C1-C4]**

Distance from installation site to landfill	100	mi
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