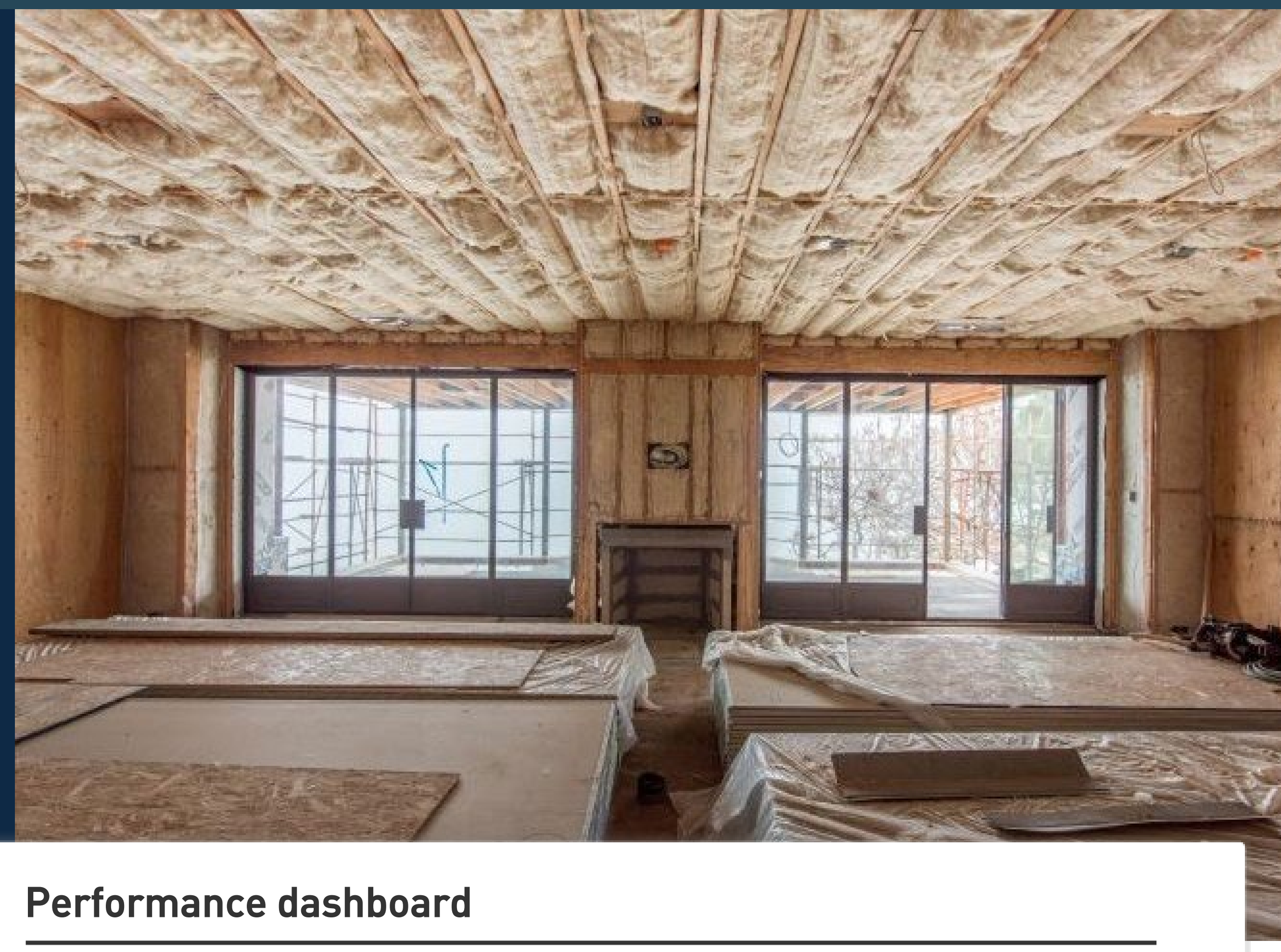
Havelock Wool

Wool Batt Insulation
Wool Loose-fill Insulation

Havelock Wool is healthy, high performance insulation made of 100% wool. Our raw material is sustainably harvested in New Zealand and mechanically processed in the US without the use of any chemical binders. The inherent characteristics of the wool fiber provide an exceptional R Value, moisture management, passive indoor air filtration and superb sound absorption. Further Havelock Wool insulation is Class A rated for both fire hazard and flame spread.



Performance dashboard

Features & functionality

Batt and loose-fill insulation to be used in all insulation applications

Fast, easy and safe installation requiring no special protective clothing

Class A rated for Fire Resistance and Smoke Development.

Treated with boric acid to resist insects

Wool does not support the growth of mold

Passive air filtration — amino acids in wool bond with harmful chemicals

No off-gassing — natural characteristics make our insulation devoid of harmful chemicals

Visit Havelock for more product information:
Havelock Wool Batt Insulation
Havelock Wool Loose-fill Insulation

Environment & materials

Improved by:
A uniquely simple process which employs repurposed carding machines, electric motors, needle punches and simple cutting stations
Raw material is 100% wool — sustainable and renewable Sheep eat grass fed by rainfall
All SKUs are 100% wool ie no synthetic mix
No chemical binders
No high heat required
No toxic flame retardants as wool is naturally self-extinguishing
Wool is compostable at end of an extended useful life

Certifications, rating systems & disclosures:
Bureau of Household Goods And Services, Certified Insulation Material
Declare, Red List Free
Health Product Declaration
ASTM E84 - Class A
ASTM C518 - Thermal Conductivity
ASTM C423 - Noise Reduction Coefficient WUFI Analysis

CSI MasterFormat® 07 21 00 & 07 21 23
Technical Spec Sheet
For spec help, contact us or call +775 971 4870

Download all documents

See LCA, interpretation & rating systems

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd party reviewed	✓
	Transparency Report (EPD)
3rd party verified	✓

Validity: 2020/06/05 – 2025/06/05
HW – 20200605 – 001

This environmental product declaration (EPD) was independently verified by WAP Sustainability Consulting to the ISO 21930:2017, the ULE PCR Parts A and B and ISO 14025:2006.

WAP Sustainability Consulting
1701 Market Street
Chattanooga, TN 37405
www.wapsustainability.com
(855) 452-2522

SUMMARY
Reference PCR
ULE Part A: Environment Standard 10010 Version 3.2 | Part B: Building Envelope Thermal Insulation EPD Requirements UL 10010-1, 04/18 – 02/23

Regions; system boundaries
North America; Cradle to grave

Functional unit / reference service life:
1 m^2 of installed insulation w/packaging; thickness that gives an avg thermal resistance of RSI = 1 $m^2 \cdot K/W$ over 75 years.

LCIA methodology: TRACI 2.1

LCA software; LCI database
SimaPro 9.0.0.49, ecoinvent 3.1, 2.2

LCA conducted by: Sustainable Minds

Public LCA: Havelock Products

Havelock Wool
204 Edison Way
Reno, NV 89502
www.havelockwool.com
775 971 4870

Contact us

LCA results & interpretation

Havelock Wool Batt and Loose-fill Insulation

Life cycle assessment

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ✔ **Cradle to grave**

Application

Havelock has applied unique insulating technology to traditional batt and loose-fill insulation. They are made with 100% wool, no synthetic mix, and are bonded with a needle punch, not chemicals. The applications for this insulation include thermal and acoustical treatments to walls for residential purposes. Insulation is delivered to the installation site pre-packaged and easy to install.

Functional unit

Reference service life: 75 years. One square meter of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of RSI=1m2·K/W over a period of 75 years.

Batts

Reference flow: .997 kg per m^2

Thickness: .0399 m

Loose-fill

Reference flow: .607 kg per m^2

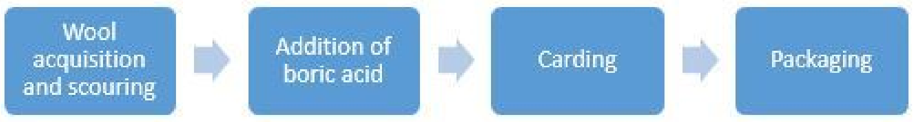
Thickness: .0335 m

Manufacturing data

Reporting period: January 2019-December 2019

Location: Reno, NV

Data represents a mix of primary data from Havelock on the production of the insulation products (gate-to-gate) and background data from SimaPro databases. The quality is considered to be high and representative of the described systems. Data for material processing and product manufacturing were collected in a consistent manner and were checked for plausibility of inputs and outputs to ensure high quality.



Default installation, packaging, and disposal scenarios

During manufacturing stage, 1652 kg/yr of metal straps and nylon bale wraps, used for acquisition of raw material, are recycled.

At the installation site, insulation products are unpackaged and installed by hand with a blowing machine or a staple gun. The potential impact of the blower is included in this study. The thickness and density of batts being is .0399m and 24.98 kg/m^3 and thickness and density of loosefill is .0335m and 18.1 kg/m^3.

Plastic packaging waste is disposed (100% to landfill), and no maintenance, replacements, refurbishments, or operational energy/water use is required to achieve the product's life span during use; use is strictly for insulation in walls. After removal, the insulation is meant to be composted or it can be landfilled.

What's causing the greatest impacts

All life cycle stages

The raw material acquisition and manufacturing stages (A1-A3) and the distribution transportation (A4) dominate the results for all impact categories. Ecotoxicity, ADP Fossil, and global warming potential are the most impacted categories. The impacts are from the use of boric acid, transportation of raw materials to the manufacturing facility and transportation for distribution of the product.

End of life (C1-C4)

Wool is a biogenic material, which is a material produced directly by the physiologic activities of organisms, either plant or animal. Havelock encourages composting as the optimal end of live method. However, when wool is landfilled, it is anticipated that it biodegrades after 6 months. No substances required to be reported as hazardous are associated with the production of this product.

Interpretation of results

Overall, over 80% of the impacts are in A1-A3. The results show that the largest area for reduction of each product's environmental impact is in the raw material acquisition and manufacturing phase. The impacts in the stage are largely due to transportation from raw material acquisition site to the plant. This is an important area for Havelock to focus its efforts and one which it can influence.

Different end-of-life scenarios were compared: compost vs landfill and it was found that in both cases, the overall impacts due to end-of-life scenarios are negligible; the contribution of end of life scenario is less than 2% of overall impacts, therefore holds little significance.

How we're making it greener

Havelock Wool has established itself around the concept of the circular economy; Havelock aims at eliminating waste and the continual use of non-renewable resources by using waste from other industries and creating a product that can be returned to the economy.

Raw material acquisition: Havelock purchases sheep wool as a biproduct of the meat production industry. By using this wool, Havelock reduces its impacts by eliminating the impacts associated with sheep husbandry.

Waste management: Havelock practices healthy waste management through composting; waste from the manufacturing process (wool dust) is composted and the final product at end of life can also be composted.

Energy consumption: Havelock uses minimal energy during the manufacturing stage and it is looking for ways to get electricity from renewable resources.

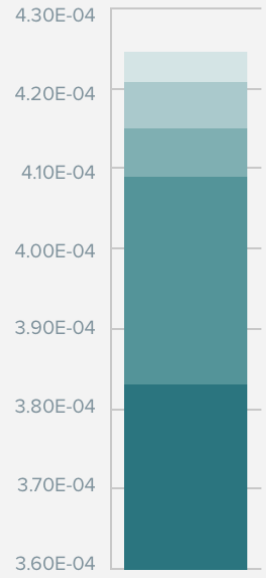
Havelock is continuously finding ways to make improvements to their product and to their process. Havelock will make use of this EPD to make evidence based decisions regarding their product and supply chain.

See how we make it greener

Material composition

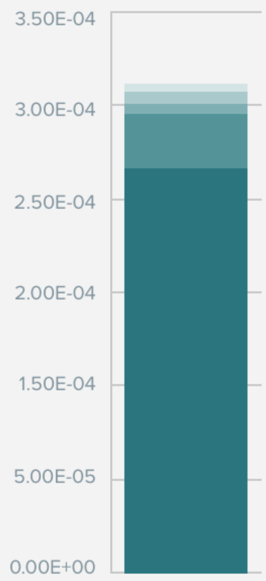
FLOW	MASS PERCENTAGE
Raw wool	97.85%
Boric acid	0.73%
Steel straps	1.18%
Nylon bale wrap	0.24%

Batts: total impacts by life cycle stages [mPts/func unit]



LIFE CYCLE STAGE	MPTS/FUNC UNIT
Raw material acquisition and manufacturing	3.83E-04
Transportation	2.58E-05
Installation and maintenance	6.10E-06
Transportation	5.76E-06
Disposal	3.90E-06

Loose-Fill: total impacts by life cycle stages [mPts/func unit]



LIFE CYCLE STAGE	MPTS/FUNC UNIT
Raw material acquisition and manufacturing	2.51E-04
Transportation	3.37E-05
Installation and maintenance	7.25E-06
Transportation	4.94E-06
Disposal	4.61E-06

LCA results

LIFE CYCLE STAGE	A1-A3 RAW MATERIAL ACQUISITION AND MANUFACTURING	A4 TRANSPORTATION	A5, B1-B7 INSTALLATION AND MAINTENANCE	C2 TRANSPORTATION	C4 DISPOSAL/ REUSE/RECYCLING
Information modules: Included I Stages C1, C3, and D are not applicable	**x A1 Raw Materials**	**x A4 Transporation/ Delivery**	**x A5 Construction/ Installation**	**x C2 Transportation**	**x C4 Disposal**
*In the installation and maintenance phase, packaging waste and electricity or gas used by the insulation blowing machines in module A5 are the only contributors to the potential impacts.	**x A2 Transportation**		**x B1 Use**		
	x A3 Manufacturing		**x B2 Maintenance**		
			x B3 Repair		
			x B4 Replacement		
			x B5 Refurbishment		
			x B6 Operational energy use		
			x B7 Operational water use		
					

Batts: SM 2013

Learn about SM Single Score results

Impacts per 75 years of service	3.83E-04 mPts	2.58E-05 mPts	6.10E-06 mPts	5.76E-06 mPts	3.90E-06 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Boric acid used in the production of the insulation.	Truck and trailer, 16-32T used to transport product to building site.	Transportation to disposal and disposing of packaging materials.	Transportation to composting site.	Compost of product.

Batts: TRACI v2.1 results per functional unit

LIFE CYCLE STAGE		RAW MATERIAL ACQUISITION AND MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	TRANSPORTATION	DISPOSAL/REUSE/ RECYCLING
Ecological damage						
Impact category	Unit					
Acidification	**kg SO_2 eq**	1.37E-02	1.71E-03	6.17E-04	4.90E-04	1.83E-03
Eutrophication	**kg N eq**	2.79E-03	2.05E-04	3.64E-05	5.24E-05	8.12E-05
Global warming (Embodied carbon)	**kg CO_2 eq**	2.63E+00	3.62E-01	5.33E-02	8.11E-02	4.17E-02
Ozone depletion	**kg CFC-11 eq**	1.84E-07	7.07E-08	8.19E-11	1.59E-08	3.48E-09
Smog	**kg O_3 eq**	2.91E-01	4.39E-02	1.88E-02	1.37E-02	1.52E-03
Human health damage						
Impact category	Unit					
Carcinogenics	**CTU_h**	1.17E-07	4.60E-09	8.84E-10	9.41E-10	7.77E-10
Non-carcinogenics	**CTU_h**	4.00E-07	2.87E-08	8.48E-09	5.92E-09	3.07E-09
Respiratory effects	**kg $PM_{2.5}$ eq**	5.04E-03	1.13E-04	1.01E-05	2.88E-05	5.64E-05
Additional environmental information						
Impact category	Unit					
Ecotoxicity	**CTU_e**	4.31E+00	2.23E-01	1.64E-01	4.59E-02	1.58E-02
ADP Fossil	**MJ, LHV**	3.09E+00	7.31E-01	1.23E-01	1.64E-01	3.26E-02

Loose-fill: SM 2013

Learn about SM Single Score results

Impacts per 75 years of service	2.51E-04 mPts	3.37E-05 mPts	7.25E-06 mPts	6.80E-06 mPts	4.61E-06 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Boric acid used in the production of the insulation.	Truck and trailer, 16-32T used to transport product to building site.	Transportation to disposal and disposing of packaging materials.	Transportation to composting Site.	Compost of product.

Loose-fill: TRACI v2.1 results per functional unit

LIFE CYCLE STAGE		RAW MATERIAL ACQUISITION AND MANUFACTURING	TRANSPORTATION	INSTALLATION AND MAINTENANCE	TRANSPORTATION	DISPOSAL/REUSE/ RECYCLING
Ecological damage						
Impact category	Unit					
Acidification	**kg SO_2 eq**	1.13E-02	2.87E-03	7.34E-04	5.80E-04	2.16E-.03
Eutrophication	**kg N eq**	1.88E-03	3.07E-04	4.35E-05	6.19E-05	9.60E-05
Global warming (Embodied carbon)	**kg CO_2 eq**	1.76E+00	4.75E-01	6.36E-02	9.58E-02	4.93E-02
Ozone depletion	**kg CFC-11 eq**	1.13E-07	9.29E-08	2.91E-10	1.87E-08	4.11E-09
Smog	**kg O_3 eq**	2.73E-01	8.05E-02	2.23E-02	1.62E-02	1.79E-03
Human health damage						
Impact category	Unit					
Carcinogenics	**CTU_h**	7.32E-08	5.51E-09	1.05E-09	1.11E-09	9.18E-10
Non-carcinogenics	**CTU_h**	2.65E-07	3.47E-08	1.01E-08	6.99E-09	3.63E-09
Respiratory effects	**kg $PM_{2.5}$ eq**	3.12E-03	1.69E-04	1.24E-05	3.41E-05	6.67E-05
Additional environmental information						
Impact category	Unit					
Ecotoxicity	**CTU_e**	3.02E+00	2.69E-01	1.94E-01	5.42E-02	1.87E-02
ADP Fossil	**MJ, LHV**	2.18E+00	9.59E-01	1.48E-01	1.93E-01	3.86E-02

References

Havelock Wool LCA Background Report
Havelock 2020. SimaPro Analyst 9.0.0.49, EcoInvent 3.1, 2.2 database.

ULE PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements v3.1
May 2, 2018. Technical Advisory Panel members reviewed and provided feedback on content written by UL Environment and USGBC. Past and present members of the Technical Advisory Panel are listed in the PCR.

ULE PCR Part B: Building Envelope Thermal Insulation
Version 2.0, April 2018. PCR review conducted by Thomas Gloria, PhD (chair, t.gloria@industrial-ecology.com); Andre Desjarlais; and Christoph Koffler, PhD.

ISO 14025, "Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services", ISO21930:2017
Independent external verification of the declaration and data, according to ISO 14025.

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. Environmental declarations from different programs (ISO 14025) may not be comparable. They are designed to present information transparently to make limitations of comparability more understandable. Limitations of LCA results for products represent production volumes for the Reno, NV facility only. 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. Comparison of the environmental performance of building envelope thermal insulation using EPD information shall be based on the products use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under the PCR. Environmental declarations from different programs based upon differing PCRs may not be comparable. Full conformance with the PCR for building envelope thermal insulation allows EPD comparability only when all stages of a life cycle have been considered, when they comply with all referenced standards, use the same sub-category PCR and use equivalent scenarios with respect to construction works. Compliance with model building codes does not always ensure compliance with state or local building codes, with may be amended versions of these model codes. Always check with local building code officials to confirm compliance. However, variations and deviations are possible. Example variations: Different LCA software and background LCI data sets may lead to different results upstream or downstream of the life cycle stages declared.

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

LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization
Environmental product declarations

☐ Industry-wide (generic) EPD	½ product
☑ Product-specific Type III EPD	1.5 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

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products
Environmental Product Declarations (EPD)

☐ Industry average EPD	.5 Points
☐ Multi-product specific EPD	.75 Points
☑ Product specific EPD	1 Point

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd party reviewed	☑
	Transparency Report (EPD)
3rd party verified	☑

Validity: 2020/06/05 – 2025/06/05
HW – 20200605 – 001

This environmental product declaration (EPD) was independently verified by WAP Sustainability Consulting to the ISO 21930:2017, the ULE PCR Parts A and B and ISO 14025:2006.

WAP Sustainability Consulting
1701 Market Street
Chattanooga, TN 37405
www.wapsustainability.com
(855) 452-2522

WAP SUSTAINABILITY CONSULTING

SUMMARY
Reference PCR
ULE Part A: Environment Standard 10010 Version 3.2 | Part B: Building Envelope Thermal Insulation EPD Requirements UL 10010-1, 04/18 – 02/23

Regions; system boundaries
North America; Cradle to grave

Functional unit / reference service life:
1 m² of installed insulation w/packaging; thickness that gives an avg thermal resistance of RSI = 1 m²·K/W over 75 years.

LCIA methodology: TRACI 2.1

LCA software; LCI database
SimaPro 9.0.0.49, ecoinvent 3.1, 2.2

LCA conducted by: Sustainable Minds

Public LCA: Havelock Products

Havelock Wool
204 Edison Way
Reno, NV 89502
www.havelockwool.com
775 971 4870

Contact us

How we make it greener

Havelock Wool Batt and Loose-fill Insulation

See LCA results by life cycle stage

RAW MATERIAL ACQUISITION

Havelock Wool is a specific blend of New Zealand wool particularly suited for insulation. Our wool is a byproduct of the meat production industry and contains no synthetic mix or bonding agents making our products compostable at the end of extended useful life.

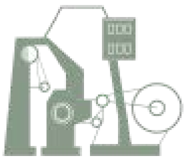
Sheep in New Zealand eat grass fed by rainfall and twice a year they need a haircut. This leads to 5kg or 10kg of wool per year that is available to be cleaned and turned into insulation.

New Zealand is hugely pastoral which limits the amount of vegetable matter (VM) in the wool and therefore allows for scouring (cleaning) to yield a product that carries ~0.1% VM.

The US by contrast typically achieves 1.5%. Canada has no scouring capabilities. This minimal amount of VM is important to keep our processing machines in tolerance so we can make a consistent product.

We are approached from around the world with offers to buy wool. We are biased towards New Zealand for quality, consistency and cost though we would like to see that change over time. Though ocean freight is extremely efficient we would like to pick up some raw material in closer proximity to our end-users.

PRODUCTION



Our production process employs two ingredients – wool and a slight amount of boric acid. Our processing equipment is uniquely simple for many reasons – not least very low power requirements.

Wool is the base fiber for our insulation. We do not include synthetics which typically require high heat and bonding agents to make a consistent finished product. Havelock, conversely, uses repurposed carding machines and a needle punch to make insulation. All of our machines run on electric motors which draw low power.

Our machine maintenance program is consistent and minimally invasive – machines are metal drums with teeth that turn with chains and sprockets or pulleys and belts. Bearings need grease and if a sprocket wears out it is quickly and easily replaced. We produce 6 days / week with almost no disruption.

There is an opportunity to add solar to our building and generate enough power to run our machines during production hours. We are exploring options and intend to add this capability to the equation.

INSTALLATION

Available in batts and loose-fill, Havelock Wool is used in residential and commercial construction as thermal and acoustic insulation. Havelock wool products install easily – blow-in and batts are installed like other mediums, but no protective clothing is required.

Loose-fill insulation can be installed by hand though pneumatic blowing is recommended. There are various machines fit for installing wool.

Batts are typically cut at 48" and can be applied with friction. A staple may be added at the installer's discretion. Wire or lightning rods are often used in a ceiling joist or with metal framing.

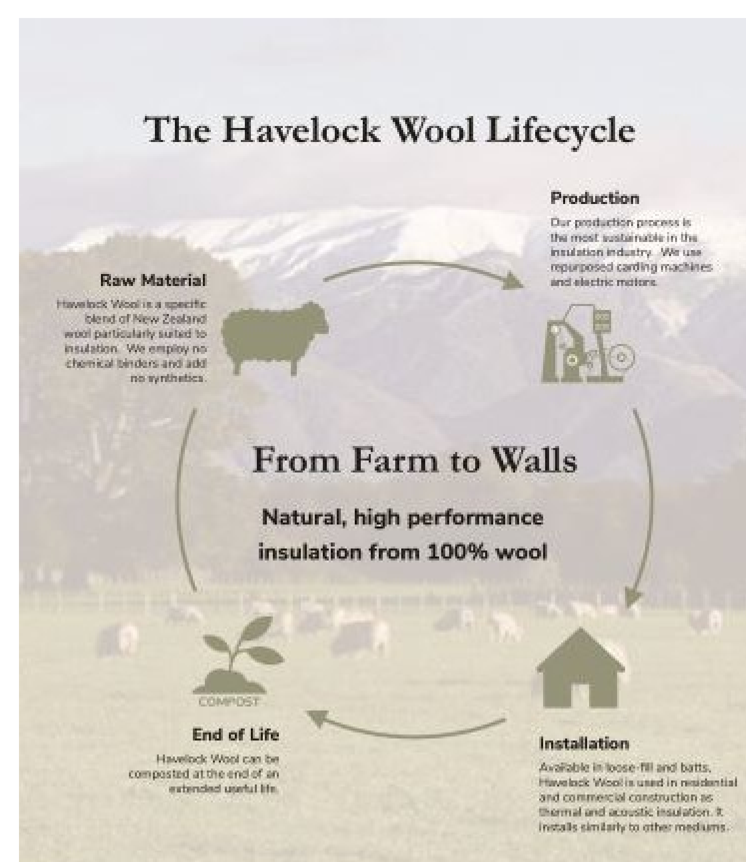
Our packaging can be made more recyclable. Doing so would noticeably add to cost so we will add this in stages whereby the option becomes available to discerning clientele before a wholesale shift is made.

END OF LIFE

COMPOST

Wool is a biogenic material. That means materials that are produced directly by the physiologic activities of organisms, either plant or animal. Havelock encourages composting as the optimal end of live method. However, when wool is landfilled, it biodegrades completely after six months.

At Havelock, we will always offer a product that comes from nature providing little impact when it has reached its end of life and returned to the earth.



SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd party reviewed	✔
	Transparency Report (EPD)
3rd party verified	✔

Validity: 2020/06/05 – 2025/06/05
HW – 20200605 – 001

This environmental product declaration (EPD) was independently verified by WAP Sustainability Consulting to the ISO 21930:2017, the ULE PCR Parts A and B and ISO 14025:2006.

WAP Sustainability Consulting
1701 Market Street
Chattanooga, TN 37405
www.wapsustainability.com
(855) 452-2522

WAP SUSTAINABILITY CONSULTING

SUMMARY

Reference PCR
ULE Part A: Environment Standard 10010 Version 3.2 | Part B: Building Envelope Thermal Insulation EPD Requirements UL 10010-1, 04/18 – 02/23

Regions; system boundaries
North America; Cradle to grave

Functional unit / reference service life:
1 m^2 of installed insulation w/packaging; thickness that gives an avg thermal resistance of RSI = 1 m^2·K/W over 75 years.

LCIA methodology: TRACI 2.1

LCA software; LCI database
SimaPro 9.0.0.49, ecoinvent 3.1, 2.2

LCA conducted by: Sustainable Minds

Public LCA: Havelock Products

Havelock Wool
204 Edison Way
Reno, NV 89502
www.havelockwool.com
775 971 4870

Contact us

Additional EPD content required by:
ULE PCR Parts A and B for Building Envelope Thermal Insulation

Wool Batts and Loose-fill

Data

Background: This product specific declaration was created by collecting product data over the course of a year for each product from Reno, NV where the product was manufactured. The reference service life applies for the reference in-use conditions only.

Allocation: No allocation was necessary in this project. Havelock provided data for two different products from one facility. All the data provided was specific to each product.

Cut-off criteria For the inclusion of mass and energy flows are 1% of renewable primary resource (energy), 1% nonrenewable primary resource (energy) usage, 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exception to these criteria is substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass. No known flows are deliberately excluded from this declaration.

Data selection and quality The data used to create the inventory model shall be as precise, complete, consistent, and representative as possible with regards to the goal and scope of the study. Primary data were collected February 2020 on a years worth of production. Data were collected for Havelocks wool insulation production facility in the US. Havelocks facility is located in Reno, NV. As such, the geographical coverage for this study is based on United States system boundaries.

Scenarios and additional technical information

PARAMETER	VALUE	UNIT
Transport to the building site [A4]		
Vehicle type	Truck-16T	
Fuel type	Diesel	
Average distance from Reno, NV to installation site	2704	km
Weight of product	57,000	kg/yr
Installation into the building [A5]		
Gas	1585	liters/yr
Mass of plastic packaging waste to disposal	7524	kg/yr
Reference service life [B1-B7]		
RSL	75	years
Declared product properties (at gate) and finishes	100% wool	
Assumed quality of work when installed in accordance with manufacturer's instructions	High	
Indoor Environment (if relevant for indoor applications), e.g. temperature, moisture, and chemical exposure	Residential	
Use conditions, e.g. frequency of use and mechanical exposure	One installation	per RSL
Disposal/reuse/recycling [C1-C4]		
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	Individuals are assumed to take product to nearest composting facility	
Collection process (specified by type)	unknown	
Recovery (specified by type)	compost	
Disposal (specified by type)	wool	

LCIA results, resource use, output and waste flows, and carbon emissions and removals for batts per functional unit

Parameter	Unit	A1-A3	A4	A5		B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
LCIA results															
Acidification	kg SO2eq	1.37E-02	1.71E-03	6.17E-04	0	0	0	0	0	0	0	0	4.90E-04	0	1.83E-03
Eutrophication	Kg N eq	2.79E-03	2.05E-04	3.64E-05	0	0	0	0	0	0	0	0	5.24E-05	0	8.12E-05
Global warming	kg CO_2 eq	2.63E+00	3.62E-01	5.33E-02	0	0	0	0	0	0	0	0	8.11E-02	0	4.17E-02
Ozone depletion	kg CFC-11	1.84E-07	7.07E-08	8.19E-11	0	0	0	0	0	0	0	0	1.59E-08	0	3.48E-09
Smog	kg O_3 eq	2.91E-01	4.39E-02	1.88E-0E	0	0	0	0	0	0	0	0	1.37E-02	0	1.52E-03
ADP Fossil	MJ, LHV	3.09E+00	7.31E-01	1.23E-01	0	0	0	0	0	0	0	0	1.64E-01	0	3.26E-02

Resource use indicators

Renewable primary energy used as energy carrier (fuel)	MJ, LHV	6.38E+00	8.79E-03	7.86E-06	0	0	0	0	0	0	0	0	1.83E-03	0	3.24E-03
Renewable primary resources with energy content used as material	MJ, LHV	1.96E+01	1.46E-02	2.04E-05	0	0	0	0	0	0	0	0	4.60E-02	0	4.60E-02
Total use of renewable primary resources with energy content	MJ, LHV	2.60E+01	2.34E-02	2.83E-05	0	0	0	0	0	0	0	0	4.82E-03	0	4.93E-02
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	4.57E+01	7.47E+00	1.15E+00	0	0	0	0	0	0	0	0	1.66E+00	0	4.17E-01
Non-renewable primary resources with energy content used as material	MJ, LHV	2.68E-03	2.18E-05	1.05E-07	0	0	0	0	0	0	0	0	4.57E-06	0	1.10E-05
Total use of non-renewable primary resources with energy content	MJ, LHV	4.57E+01	7.47E+00	1.15E+00	0	0	0	0	0	0	0	0	1.66E+00	0	4.17E-01
Secondary materials	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water resources	m3	4.01E-01	4.33E-03	3.87E-04	0	0	0	0	0	0	0	0	9.46E-04	0	8.57E-02

Output flows and waste category indicators

Hazardous waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-hazardous waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High-level radioactive waste, conditioned, to final repository	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Carbon emissions and removals

Biogenic Carbon Removal from Product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biogenic Carbon Emission from Product	kg CO_2	2.71E-01	0	3.72E-05	0	0	0	0	0	0	0	0	0	1.32E-04	0	1.44E-01
Biogenic Carbon Removal from Packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biogenic Carbon Emission from Packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcination Carbon Emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonation Carbon Removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Numbers shown in purple have a variation of 10 to 20%
Numbers shown in red have a variation greater than 20%

Additional EPD content required by:
ULE PCR Parts A and B for Building Envelope Thermal Insulation

Wool Batts and Loose-fill

LCIA results, resource use, output and waste flows, and carbon emissions and removals for loose-fill per functional unit

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
LCIA results															
Acidification	kg SO2eq	1.13E-02	2.87E-03	7.34E-04	0	0	0	0	0	0	0	0	5.20E-04	0	2.16E-03
Eutrophication	Kg N eq	1.88E-03	3.07E-04	4.35E-05	0	0	0	0	0	0	0	0	6.19E-05	0	9.60E-05
Global warming	kg CO_2 eq	1.76E+00	4.75E-01	6.36E-02	0	0	0	0	0	0	0	0	9.58E-02	0	4.93E-02
Ozone depletion	kg CFC-11	1.13E-07	9.29E-08	2.91E-10	0	0	0	0	0	0	0	0	1.87E-08	0	4.11E-09
Smog	kg O_3 eq	2.73E-01	8.05E-02	2.23E-02	0	0	0	0	0	0	0	0	1.62E-02	0	1.79E-03
ADP Fossil	MJ, LHV	2.18E+00	9.59E-01	1.48E-01	0	0	0	0	0	0	0	0	1.93E-01	0	3.86E-02
Resource use indicators															
Renewable primary energy used as energy carrier (fuel)	MJ, LHV	2.16E+00	5.94E-03	1.58E-05	0	0	0	0	0	0	0	0	1.20E-03	0	2.12E-03
Renewable primary resources with energy content used as material	MJ, LHV	6.63E+00	9.76E-03	4.11E-05	0	0	0	0	0	0	0	0	1.97E-03	0	3.02E-02
Total use of renewable primary resources with energy content	MJ, LHV	8.78E+00	1.57E-02	5.70E-05	0	0	0	0	0	0	0	0	3.17E-03	0	3.23E-02
Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	1.70E+01	5.39E+00	7.63E-01	0	0	0	0	0	0	0	0	1.09E+00	0	2.74E-01
Non-renewable primary resources with energy content used as material	MJ, LHV	9.07E-03	1.49E-05	2.11E-07	0	0	0	0	0	0	0	0	3.00E-06	0	7.25E-06
Total use of non-renewable primary resources with energy content	MJ, LHV	1.70E+01	5.39E+00	7.63E-01	0	0	0	0	0	0	0	0	1.09E+00	0	2.74E-01
Secondary materials	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recovered energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water resources	m3	2.53E-01	2.88E-03	1.10E-03	0	0	0	0	0	0	0	0	5.76E-04	0	5.74E-02

Output flows and waste category indicators

Hazardous waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-hazardous waste disposed	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High-level radioactive waste, conditioned, to final repository	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for recycling	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy	MJ, LHV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Carbon emissions and removals

Biogenic Carbon Removal from Product	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biogenic Carbon Emission from Product	kg CO_2	1.40E-01	6.55E-04	3.97E-05	0	0	0	0	0	0	0	0	0	1.32E-04	0	1.44E-01
Biogenic Carbon Removal from Packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biogenic Carbon Emission from Packaging	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcination Carbon Emissions	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbonation Carbon Removals	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes	kg CO_2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0