ENVIRONMENTAL PRODUCT DECLARATION

PVC FITTING COVERS AND JACKETING

ZESTON® 2000 SERIES • ZESTON® 300 SERIES • ZESTON® PVC JACKETING

Think JM.

Johns Manville's fitting covers and jacketing is designed to cover insulated pipes in above and below ambient applications. They can be used indoors and outdoors (UV-resistant white) and come in 14 different colors. Above: Zeston parts – manufactured in Edison, NJ.

Johns Manville
A Berkshire Hathaway Company

At Johns Manville, product performance and corporate accountability are top priorities. We ensure that our Zeston® PVC fittings and jacketing not only perform but also contribute to the health, safety, and sustainability of the environments where they are used.

We strive to ensure that our products meet the rigorous demands of their applications while focusing on finding new ways to reduce our environmental footprint, and we want to provide you with reliable materials that will allow you to do the same.

As a company, we are committed to evolving to help create a sustainable world for our future. When it comes to making decisions about your environmental impact, don't just think insulation, think JM.

PEOPLE • PASSION • PERFORM • PROTECT

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

Johns Manville

PVC Fitting Covers and Jacketing
Product Category: Pipe and Equipment Covers

According to ISO 14025 and EN 15804

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	Johns Manville
DECLARATION NUMBER	4787305280.107.1
DECLARED PRODUCT	Zeston® PVC Fitting Covers and Jacketing
REFERENCE PCR	Environdec PCR for Construction Products and Construction Services (2013)
DATE OF ISSUE	April 18, 2018
DATE OF EXPIRATION	April 18, 2024
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:	IVL Swedish Environmental Research Institute
	Martin Erlandsson
	martin.erlandsson@ivl.se
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin
	Grant R. Martin , UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	
	Thomas P. Gloria, Industrial Ecology Consultants

This EPD conforms with EN 15804

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Product Definition

Company Description

For more than 150 years, Johns Manville (JM) has been dedicated to providing products that improve energy efficiency, and contribute to the health and comfort of building occupants.

We manufacture premium-quality building and mechanical insulation, commercial roofing, glass fibers and nonwoven materials for commercial, industrial and residential applications. JM products are used in a wide variety of industries including building products, aerospace, automotive and transportation, filtration, commercial interiors, waterproofing and wind energy.

JM employs 7,000 people globally and provides products to more than 85 countries. We operate 44 manufacturing facilities in North America, Europe, and China. Since 1988, JM's global headquarters has been located in downtown Denver, Colorado.

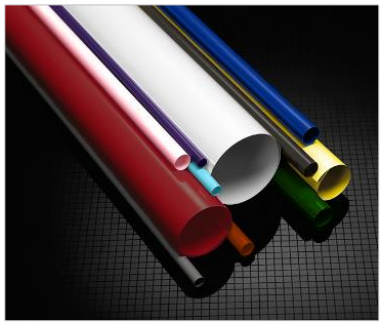
Product Description

Zeston® 2000 Series PVC – Insulated Fitting Covers and Jacketing

Johns Manville Zeston 2000 Series standard gauge PVC fitting covers are manufactured from high-impact, polyvinyl chloride material designed to provide abuse-resistant protection for insulated piping. The one-piece fittings are available with or without Hi-Lo® Temp Formaldehyde-free fiber glass inserts. Our wide range of products and accessories enable the contractor to design, fabricate and install a complete system with a quality finished appearance, and our UV-resistant white PVC can be used outdoors.

Zeston® 300 Series PVC

Zeston 300 Series PVC fitting covers are made from a thick gauge material that provides superior impact resistance and increased durability for high abuse areas in industrial and commercial applications. Zeston 300 Series PVC fitting covers are manufactured from a glossy, high-impact, UV-resistant material (white PVC only). Our wide range of products and accessories enable the contractor to design, fabricate and install a complete system with a quality finished appearance. When combined with JM's PVC jacketing and solvent welding adhesive, our PVC fitting covers form a completely sealed system that meets USDA and FDA requirements for applications in food, beverage and pharmaceutical facilities.



Zeston® PVC Jacketing for Commercial and Industrial Applications

Made from the same PVC material as the fitting covers, Zeston jacketing is designed to fit seamlessly over the Zeston fitting covers.

Johns Manville

PVC Fitting Covers and Jacketing
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According to ISO 14025

Content Declaration

Zeston PVC fitting covers and jacketing do not contain any substances on the European Chemicals Agency's Candidate List of Substances of Very High Concern. These products are primarily manufactured from PVC resin, JM fiber glass insulation, calcium carbonate (filler), and various auxiliary materials and process aids.

Application and Uses

Zeston PVC fitting covers and jacketing are ideally suited for indoor use on chilled water, hot water, steam and other piping systems in commercial, institutional, and industrial applications. When combined with Zeston PVC Color jacketing and solvent welding adhesive or Z-tape, Zeston fitting covers form a completely sealed system that may be used for chilled water applications. The Zeston PVC color system of fittings and jacketing provides easy identification for different pipe systems. All colored Zeston fittings and jacketing are not recommended for outdoor use; however all white PVC from JM is UV-resistant and may be used outdoors in certain applications.

Description of Production and Subsequent Life Cycle Stages

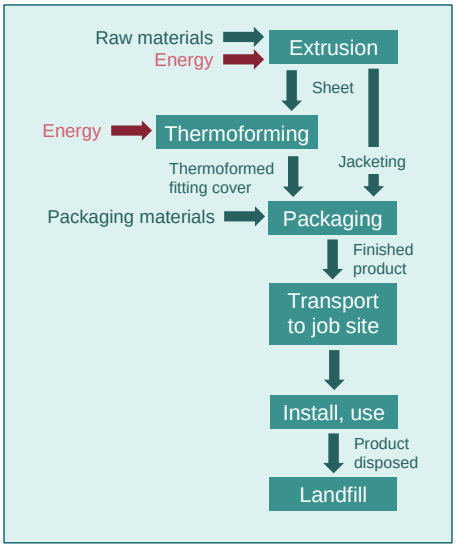
The life cycle of the product under study begins with the extraction and processing of the raw materials that constitute the PVC "dry mix." Together, these materials (PVC resin, calcium carbonate, auxiliary materials and process aids) are extruded into sheets. Part of the sheet production is sold as jacketing; another part is thermoformed into fitting covers like elbows, reducers, or tees. The product is packaged using corrugated boxes, shrink film and wood pallets.

Transport to the job site is estimated as 700 miles via truck. The fittings and jacketing product is assumed to be tailored to customer specifications, leading to negligible material loss during installation. At installation, only the packaging materials are assumed to be sent to landfill. The use phase is considered to be burden-free for insulation-related products as these products require no maintenance and have a 60-year reference service life—equal to that of the entire building. When the building is demolished, the fittings and jacketing is assumed to be sent to landfill along with the insulation product covered.

Figure 1 illustrates the production and subsequent life cycle stages.

Primary data were collected from Johns Manville for raw material use, packaging and scrap rates. Electricity and other facility fuel use were modeled with GaBi unit processes for extrusion and thermoforming.

Figure 1: Production and life cycle stages



Health, Safety, and Environmental Aspects during Production

Johns Manville PVC fittings covers and jacketing are designed, manufactured and tested in our own facilities, which are certified and registered to ISO 14001 standards. These certifications, along with regular, independent third-party auditing for compliance, is your assurance that Johns Manville products deliver consistent high quality.

Installation

In order to apply a PVC jacket or fitting cover, you will need to have a vapor barrier mastic, tacks, a securing strap, and a sealant, like Johns Manville's Z-tape, or Permaweld adhesive. Please note, if you are covering a material other than

fiber glass insulation, please measure the outer diameter, before placing an order with a distributor.

- **Zeston PVC Fittings:** The installer should start by insulating the elbows with Johns Manville's pre-cut Hi-Lo® Temp fiber glass insulation inserts. Once the insulation is in place, insert the tacks into one edge of the PVC fitting prior to placing it around the pipe. Next, wrap the fitting around the elbow and adjust it until it fits snugly around the insert, then press the tacks into place to secure the fitting. On a cold or dual-cycle pipe system, cover the tacks with Z-tape or a vapor retarder mastic to ensure the system is completely sealed.
- **Zeston Cut & Curl Jacketing:** Zeston PVC Cut & Curl jacketing is applied in a similar fashion to the PVC fittings. Wrap the jacketing around the insulated pipe so that it is securely in place. Instead of using tacks, however, apply a solvent weld PVC adhesive, like Johns Manville's Permaweld Adhesive, at the seams to the entire length of the longitudinal lap, and then secure the jacketing in place with straps to allow the solvent to bond. Seal the seam with a PVC tape to ensure that the system is completely closed.

Health, Safety, and Environmental Aspects during Installation

Zeston PVC fittings and jacketing are classified as a non-hazardous substance or mixture per GHS classification. They meet the definition of article in the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Use the appropriate personal protective equipment (PPE) during installation. Johns Manville recommends the following PPE precautions when handling Zeston PVC fittings and jacketing:

- **Respiratory:** No personal respiratory protective equipment is normally required
- **Hand protection:** For prolonged or repeated contact when handling Zeston products, use protective gloves.
- **Eye protection:** Safety glasses are recommended during installation.
- **Skin and body protection:** If used as directed, no special protective equipment is necessary.
- **Hygiene measures:** Handle Zeston PVC in accordance with good, industrial hygiene and safety practice. Written instructions for handling must be available at the work place.

Johns Manville's Zeston PVC safety data sheet may be found at:
https://www.jm.com/content/dam/jm/global/en/MSDS/200000000063_US_EN.pdf

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Life Cycle Assessment – Product System and Modeling

A “cradle-to-gate with options” life cycle assessment (LCA) was conducted for this EPD. The analysis was done according to the product category rules (PCR) for construction products by Environdec and followed LCA principles, requirements and guidelines laid out in the ISO 14040/14044 standards. As such, EPDs of construction products may not be comparable if they do not comply with the same PCR or if they are from different programs. While the intent of the PCR is to increase comparability, there may still be differences among EPDs that comply with the same PCR (e.g., due to differences in system boundaries, background data, etc.).

Declared Unit

Per the PCR, the declared unit for this analysis is ***1 kg of product***.

Life Cycle Stages Assessed

The following life cycle stages are covered in the “cradle-to-gate (A1-A3) with options (A4-A5, C2, C4)” system boundaries:

- **Upstream:** Raw material supply (including virgin and recycled materials); generation of electricity, steam and heat from primary energy resources
- **Core:** Inbound transportation of raw materials; manufacturing of PVC product, packaging of finished product, manufacturing waste, releases to the environment
- **Downstream:** Distribution of the product from the production plant to a distributor (if applicable) and from there, to the building site; installation process, installation wastes and releases to the environment; End-of-Life (EoL) transport to final disposal site, final disposition

Figure 2 and Figure 3 offer visualizations of the life cycle stages and information modules declared in this EPD.

Figure 2: Life cycle stages included in system boundary

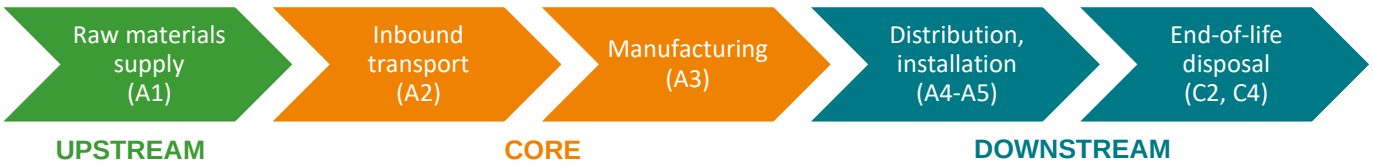

Figure 3: Complete life cycle stages with relevant modules declared (X), modules not declared (MND)

PRODUCT STAGE			CONSTRUCTION PROCESS		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	MND

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Transportation Assumptions

Transport of the finished product to installation was estimated as described in Table 1.

Table 1: A4 Transport to the construction site, per declared unit

Additional technical information			
Scenario title	**Parameter**	**Unit**	**Value**
A4 Transport to site	Vehicle type used for transport	n/a	Heavy truck 8b
	Vehicle load capacity	kg per vehicle	24,190
	Fuel type and consumption	Liter of fuel type per distance	Diesel
	Distance to construction site	km (miles)	1127 (700)
	Capacity utilization (including empty returns)	%	28
	Volume capacity utilization factor (factor: = 1 or < 1 or ≥ 1 for compressed or nested packaged products)	n/a	< 1

Installation Assumptions

PVC fittings are custom ordered and manually installed without installation waste (other than packaging) as indicated in Table 2.

Table 2: A5 Installation of the product, per declared unit

Additional technical information			
Scenario title	**Parameter**	**Unit**	**Value**
A5 Installation of the product	Ancillary materials for installation (specified by material)	kg	-
	Water use	m^3	-
	Other resource use	kg	-
	Quantitative description of energy type consumption during preparation and installation	MJ	-
	Direct emissions to ambient air, soil and water	kg	-
	Waste materials on the building site, generated by product's installation, i.e., packaging: - Wooden pallet - Corrugated paperboard - Shrink wrap	 kg kg kg	 0.125 0.107 0.007
	Output materials (specified by type) as result of waste processing at the construction site: - Wood to landfill - Paper to landfill - Plastic to landfill	 kg kg kg	 0.125 0.107 0.007

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Use

Not considered in this study.

End-of-Life Assumptions

At end-of-life, PVC fittings are removed from the deconstructed building. While PVC parts can be recycled, doing so currently is not common practice in the industry. Therefore, the analysis assumes that, after removal, the PVC fittings are transported to the disposal site and landfilled as described in Table 3.

Table 3: C End of Life, per declared unit

Additional technical information			
Module	**Parameter**	**Unit**	**Value**
C2 Transport	Dump truck transport to landfill, distance	km (miles)	32 (20)
C4 Disposal	Inert material to landfill	kg	1

Cut-off Criteria

No cut-off criteria were applied in this study.

Period under Consideration

Primary data were collected on 2015 PVC parts production for the Johns Manville manufacturing plant in Edison, NJ.

Background Data

The LCA model was created using the GaBi ts software system for life cycle engineering, developed by thinkstep. The GaBi 2016 database provided the life cycle inventory data for upstream and downstream processes of the background system. US-specific background data were used whenever possible, with European or global data substituted as proxies as necessary.

Data Quality

Data quality and representativeness are considered to be good to high. Foreground data were collected from Johns Manville's manufacturing facility, with seasonal variations accounted for by collecting 12 months-worth of data. No data were omitted under cut-off criteria. All primary data were collected with the same level of detail while all background data were sourced from the GaBi databases. GaBi unit processes were used to represent extrusion and thermoforming processes, with scrap rates adjusted to JM specifications. Allocation and other methodological choices were made consistently throughout the model.

Allocation

No allocation was applied in this study.

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Life Cycle Assessment – Results and Analysis

Resource Use and Wastes

Table 4 and Table 5 show resource use and waste category indicators per declared unit, respectively. Energy resource consumption is broken down between renewable and non-renewable resources.

Table 4: Resource use, per declared unit

	Unit	A1	A2	A3	A4	A5	C2	C4
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	4.89	0.00941	0.04	0.0410	0.00943	0.000577	0.0389
Use of renewable primary energy resources used as raw materials	MJ	-	-	2.78	-	-	-	-
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.89	0.00941	2.82	0.0410	0.00943	0.000577	0.0389
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	50.8	0.600	2.30	2.62	0.180	0.0368	0.717
Use of non-renewable primary energy resources used as raw materials	MJ	10.86	-	-	-	-	-	-
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	61.6	0.600	2.30	2.62	0.180	0.0368	0.717
Use of secondary material	kg	0.0945	-	-	-	-	-	-
Use of renewable secondary fuels, net calorific value	MJ	-	-	-	-	-	-	-
Use of non-renewable secondary fuels, net calorific value	MJ	-	-	-	-	-	-	-
Use of net fresh water (blue water consumption)	m^3	0.0193	0.00012	0.00130	0.00052	-0.00013	7.33E-06	-0.00066

Table 5: Waste category indicators, per declared unit

	Unit	A1	A2	A3	A4	A5	C2	C4
Hazardous waste disposed	kg	3.35E-06	8.64E-08	5.82E-07	3.77E-07	3.43E-08	5.30E-09	1.38E-07
Non-hazardous waste disposed	kg	0.153	1.98E-05	0.041	8.63E-05	0.173	1.21E-06	1
Radioactive waste disposed/stored	kg	0.00206	1.25E-06	2.52E-05	5.45E-06	1.92E-06	7.66E-08	7.97E-06

Life Cycle Impact Assessment

Table 6 contains life cycle impact assessment results per declared unit. Impact results were calculated using the CML 2001 – Apr. 2013 methodology for the following impact categories:

- Global warming potential excl. biogenic carbon, kg CO_2 equivalents (GWP_{100})
- Ozone depletion potential, kg CFC 11 equivalents (ODP)
- Acidification potential of land and water, SO_2 equivalents (AP)
- Eutrophication potential, PO_4^{3-} equivalents (EP)
- Photochemical ozone creation potential, C_2H_2 equivalents (POCP)
- Depletion potential of abiotic resources (elements), kg Sb equivalents (ADP_e)
- Depletion potential of abiotic resources (fossil), MJ net calorific value (ADP_f)

Table 6: Life cycle impact category results (CML 2001 – Apr. 2013), per declared unit

Impact Category	Units	Upstream	Core		Downstream			
		A1	A2	A3	A4	A5	C2	C4
GWP_{100}	kg CO_2 eq	3.1	0.0425	0.152	0.186	0.16	0.00261	0.0462
ODP	kg R11 eq	6.83E-10	3.42E-13	4E-12	1.49E-12	2.5E-13	2.1E-14	1.03E-12
AP	kg SO_2 eq	0.00949	0.000149	0.000283	0.000733	0.000472	9.13E-06	0.000202
EP	kg PO_4^{3-} eq	0.00135	3.77E-05	8.38E-05	0.000186	0.000141	2.31E-06	2.69E-05
POCP	kg Ethene eq	0.00151	1.81E-05	3.75E-05	8.77E-05	0.000132	1.11E-06	2.14E-05
ADP_e	kg Sb eq	2.46E-05	5.59E-09	5.04E-08	2.44E-08	4.28E-09	3.43E-10	1.76E-08
ADP_f	MJ	56.4	0.597	2.24	2.6	0.175	0.0366	0.696

Interpretation

Upstream material production and energy generation (A1) dominate all impact categories, with PVC resin and electricity as the main contributors to potential environmental impact. The relatively strong contribution of electricity to ODP is owed to the regional electricity grid mix, which contains 32% nuclear energy.

Core manufacturing (A2-A3) impacts are relatively insignificant, as the electricity used to power the extrusion and thermoforming processes is accounted for under A1, upstream.

Downstream impacts from installation (A4-A5) contribute less than 20% to any of the CML impact categories and are dominated by truck distribution to the installation site and the subsequent decomposition of landfilled packaging materials. End-of-life disposal to landfill (C2, C4) does not contribute significantly to the declared impact categories, as PVC and insulation are all but inert in a landfill environment.

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References

EN 15804	EN 15804:2012+A1, European Standard, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products.
GaBi ts software 2016	thinkstep AG, GaBi ts software: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2016.
ISO 14025	ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.
ISO 14040	ISO 14040:2009-11, Environmental management — Life cycle assessment — Principles and framework.
ISO 14044	ISO 14044:2006-10, Environmental management — Life cycle assessment — Requirements and guidelines.
Environdec 2016	Environdec, Product Category Rules for Construction Products and Construction Services, Version 2.1. Stockholm, 2016.

Contact Information

Study Commissioner

Johns Manville

Building Insulation Technical, John Elverum

+1 (800) 654-3103: Option 3

P. O. Box 5108, Denver, CO 80217-5108

www.jm.com

LCA Practitioner

thinkstep

thinkstep, inc.

+1 (617) 247-4477, info@thinkstep.com

170 Milk St, 3rd floor, Boston, MA 02109

www.thinkstep.com