



ENVIRONMENTAL PRODUCT DECLARATION



ASTM International Certified Environmental Product Declaration

This document is a Type III environmental product declaration (EPD) for Versico's VersiFlex™ polyvinyl chloride (PVC) polyester reinforced single-ply roofing membranes in 50, 60 and 80 mil nominal thicknesses, as manufactured at the Greenville, IL facility for the reference year 2018.

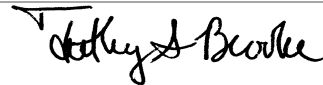
This declaration has been prepared in accordance with ISO 14025 [8], ISO 21930 [3], ISO 14040/44 [4, 5], the NSF International's Product Category Rules for Single-Ply Roofing Membranes [6] and ASTM's General Program Instructions for Type III EPD [7].

The intent of this document is to further the development of environmentally compatible and more sustainable construction methods by providing comprehensive environmental information related to potential impacts of Versico's VersiFlex™ PVC roofing membranes in accordance with international standards.

Environmental Product Declaration Summary

General Information	
Owner of the EPD	 Versico Roofing Systems A division of Carlisle Construction Materials LLC P.O. Box 1289 Carlisle, PA 17013 Link (URL): www.versico.com Versico was formed through the acquisition of a major single-ply roofing supplier in 1993. With decades of experience in the single-ply roofing industry, Versico strives to provide the highest quality, longest-lasting and most efficient roofing products in the industry. Versico provides its customers with superior roofing systems and services through a select network of manufacturer's representatives, distributors and applicators. <i>The owner of the declaration is liable for the underlying information and evidence.</i>
Manufacturing Site	Single-Ply Roofing Membranes Greenville, IL 1825 East U.S. Route 40 Greenville, IL 62246
Product Group	Single-Ply Roofing Membranes
Product Name	Versico's VersiFlex™ PVC roofing membrane with a finished nominal thickness of 1.27 mm (50 mils), 1.52 mm (60 mils) and 2.03 mm (80 mils).

Versico VersiFlex™ single-ply PVC roofing membrane

Product Definition		Single-ply roofing membranes are defined as thermoplastic or thermoset membranes of compounded synthetic materials manufactured in a factory for use in roofing.	
Product Category Rule (PCR)		NSF International, Product Category Rule for Environmental Product Declarations for Single Ply Roofing Membranes, October 2019 [6]. ISO 21930:2017 serves as the core PCR [3].	
Certification Period		07.02.2021 – 07.02.2026	
Declared Unit		1 m ² manufactured of Versico’s VersiFlex™ PVC single-ply roofing membrane	
ASTM Declaration Number		EPD – 239	
EPD Information			
Program Operator		ASTM International 100 Barr Harbor Drive, PO Box C700 West Conshohocken, PA 19428-2959, USA www.astm.org/EPDs.htm	
Declaration Holder		Versico Roofing Systems	
Product group	Date of Issue	Period of Validity	Declaration Number
Single Ply Roofing Membranes	07.02.2021	5 years	EPD-239
Declaration Type			
This “Cradle-to-gate” EPD applies to the Versico’s VersiFlex™ PVC roofing membrane (all colors) in 50, 60, and 80 mil nominal thicknesses. Production activities covered include <i>the extraction and upstream production, transport to factory and manufacturing</i> (modules A1 to A3). The declaration is intended for Business-to-Business (B-to-B) communication.			
Applicable Countries			
United States and Canada			
Product Applicability			
Versico’s VersiFlex™ PVC is an advanced-formula, heat-weldable PVC thermoplastic membrane that is designed for long-term weatherability and performance. The declared roofing membranes are designed for low-slope roofing applications. PVC roofing membrane can be used in adhered and mechanically fastened systems.			
This EPD was independently verified by ASTM in accordance with ISO 14025:			
Internal	External	Tim Brooke 100 Barr Harbor Drive, PO Box C700 West Conshohocken, PA 19428-2959, USA www.astm.org/EPDs.htm	
	X		
EPD Project Report Information			
EPD Project Report		A Cradle-to-Gate Life Cycle Assessment of Carlisle Construction Materials’ Single-Ply Polyester Reinforced PVC and KEE HP Roofing Membranes of Various Thicknesses with and without Fleece Backing, May 2021 [13].	

Prepared by  Athena Sustainable Materials Institute	Lindita Bushi PhD, Mr. Jamie Meil and Mr. Grant Finlayson Athena Sustainable Materials Institute 119 Ross Avenue, Suite 100 Ottawa, Ontario, K1Y 0N6, Canada info@athenasmi.org
This EPD project report was independently verified by and in accordance with ISO 14025 and the reference PCR:	Thomas P. Gloria, Ph.D. Industrial Ecology Consultants 35 Bracebridge Rd. Newton, MA 02459-1728
PCR Information	
Program Operator	NSF International
Reference PCR	NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Single Ply Roofing Membranes [6].
Date of Issue	October 2019
PCR review was conducted by:	Thomas P. Gloria, PhD (Chair), Industrial Ecology Consultants t.gloria@industrial-ecology.com Mr. Jack Geibig, EcoForm Mr. Bill Stough, Sustainable Research Group
EPD Explanatory material	For any explanatory material, regarding this EPD, please contact the program operator. ASTM International Environmental Product Declarations 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, http://www.astm.org

1 PRODUCT IDENTIFICATION

1.1 PRODUCT DEFINITION

This EPD applies to the Versico's VersiFlex™ single-ply PVC Roofing Membrane (all colors), with a finished nominal thickness of 50, 60 and 80 mils, as produced at its Greenville, IL plant.

Versico's VersiFlex™ PVC membrane is an advanced-formula, heat-weldable PVC thermoplastic membrane that is designed for long-term weatherability and performance. The physical properties of the membrane are enhanced by a weft-inserted polyester fabric that is encapsulated by thick PVC-based top and bottom plies.

The smooth surface of the PVC membrane allows for a total-surface fusion and permanent weld, creating a consistent, watertight, monolithic roof assembly. The gray-colored bottom ply provides a visual confirmation of a proper weld during the lap welding process.

Versico's VersiFlex™ PVC contributes to LEED® credit requirements and is Cool Roof Rating Council (CRRC)-rated and Title 24 compliant. The VersiFlex™ product line is one of the broadest in the industry, offering a PVC membrane for virtually any low-slope roofing specification. The membranes weld quickly, cleanly, and consistently. Versico's VersiFlex™ PVC roofing membranes can be either installed as a mechanically fastened or adhered roofing system.

Table 1 summarizes key technical data for Versico VersiFlex™ single-ply PVC roofing membrane by thickness. Versico's VersiFlex™ PVC is classified as Type III and/or Type IV and meets or exceeds the requirements of ASTM D4434 [1]. Further testing information and results can be found on the Versico Roofing Systems's website (www.versico.com).

Table 1. Key technical data of declared thicknesses

Technical data	Units	Values		
Finished nominal thickness	mil	50	60	80
	mm	1.27	1.52	2.03
Finished density	kg/m ²	1.6	1.9	2.6
Color	n/a	white, gray, light gray, slate gray, and tan		

1.2 PRODUCT STANDARDS

The Versico VersiFlex™ PVC roofing membrane, with a finished nominal thickness of 50, 60 and 80 mils meet the following standards and requirements,

- ASTM D4434 Type IV Standard Specification for Poly (Vinyl Chloride) Sheet Roofing
- Cool Roof Rating Council®
- FM Approvals
- Miami-Dade County Approval
- California's Building Energy Code (Title 24) Compliant
- Underwriters Laboratory Inc.

- Underwriters Laboratories of Canada

2 DECLARED UNIT

The declared product is 1 m² of Versico's VersiFlex™ single-ply PVC Roofing membrane, with a finished nominal thickness of 50, 60 or 80 mils.

3 MATERIAL CONTENT

The average material composition by input material (in %) for 1m² for the Versico VersiFlex™ PVC is provided in Table 2.

Table 2. Average material content for 1 m² Versico VersiFlex™ PVC Membrane

Material input	Material Content (in %)
PVC Resin	51
Plasticizers	31
Pigments	5
Fire retardant	2
Stabilizers	2
Fillers	3
Processing aids, oils, and lubricants	1
Biocide	<1
Polyester reinforcement	5
Total weight (Input)	100

4 LIFE CYCLE STAGES

Figure 1 shows the life-cycle stages and information modules that are included within the cradle-to-gate LCA system boundary of this EPD. The boundary is "cradle-to-gate", which includes the *Production stage* (A1 to A3 modules). *Construction, Use, and End-of-Life stages* - are excluded from the system boundary. The *Production stage* system boundary is shown in Figure 2. Per ISO 21930, 7.1.7.2.1 [3], the system boundary with nature (natural environment) includes those technical processes that provide the material and energy inputs into the system and the subsequent manufacturing and transport processes up to the to the factory gate, as well as the processing of any waste arising from those processes.

Production stage			Construction stage		Use stage							End-of-life stage			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3
X			MND												
X- module is included in system boundary; MND- module is not declared (excluded from system boundary)															

Figure 1 Life Cycle Stages and Modules

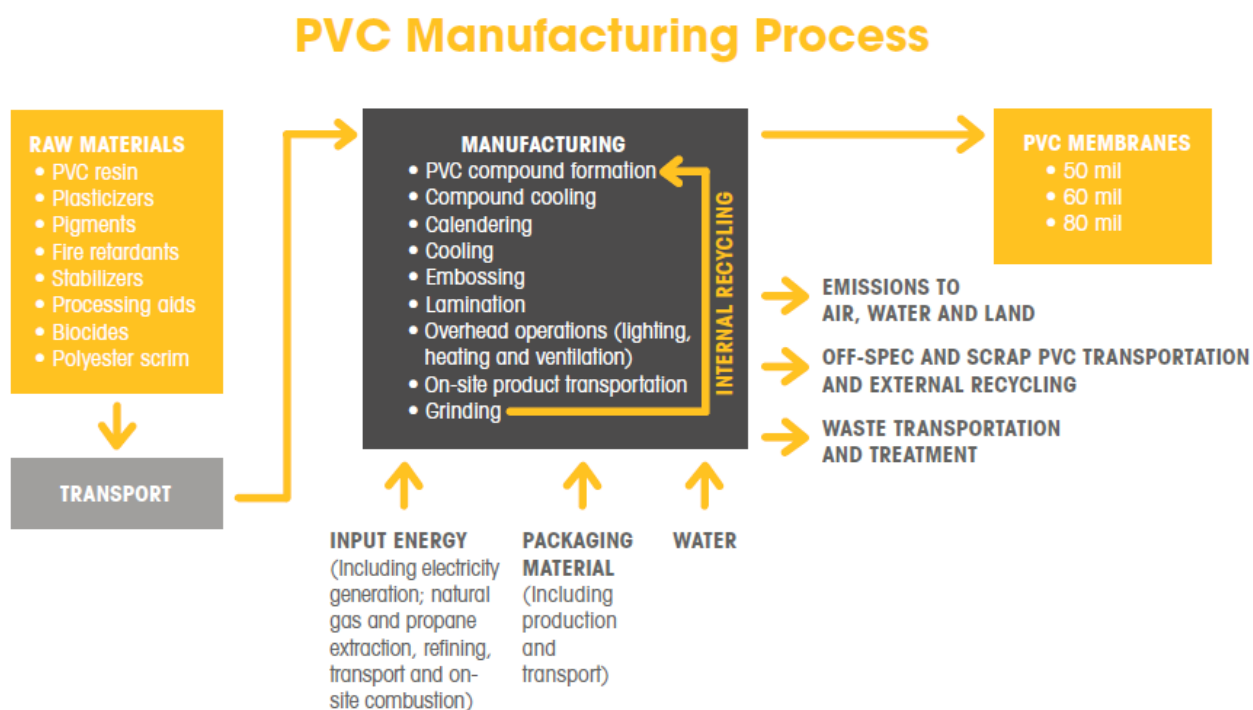


Figure 2 Versico VersiFlex™ PVC Membrane System Boundaries

5 LIFE CYCLE INVENTORY

5.1 DATA COLLECTION, SOURCES, AND CALCULATIONS

LCI data collection was based on one customized LCI survey. The LCI survey covered the primary data for the facility for the 2018 reference year. Source of data is specified as: Direct, based on measurements or purchasing/selling records of the surveyed facility; Indirect, based on calculations made by the personnel of the surveyed facility; and Estimated, based on the industry average data and/or expert judgment. Data calculation procedures follow ISO 14044 [5], and NSF PCR for Single Ply Roofing Membranes [6]. Per ISO 21930, 7.2.2 [3], when transforming the inputs and outputs of combustible material into inputs and outputs of energy, the net calorific value (lower heating value) of fuels is applied according to scientifically based and accepted values specific to the combustible material.

5.2 DATA QUALITY REQUIREMENTS AND ASSESSMENTS

A detailed description of collected data and the data quality assessment regarding the NSF PCR requirements [6] and ISO 14044 [5] is provided in the LCA project report. Data quality is assessed based on its representativeness (technology coverage, geographic coverage, time coverage), completeness, consistency, reproducibility, transparency, and uncertainty (Table 3).

Table 3. Data Quality Requirements and Assessments

Data Quality Requirements	Description
Technology Coverage	Data represents the prevailing technology at the Grenville, IL facility. Whenever available, for all upstream and core material and processes, North American typical or average industry LCI datasets were utilized. <i>Technological representativeness is characterized as "high".</i>
Geographic Coverage	The geographic region considered is the U.S. <i>Geographical representativeness is characterized as "high".</i>
Time Coverage	Activity data are representative. - Roofing membrane manufacturing process - primary data collected for reference year 2018 (12 months) - In-bound/ out-bound transportation data- primary data collected for reference year 2018 (12 months) - Polyester scrim reinforcement production- U.S. industry data for the reference year 2010 (12 months) - Generic data: the most appropriate LCI datasets were used as found in the US LCI Database, ecoinvent v.3.5 database for US and Global, 2018. US LCI database "dummies" (empty/missing LCI datasets) are substituted with ecoinvent v3.5 LCI datasets. <i>Temporal representativeness is characterized as "medium" to "high".</i>

Data Quality Requirements	Description
Completeness	All relevant, specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled. The relevant background materials and processes were taken from the US LCI Database (adjusted for known data placeholders), ecoinvent v 3.5 LCI database for US, and modeled in SimaPro software v.9.1.1.1, 2021. The completeness of the cradle-to-gate process chain in terms of process steps is rigorously assessed for all membranes and documented in project report.
Consistency	To ensure consistency, the input/output LCI modeling of the PVC single-ply roofing membranes used the same LCI modeling structure, which consisted of input raw, secondary, ancillary, and packaging materials, intermediate products, energy flows, water resource inputs, product outputs, co-products, by-products, emissions to air, water and soil, and solid and liquid waste disposal. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the facility level and selected process levels to maintain a high level of consistency.
Reproducibility	Internal reproducibility is possible since the data and the models are stored and available in <i>Athena CCM LCI database</i> developed in SimaPro, 2021. A high level of transparency is provided throughout the report as the LCI profile is presented for each of the declared products as well as major upstream inputs. Key primary (manufacturer specific) and secondary (generic) LCI data sources are summarized in the supporting LCA project report.
Transparency	Activity and LCI datasets are transparently disclosed in the project report, including data sources.
Uncertainty	A <i>sensitivity check</i> was conducted to assess the reliability of the EPD results and conclusions by determining how they are affected by uncertainties in the data or assumptions on calculation of LCIA and energy indicator results. The sensitivity check includes the results of a <i>sensitivity analysis</i> and <i>Monte Carlo uncertainty analysis of background data sets</i> .

5.3 ALLOCATION RULES

The Greenville, IL single-ply roof membrane manufacturing facility produces other co-products besides selected membranes and as such and as per the PCR, allocation based on the mass of membrane products was necessary. “Mass” based, plant specific formulation for 1m² of PVC roofing membranes were used to calculate the input raw the ancillary materials consumed. “Mass” was used as the physical parameter for allocating flows between the products of interest and other co-products to calculate the input energy flows (electricity, natural gas, propane, etc.), shipping and packaging materials, lubricants, hydraulic fluid, greases, and heating oil, total water consumption, process emissions to air and waste flows. No burden is allocated to the by-product of the declared product system such as off-spec PVC roofing membranes. In addition, allocation related to transport is based on the mass of transported inputs and outputs.

5.4 CUT OFF RULES

The cut-off criteria as per NSF PCR, Section 7.1.6 [6] and ISO 21930, 7.1.8 [3] were followed. All input/output data reported by the Greenville, IL manufacturing plant were included in the LCI modelling. None of the reported flow data were excluded based on the cut-off criteria. Any plant specific data gaps for the reference year (e.g., input hydraulic fluids, lubricants, greases, or heated oil) were filled in with industry average data. Material Safety Data Sheet (MSDSs) were confidentially provided by CCM for each additive e.g., plasticizer, fire retardant, stabilizer, fleece backing, etc. Any data gaps in the MSDS are filled in with proxy and conservative generic LCI datasets, as appropriate.

This EPD excludes the following processes:

- Capital goods and infrastructure
- Human activity and personnel related activity (travel, furniture, office operations and supplies)
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location.

6 LIFE CYCLE ASSESSMENT RESULTS

Table 4 details the “cradle-to-gate” LCA results for 1 m² of 50, 60 and 80 mils Versico VersiFlex™ PVC membrane on an absolute basis.

As per the NSF PCR, the US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), version 2.1, 2012 impact categories are used as they provide a North American context for the mandatory category indicators to be included in this EPD. *These are relative expressions only and do not predict category impact endpoints, the exceeding of thresholds, safety margins or risks* [4], [5]. Additional mandatory resource use, waste categories and output flows are also reported as per the PCR.

Table 4. EPD results for 1 m² of 50, 60 and 80 mils Versico VersiFlex™ PVC Membrane - Production Stage (A1-A3)

Impact category and inventory indicators	Unit	Versico VersiFlex™ PVC membranes Production stage (A1 to A3)		
		50 mils	60 mils	80 mils
Global warming potential, GWP 100 ¹⁾	kg CO ₂ eq	5.5	6.6	8.8
Ozone depletion potential, ODP ¹⁾	kg CFC-11 eq	8.4E-07	1.0E-06	1.4E-06
Smog formation potential, SFP ¹⁾	kg O ₃ eq	0.33	0.41	0.55
Acidification potential, AP ¹⁾	kg SO ₂ eq	0.032	0.039	0.052
Eutrophication potential, EP ¹⁾	kg N eq	0.087	0.108	0.146
Fossil fuel depletion, FFD ¹⁾	MJ surplus	11.4	13.8	18.6
Abiotic depletion potential, fossil ADPf ²⁾	MJ LHV	86.6	104.5	140.0

Impact category and inventory indicators	Unit	Versico VersiFlex™ PVC membranes Production stage (A1 to A3)		
		50 mils	60 mils	80 mils
Renewable primary resources used as an energy carrier (fuel), RPR _E	MJ LHV	4.9	6.0	8.2
Renewable primary resources with energy content used as material, RPR _M ³⁾	MJ LHV	-	-	-
Non-renewable primary resources used as an energy carrier (fuel), NRPR _E	MJ LHV	56.4	67.3	88.9
Non-renewable primary resources with energy content used as material, NRPR _M ³⁾	MJ LHV	40.4	49.3	67.0
Secondary materials, SM ³⁾	kg	0	0	0
Renewable secondary fuels, RSF ³⁾	MJ LHV	-	-	-
Non-renewable secondary fuels, NRSF ³⁾	MJ LHV	-	-	-
Recovered energy, RE ³⁾	MJ LHV	-	-	-
Consumption of freshwater, FW ³⁾	m ³	2.0E-05	2.4E-05	3.3E-05
Hazardous waste disposed, HWD ³⁾	kg	0	0	0
Non-hazardous waste disposed, NHWD ³⁾	kg	0.0058	0.0071	0.0096
High-level radioactive waste, conditioned, to final repository, HLRW ^{3) 4)}	m ³	5.1E-09	6.1E-09	8.0E-09
Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW ^{3) 5)}	m ³	8.0E-08	9.6E-08	1.3E-07
Components for re-use, CRU ³⁾	kg	-	-	-
Materials for recycling, MR ³⁾	kg	0.127	0.156	0.211
Materials for energy recovery, MER ³⁾	kg	-	-	-
Recovered energy exported from the product system, EE ³⁾	MJ LHV	-	-	-

Notes:

¹⁾ Calculated as per U.S EPA TRACI 2.1, v1.05, SimaPro v 9.1.1.1 GWP-100, excludes biogenic CO₂ removals and emissions associated with any biobased products; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5), TRACI 2.1, v1.05 [10]. FPD is required in LEED V4.1 MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations [11].

²⁾ Calculated as per CML-IA Baseline V3.05, SimaPro v 9.1.1.1. ADP_f is also required in LEED V4.1 MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations [11].

³⁾ Calculated as per ACLCA ISO 21930 Guidance [12], respective sections 6.2 to 10.8.

⁴⁾ It should be noted that the foreground system (CCM roofing membrane manufacturing process) does not generate any HLRW. High-level radioactive waste, e.g., when generated by electricity production, consists mostly of spent fuel from reactors.” (ISO 21930:2017, clause 7.2.14).

⁵⁾ It should be noted that the foreground system (CCM roofing membrane manufacturing process) does not generate any ILLRW. Low- and intermediate-level radioactive wastes, e.g., when generated by electricity production, arise mainly from routine facility maintenance and operations (ISO 21930:2017, clause 7.2.14).

⁶⁾ “-“N/A for this product system. “Not all LCA datasets for upstream materials include these impact categories and thus results may be incomplete. Use caution when interpreting data in these categories” [6].

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⁷⁾ “Emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories: RPR_E, RPR_M, NRPR_E, NRPR_M, SM, RSF, NRSF, RE, HWD, NHWD, HLRW, ILLRW, CRU, MR, MER, EE” [6].

⁸⁾ Biogenic C-content of packaging fall below the cut-off criteria (NSF PCR, Section 7.1.6 [6] and ISO 21930, 7.1.8 [3]), and is therefore excluded. It should be noted that GWP based on biogenic C-content of packaging is not included in the quantification of GWP 100.

7 INTERPRETATION

The Versico’s VersiFlex™ EPD results represent a “cradle-to-gate” environmental profile per 1 m² for each declared PVC roofing membrane thickness as manufactured at the Greenville, IL plant for the reference year 2018.

Module A1 Extraction and upstream material input production contributes the largest share of the LCIA category and energy indicator results – accounting for between 75% (non-renewable primary energy) and 97% (eutrophication) of the potential environmental burdens. *Module A2 Transportation* contributed 16% of the smog related emissions, but was otherwise, a minor contributor (<6%) to the overall impact of membrane manufacture. *Module A3 Manufacturing* is the second largest contributor (<21%) to the overall potential environmental impacts of the membrane manufacture.

8 ADDITIONAL ENVIRONMENTAL INFORMATION

- The Versico PVC roofing membranes meet the requirements of LEED®, Green Globes™ and exceed the cool roof requirements of California's Building Energy Code (Title 24).
- Versico diverts all pre-consumer off-specs vinyl membrane from landfill, by recycling it back into their PVC roofing membrane products or shipping it to external PVC recyclers.
- Versico PVC roofing membranes surpass the requirements and are certified with SECO, Intron and BBA with routine audits to maintain certification which validates plant processes and product characteristics.
- Versico PVC roofing membranes help building owners achieve LEED and Green Globes certification.
- No substances of high concern were identified in the framework of this EPD.

9 DECLARATION TYPE

This “Cradle-to-gate” EPD applies to the Versico’s VersiFlex™ PVC roofing membrane (all colors) 50, 60, and 80 mils nominal thicknesses. Production activities covered include *the extraction and upstream production, transport to factory, manufacturing* (modules A1 to A3). The declaration is intended for Business-to-Business (B-to-B) communication.

The three declared thicknesses (50, 60 and 80 mils), Versico VersiFlex™ PVC roofing membrane fall under the description:

- *A product-specific EPD, from a manufacturer’s plant.*

10 EPD COMPARABILITY LIMITATION STATEMENT

- *Only EPDs prepared from cradle-to-grave life cycle results and based on the same function, RSL, quantified by the same functional unit, and meeting all the conditions for comparability listed in ISO 14025:2006 and ISO 21930:2017 can be used to make comparison between products.*
- Declarations based on the NSF Product category rules are not comparative assertions; that is, no claim of environmental superiority may be inferred or implied.

11 REFERENCES

1. ASTM D4434/ D4434M – 15 Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
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3. ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.
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13. Athena Sustainable Materials Institute, *A Cradle-to-Gate Life Cycle Assessment of Carlisle Construction Materials' Single-Ply Polyester Reinforced PVC and KEE HP Roofing Membranes of Various Thicknesses with and without Fleece Backing*, May 2021 (73 pages).

ABOUT VERSICO ROOFING SYSTEMS

Versico Roofing Systems was formed in 1993 through the acquisition of a major single-ply roofing manufacturer. Now, more than twenty-five years later, Versico has positioned itself as one of the top single-ply roofing system suppliers in the U.S. by focusing its efforts on quality products and exceptional service.

With decades of experience in the single-ply roofing field, Versico has been instrumental in the development of today's leading technologies in the commercial roofing industry. Versico manufactures EPDM, TPO, PVC, polyiso and EPS insulation and a full line of adhesives and accessories.



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