

**Environmental Product Declaration**






Mannington Commercial crafts flooring with purpose. We offer a full range of products designed to inspire creativity and deliver advanced performance in all types of commercial spaces. Our fourth-generation, family-owned company is guided by a dedication to our customers and to making a positive impact on the environment and local communities.

Cirro is a non-vinyl polymeric composite floor defined by its clarity of design and consideration for the environment. Cirro planks and tiles are made without PVC or phthalates and are crafted to perform under high traffic. In 20 versatile visuals, Cirro meets every style need and all with a low environmental impact and carries the Mannington Commercial legacy of performance, innovation and commitment to the world we share.



# ENVIRONMENTAL PRODUCT DECLARATION

Program Operator	NSF Certification LLC 789 N. Dixboro, Ann Arbor, MI 48105 www.nsf.org	
General Program instructions and Version Number	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2	
Manufacturer Name and Address	Mannington Commercial Kingfield Road, Coventry CV6 5AA UK	
Declaration Number	EPD10266	
Declared Product and Functional Unit	Floor Resilient Tile manufactured at Coventry, UK 1 square meter of installed flooring and with a building service life of 75 years	
Reference PCR and Version Number	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2 Part B: Flooring EPD Requirements. UL 10010-7, September 28, 2018	
Product's intended Application and Use	Flooring Applications	
Product RSL	10 years	
Markets of Applicability	North America	
Date of Issue	09/09/2019	
Period of Validity	5 years from date of issue	
EPD Type	Product Specific	
Range of Dataset Variability	N/A	
EPD Scope	Cradle to Grave	
Year of reported manufacturer primary data	2017	
LCA Software and Version Number	GaBi 8.7.0.18	
LCI Database and Version Number	GaBi Database Version 8.7, Service Pack 37	
LCIA Methodology and Version Number	TRACI 2.1 CML 2001-Jan 2016	
The sub-category PCR review was conducted by:	Jack Geibig (Chair) - EcoForm Thomas Gloria, PhD Thaddeus Owen	

This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Life Cycle Assessment Calculation Rules and Report Requirements" v3.2 (December 2018), based on CEN Norm EN 15804 (2012) and ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) <input type="checkbox"/> Internal <input type="checkbox"/> External	Jenny Oorbeck <a href="mailto:joorbeck@nsf.org">joorbeck@nsf.org</a> 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig - EcoForm <a href="mailto:jgeibig@ecoform.com">jgeibig@ecoform.com</a> 
<p>Limitations:</p> <p>Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of Flooring Products using EPD information shall be based on the product's 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 this PCR. Full conformance with the PCR for Products allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.</p>	



## ENVIRONMENTAL PRODUCT DECLARATION: DETAILED VERSION

### Product Definition and Information

#### Description of Company

One of the world's leading manufacturers of fine flooring, Mannington Mills, Inc., based in Salem, New Jersey (USA), is a manufacturer of residential and commercial sheet vinyl, luxury vinyl, laminate and hardwood, as well as commercial carpet and rubber. Founded in 1915, Mannington is privately held and continues its commitment to quality, customer satisfaction and the environment. Mannington and its associates still operate under the same mission that was set forth generations ago: To Be the Best People To Do Business with in The Flooring Industry.

This study was conducted to reveal the environmental impacts of Mannington Commercial's Cirro Resilient tile product – Cirro Resilient. Mannington Mills (Mannington Commercial's parent organization) acquired Amtico International in 2012. All of Amtico's products are sold as collections under Mannington Commercial under the "Amtico" brand name. This EPD covers the manufacturing operations at the Coventry, UK location.

#### Product Classification and Description

Cirro Resilient is a design-led, high-performance thermoplastic tile collection consisting of 3 families of products – Woods, Stones and Abstracts. Totally, the families contain 20 products: 16 Woods, 2 Stones and 2 Abstracts. The only difference between the products is the print film that gives each product its distinct appearance and tile and plank sizes. Available in 2 embosses in tile/plank formats. Cirro Resilient can be used in both residential and commercial applications.

Cirro Resilient is a 2.5 mm product with a 0.55 mm wear layer and is classified as per EN ISO 10874 for use in the following areas:

1. Class 23, Heavy Domestic
2. Class 33, Heavy Commercial
3. Class 42, General Light Industrial

Results in this EPD are presented based for a particular collection of products whose formulation remains the same between products. The only difference between them is the print film that gives each product its distinct appearance (reflecting wood, stone or other surfaces for aesthetic purposes). As the thickness of the product as well as the wear layer of the resilient tile across products in the collection is the same, the formulation is based on the total raw materials purchased in the year 2017.

#### Application


Cirro products can be used in a variety of applications including commercial, light commercial, institutional, and residential interior applications for floor applications. Cirro Resilient products are recommended for use over properly prepared concrete, suspended wood, metal and other suitable substrates. Cirro Resilient products can be used with radiant heating systems, however the surface temperature of the subfloor must not exceed 27°C (81°F).

Technical Data

Table 1: Technical Details for Cirro Resilient

Parameter		Cirro Resilient	Unit	Test Method
<b>Product thickness</b>		2.5	mm	-
<b>Wear layer thickness</b>		0.55	mm	-
<b>Product weight</b>		3.126	kg/m <sup>2</sup>	-
<b>Product form</b>	Tile	457x457	mm	-
	Plank	114x915, 184x1219, 305x610	mm	-
<b>Residual Indentation</b>		Passes < 0.1778 (0.007 in)	mm	ASTM F1914
<b>Dimensional Stability</b>		Passes Max 0.00024	mm/m	ASTM F2199
<b>Flexibility</b>		Passes 1" Mandrel – No crack or break	-	ASTM F137
<b>Slip Resistance</b>		Passes ≥0.5 Leather ≥0.6 Rubber	-	ASTM C1028
<b>Chemical Resistance</b>		Passes	-	ASTM F925
<b>Smoke Density</b>		Passes ≤ 450	-	ASTM E662
<b>HUD/ FHA</b>		Passes	-	-
<b>Squareness</b>		Passes 0.254 (0.010 in) Max	mm	ASTM F540
<b>Static Load</b>		Passes 1,054,604 (1,500 PSI) Resid. Indent ≤0.005 in	kg/m <sup>2</sup>	ASTM F970 mod.
<b>Flooring Radiant Panel</b>		Passes – Class 1 ≥0.45	Watts/cm <sup>2</sup>	ASTM E648
<b>Resistance to Light</b>		Passes	-	ASTM F1515
<b>Resistance to Heat</b>		Passes	-	ASTM F1514



 Material Content

Material Content of the Product

Table 2: Material Content Table for Cirro Resilient

Material	Cirro Resilient
<b>Urethane Lacquer</b>	<0.5 %
<b>Acrylic Polymer</b>	42 %
<b>Plasticizers</b>	22 %
<b>Rubber</b>	4 %
<b>Filler</b>	30 %
<b>Stabilizers and Pigments</b>	<2.0 %

This product contains no regulated substances.

Packaging

Table 3: Packaging per m<sup>2</sup> of product

Material	Cirro Resilient	Unit
<b>Wood pallets</b>	0.142	kg
<b>Wood spacers</b>	0.012	kg
<b>Cardboard</b>	0.201	kg
<b>Plastic shrink wrap</b>	0.001	kg

Packaging waste disposal has been modeled as per guidelines in section 2.8.5 of Part A: Life Cycle Assessment Calculation Rules and Report Requirements.



Life Cycle Assessment Stages and Methodological Framework

Declaration of Methodological Framework

This EPD is considered a Cradle-to-Grave study. A summary of the life cycle stages included in this EPD is presented in Table 8. Cirro Resilient has a warranted commercial life of 10 years. Hence the Reference service life (RSL) of the product is assumed to be 10 years. No known flows are deliberately excluded from this EPD. Third party verified ISO 14040/44 secondary LCI data sets contribute more than 67% of total impacts in all impact categories required by the PCR. Infrastructure flows have been excluded.



Manufacturing Stage

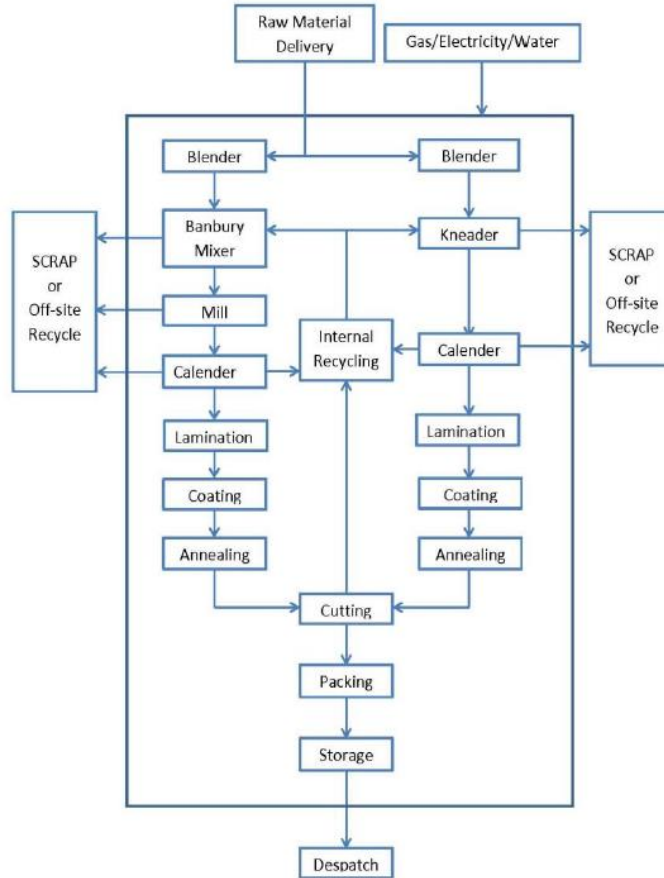


Figure 1: Cirro Production Process Flow Diagram

The manufacturing process begins with the processing of raw materials, which is a mixture composed mostly of acrylic polymer, plasticizers and fillers. The product is constructed by the thermal lamination of the wear layer, print film and backing plies. The ply raw materials are batched and blended. The ply blend is then heated and calendared on a mill to produce a ply of the required thickness. The plies required to form the end product, along with the print film, are thermally laminated together under pressure, to form the final product. The product is then coated with polyurethane (wear layer), before being cut to size, boxed and dispatched to the customer.

Any cutting waste generated during the manufacturing process is ground and returned to the mixing process in the manufacturing process.

Health, Safety, and Environmental Aspects During Production

Mannington facilities where Cirro is produced are certified:

- ISO 14001: 2015 – Environmental Management System
- OHSAS 18001: 2007
- ISO 9001: 2015 – Quality Management System

*Production Waste*

Production waste is handled as follows:

- All packaging materials (cardboard, shrink wrap, chipboard and pallets) are recycled.
- All general non-hazardous waste is sent to energy recovery.
- Any metal waste is recycled.

Delivery and Installation Stage

*Delivery*

As the product is manufactured in the UK, it is transported by truck to a port in the UK, then by ship from the UK to North America. The product is then delivered to the customer via truck depending on the location of the end-user. Transport to the installation site is assumed to be 800 km as per recommendation by the PCR (Part B) for all floor applications. This was chosen due to the unavailability of granular sales data.

*Installation*

Water based acrylic adhesive is used to install Cirro tiles onto the prepared substrate as per installation instructions. Mannington approved guidance for installation are provided online:

<https://www.manningtoncommercial.com/products/hard-surface/non-vinyl-resilient/cirro-wood/>. Cirro Resilient products should not be installed until all the subfloor preparation and the work of all other trades has been completed. Cirro Resilient should only be installed using Amtico Adhesives, all of which are certified as EC1 Plus very low emissions, as defined by the GEV EMICODE scheme. After application with adhesive and drying, the tiles are cleaned with water to remove any remaining adhesive. Additionally, a 5% installation waste is considered. Installation equipment is required though not included in the study as these are multi-use tools and the impacts per functional unit is considered negligible.

Table 4: Installation Materials

Material	Amount	Unit	Amount	Unit
<b>Adhesive</b>	0.28	kg/m <sup>2</sup>	0.63	lb/ft <sup>2</sup>
<b>Water</b>	0.02	kg/m <sup>2</sup>	0.04	lb/ft <sup>2</sup>
<b>Waste</b>	5	%	5	%

*Health, Safety, and Environmental Aspects during Installation*

The adhesives recommended for installation are very low emissions as defined by the GEV EMICODE scheme. Hence, they are no health or safety considerations during installation. The resilient tiles must be installed as per manufacturer recommended installation provided online: <https://www.manningtoncommercial.com/products/hard-surface/non-vinyl-resilient/cirro-wood/>.

*Waste*

Packaging and installation waste disposal have been modeled as per guidelines in section 2.8.5 of Part A: Life Cycle Assessment Calculation Rules and Report Requirements.



Use Stage

Cleaning and Maintenance

The level of cleaning and maintenance varies depending on the amount of floor traffic and the desired appearance of the floor that the end user is seeking. The manufacturer recommends dry cleaning with a dust mop twice a week and wet cleaning once a week. Wet cleaning involves the use of a mop water and detergent. The floors can also be cleaned using a powered cleaner during the wet cleaning cycle. The floors are also assumed to be cleaned using a powered cleaner with a rating of 1.5kW. Table 5 and Table 6 show the use phase parameters used to model maintenance scenarios.

Table 5: Use phase parameters

Use	Cleaning Process	Cleaning Frequency	Consumption of energy and resources
<b>Commercial/ Residential</b>	Dry Cleaning	104 times/ year	-
	Wet Cleaning	52 times/ year	Tap water, Detergent, Electricity

Table 6: Use phase inputs

Input	Amount	Unit
<b>Tap water</b>	3.224	l/m <sup>2</sup> /yr
<b>Detergent</b>	0.041	kg/m <sup>2</sup> /yr
<b>Electricity</b>	0.270	kWh/m <sup>2</sup> /yr

Product Reference Service Life and Building Estimated Service Life

According to Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL Environment, V3.2, 2018, the Estimated Service Life (ESL) of the building is assumed to be 75 years. As required in the PCR, the results are based on the estimated service life (ESL) of the building of 75 years. Cirro Resilient has a warranted commercial life of 10 years. Hence the Reference service life (RSL) of the product is assumed to be 10 years.

End of Life Stage

While resilient tile can be recycled or sent for energy recovery, all waste has been classified according to regional-specific legislation as laid out in Section 2.8.6 in *Part A: Life Cycle Assessment Calculation rules and Report Requirements* from UL Environment. Since resilient tile is a non-metal, all of it is landfilled at end-of-life as per the aforementioned PCR. Waste has been classified according to Resource Conservation and Recovery Act (RCRA), Subtitle 3 for North American region.







Life Cycle Assessment (LCA) Background Information

Description of the Functional Unit

The functional unit according to the PCR is 1 m<sup>2</sup> of installed flooring.

Table 7: Functional Unit

	Cirro Resilient
<b>Functional Unit [m<sup>2</sup>]</b>	1
<b>Average Weight [kg]</b>	3.126

System Boundary

This LCA is considered a Cradle-to-Grave study. A summary of the life cycle modules included in this LCA is presented in Table 8.

Table 8: Summary of Included Life Cycle Modules

Module Name	Description	Analysis Period	Summary of Included Elements
<b>A1</b>	Product Stage: Raw Material Supply	2017	Raw Material sourcing and processing as defined by secondary data.
<b>A2</b>	Product Stage: Transport	2017	Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and measured and calculated distance.
<b>A3</b>	Product Stage: Manufacturing	2017	Energy, water and material inputs required for manufacturing products from raw materials. Packaging materials and manufacturing waste are included as well.
<b>A4</b>	Construction Process Stage: Transport	2019	Shipping from manufacturing site to project site. Fuel use requirements estimated based on assumed distance recommended by the PCR (Part B).
<b>A5</b>	Construction Process Stage: Installation	2019	Installation materials, installation waste and packaging material waste.
<b>B1</b>	Use Stage: Use	2019	No inputs required for the use of the product.
<b>B2</b>	Use Stage: Maintenance	2019	Cleaning water, detergent and electricity for power cleaning.
<b>B3</b>	Use Stage: Repair	2019	Resilient tile typically is not repaired.
<b>B4</b>	Use Stage: Replacement	2019	All inputs needed to manufacture a new tile to replace the existing resilient tile at the end of its RSL.
<b>B5</b>	Use Stage: Refurbishment	2019	Resilient tile typically is not refurbished.
<b>B6</b>	Operational Energy Use	2019	Operational Energy Use of Building Integrated System During Product Use
<b>B7</b>	Operational Water Use	2019	Operational Water Use of Building Integrated System During Product Use
<b>C1</b>	EOL: Deconstruction	2019	No inputs required for deconstruction.



Module Name	Description	Analysis Period	Summary of Included Elements
C2	EOL: Transport	2019	Shipping from project site to landfill. Fuel use requirements estimated based on product weight and assumed distance recommended by the PCR (Part B).
C3	EOL: Waste Processing	2019	Waste processing not required. All waste can be processed as is.
C4	EOL: Disposal	2019	Modeled based on regional waste classification provided in the PCR (Part A).
D	Benefits beyond system	MND	Module not declared.

Estimations and Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage and production information. For the LCA, the usage information was divided by the production to create an energy and water use per square meter. Another assumption is that the installation tools are used enough times that the per square meter impacts are negligible.

Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit. No known flows are deliberately excluded from this EPD.

Data Sources

Primary data was collected by Mannington associates for onsite energy, water and waste during the course of manufacturing. Whenever available, supplier data was used for raw materials used in the production process. When primary data did not exist, secondary data for raw material production was used from GaBi Database Version 8.7, Service Pack 37. All calculation procedures adhere to ISO14044.

Data Quality

The geographical scope of the manufacturing portion of the life cycle is United Kingdom. All primary data were collected from the manufacturer. The geographic coverage of primary data is considered excellent. Primary data were provided by the manufacturer and represent all information for calendar year 2017. Primary data provided by the manufacturer is specific to the technology that the company uses in manufacturing their product. It is site-specific and considered of good quality. Data used to allocate energy and water on a per unit of product produced includes overhead energy such as lighting, heating and sanitary use of water. Sub-metering was not available to extract process only energy and water use from the total energy use. Sub-metering would improve the technological coverage of data quality.

Period under Review

The period under review is calendar year 2017.



## Allocation

General principles of allocation were based on ISO 14040/44. There are no products other than Cirro Resilient tiles that are produced as part of the manufacturing processes studied in the LCA. Since there are no co-products, no allocation based on co-products is required. To derive a per unit value for manufacturing inputs such as electricity, natural gas and water, allocation based on total production in square meters was adopted. Discussions with Mannington staff divulged this was a more representative way than via mass to allocate the manufacturing inputs based on the manufacturing processes used and the types of products created. As a default, secondary GaBi datasets use a physical mass basis for allocation. Throughout the study recycled materials were accounted for via the cut-off method. Under this method, impacts and benefits associated with the previous life of a raw material from recycled stock are excluded from the system boundary. Additionally, impacts and benefits associated with secondary functions of materials at end of life are also excluded (i.e. production into a third life or energy generation from the incineration plant). The study does include the impacts associated with reprocessing and preparation of recycled materials that are part of the bill of materials of the products under study.

## Comparability and Benchmarking

The user of the EPD should take care when comparing EPDs from different companies. Assumptions, data sources, and assessment tools may all impact the variability of the final results and make comparisons misleading. Without understanding the specific variability, the user is therefore, not encouraged to compare EPDs. Even for similar products, differences in use and end-of-life stage assumptions, and data quality may produce incomparable results. Comparison of the environmental performance of Flooring Products using EPD information shall be based on the product's 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 this PCR. Full conformance with the PCR for flooring products allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.



Life Cycle Assessment Scenarios

Table 9: Transport to building site (A4)

Name	Truck (UK)	Ship (UK to US)	Truck (US)	Unit
<b>Fuel type</b>	Diesel	Heavy fuel oil	Diesel	-
<b>Liters of fuel</b>	39.06	10,320.06	39.06	l/100km
<b>Vehicle type</b>	Cargo Lorry	Container ship, ocean going	Truck-trailer, basic, enclosed	-
<b>Transport distance</b>	150	5698.60	800	km
<b>Capacity utilization</b>	85	48	78	%
<b>Weight of products transported</b>	23,000	20,640,000	14,741.7	kg
<b>Capacity utilization volume factor</b>	1	1	1	-

Table 10: Reference Service Life

Name	Value	Unit
<b>RSL</b>	10	years
<b>Declared product properties (at the gate) and finishes, etc.</b>	See Table 1	-
<b>Design application</b>	Installation per recommendation by manufacturer	-
<b>An assumed quality of work, when installed in accordance with the manufacturer’s instructions</b>	Accepted industry standard	-
<b>Indoor environment (if relevant for indoor applications)</b>	Normal building operating conditions	-
<b>Use conditions, e.g. frequency of use, mechanical exposure</b>	Normal building operating conditions	-

Table 11: Installation into the building (A5)

Name	Value	Unit
<b>Net freshwater consumption specified by water source and fate</b>	0.00002 m <sup>3</sup> tap water	m <sup>3</sup>
<b>Adhesive</b>	0.288	kg/m <sup>2</sup>
<b>Waste materials at the construction site before waste processing, generated by product installation</b>	0.512	kg/m <sup>2</sup>
<b>Packaging waste, cardboard</b>	0.201	kg/m <sup>2</sup>
<b>Packaging waste, plastic film</b>	0.001	kg/m <sup>2</sup>



Packaging waste, pallets and spacers	0.154	kg/m <sup>2</sup>
Biogenic carbon contained in packaging	1.281	kg CO <sub>2</sub>
Direct emissions to ambient air, soil and water	N/A	kg
VOC emissions	N/A	µg/m <sup>3</sup>

Table 12: Replacement (B4) - Per ESL

Name	Value	Unit
Reference Service Life	10	Years
Replacement cycle	7	(ESL/RSL)-1
Net freshwater consumption specified by water source and fate	0.0015 m <sup>3</sup> tap water	m <sup>3</sup>
Adhesive	21.6	kg/m <sup>2</sup>
Direct emissions to ambient air, soil and water	N/A	kg

Table 13: Maintenance (B2)

Name	Value	Unit
Maintenance process information	Use phase parameters as recommended by manufacturer	
Dry cleaning	1,040	Cycles/ RSL
	7,800	Cycles/ ESL
Wet cleaning	520	Cycles/ RSL
	3,900	Cycles/ ESL
Net freshwater consumption specified by water source and fate	0.00006 m <sup>3</sup> tap water, evaporated	m <sup>3</sup> / cycle
Detergent (25% active)	0.0008	kg/m <sup>2</sup> /cycle
Electricity for power cleaning	0.0052	kWh/m <sup>2</sup> /cycle
Further assumptions for scenario development	Floor cleaned with dust mop twice a week and with damp mop once a week with powered cleaning for 52 weeks in a year	



Table 14: End of life (C1-C4)

Name		Value	Unit
<b>Assumptions for scenario development</b>		Product is either disposed of with the underlying floor or manually removed via scraping	
<b>Collection process</b>	<b>Collected separately</b>	0	kg
	<b>Collected with mixed construction waste</b>	3.41	kg
<b>Recovery</b>	<b>Reuse</b>	0	kg
	<b>Recycling</b>	0	kg
	<b>Landfill</b>	3.41	kg
	<b>Incineration</b>	0	kg
	<b>Incineration with energy recovery</b>	0	kg
	<b>Energy conversion efficiency rate</b>	84-94	%
<b>Disposal</b>	<b>Product or material for final deposition</b>	3.41	kg
<b>Removals of biogenic carbon (excluding packaging)</b>		0.348	kg CO <sub>2</sub>





Life Cycle Assessment Results

All results are given per functional unit, which is 1 m<sup>2</sup> of installed flooring over an estimated building life of 75 years. Environmental Impacts were calculated using the GaBi software platform. Impact results have been calculated using both TRACI 2.1 and CML 2001-Jan 2016 characterization factors. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development, however the EPD users shall not use additional measures for comparative purposes.

Table 15: Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE						END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY	
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
Cradle to Grave	X			X	X	X	X	X	X	X	X	X	X	X	X	X	MND

Table 16: Biogenic Carbon Uptake and Emissions

Parameter	Parameter	Circo Resilient	Unit
<b>BCRP</b>	Biogenic Carbon Removal from Product	0.154	kg CO <sub>2</sub>
<b>BCEP</b>	Biogenic Carbon Emission from Product	0.133	kg CO <sub>2</sub>
<b>BCRK</b>	Biogenic Carbon Removal from Packaging	1.01	kg CO <sub>2</sub>
<b>BCEK</b>	Biogenic Carbon Emission from Packaging	0.466	kg CO <sub>2</sub>



# ENVIRONMENTAL PRODUCT DECLARATION

See Impact Category Key below for definition of acronyms.

Table 17: Acronym Key

Acronym	Text	Acronym	Text
<b>ADP-elements</b>	Abiotic depletion potential for non-fossil resources	<b>GWP</b>	Global warming potential
<b>ADP-fossil</b>	Abiotic depletion potential for fossil resources	<b>OPD</b>	Depletion of stratospheric ozone layer
<b>AP</b>	Acidification potential of soil and water	<b>POCP</b>	Photochemical ozone creation potential
<b>EP</b>	Eutrophication potential	<b>Resources</b>	Depletion of non-renewable fossil fuels
<b>RPR<sub>E</sub></b>	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	<b>SM</b>	Use of secondary materials
<b>RPR<sub>M</sub></b>	Use of renewable primary energy resources used as raw materials	<b>RSF</b>	Use of renewable secondary fuels
<b>NRPR<sub>E</sub></b>	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	<b>NRSF</b>	Use of non-renewable secondary fuels
<b>NRPR<sub>M</sub></b>	Use of non-renewable primary energy resources used as raw materials	<b>FW</b>	Net use of fresh water
<b>HWD</b>	Disposed-of-hazardous waste	<b>MR</b>	Materials for recycling
<b>NHWD</b>	Disposed-of non-hazardous waste	<b>MER</b>	Materials for energy recovery
<b>HLRW</b>	High-level radioactive waste, conditioned, to final repository	<b>EE</b>	Exported energy
<b>ILLRW</b>	Intermediate- and low-level radioactive waste, conditioned, to final repository	<b>CRU</b>	Components for reuse
<b>RE</b>	Recovered energy		





# ENVIRONMENTAL PRODUCT DECLARATION



## Cirro Resilient

All results are given per functional unit, which is 1 m<sup>2</sup> of installed flooring over 75 years of estimated building life.

Table 18: CML Results

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADP-elements [kg Sb eq]	1.88E-05	4.29E-08	1.13E-06	0.00E+00	6.42E-06	0.00E+00	1.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.81E-09	0.00E+00	6.20E-08	MND
ADP-fossil fuel [MJ]	2.21E+02	6.51E+00	2.88E+01	0.00E+00	2.22E+02	0.00E+00	1.69E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.78E-01	0.00E+00	2.34E+00	MND
AP [kg SO <sub>2</sub> eq]	3.08E-02	9.25E-03	5.74E-03	0.00E+00	4.05E-02	0.00E+00	3.02E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.66E-05	0.00E+00	6.33E-04	MND
EP [kg Phosphate eq]	3.27E-03	1.13E-03	6.63E-04	0.00E+00	4.26E-03	0.00E+00	3.36E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E-05	0.00E+00	8.32E-05	MND
GWP [kg CO <sub>2</sub> eq]	1.04E+01	4.96E-01	1.47E+00	0.00E+00	1.53E+01	0.00E+00	8.16E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.10E-02	0.00E+00	1.51E-01	MND
ODP [kg CFC 11 eq]	1.67E-08	5.87E-17	8.35E-10	0.00E+00	4.19E-14	0.00E+00	1.14E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E-18	0.00E+00	5.47E-16	MND
POCP [kg Ethene eq]	2.44E-03	1.06E-04	4.75E-04	0.00E+00	3.58E-03	0.00E+00	1.98E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.29E-05	0.00E+00	5.36E-05	MND

Table 19: TRACI Results

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
AP [kg SO <sub>2</sub> eq]	3.15E-02	1.01E-02	6.75E-03	0.00E+00	3.95E-02	0.00E+00	3.20E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-04	0.00E+00	6.88E-04	MND
EP [kg N eq]	2.39E-03	4.00E-04	4.55E-04	0.00E+00	4.68E-03	0.00E+00	2.14E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-05	0.00E+00	3.51E-05	MND
GWP [kg CO <sub>2</sub> eq]	1.03E+01	4.95E-01	1.44E+00	0.00E+00	1.52E+01	0.00E+00	8.08E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E-02	0.00E+00	1.50E-01	MND
ODP [kg CFC 11 eq]	1.82E-08	-1.74E-15	9.10E-10	0.00E+00	-1.15E-12	0.00E+00	1.24E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.20E-16	0.00E+00	-7.87E-15	MND
Resources [MJ]	2.86E+01	9.07E-01	3.84E+00	0.00E+00	2.17E+01	0.00E+00	2.19E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-02	0.00E+00	3.01E-01	MND
POCP [kg O <sub>3</sub> eq]	4.12E-01	1.98E-01	5.72E-02	0.00E+00	3.86E-01	0.00E+00	4.45E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E-03	0.00E+00	1.38E-02	MND

Table 20: Resource Use Results

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPR <sub>E</sub> [MJ]	2.67E+01	1.09E-01	2.35E+00	0.00E+00	2.75E+01	0.00E+00	1.91E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-02	0.00E+00	1.83E-01	MND
RPR <sub>M</sub> [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPR <sub>E</sub> [MJ]	2.67E+01	1.09E-01	2.35E+00	0.00E+00	2.75E+01	0.00E+00	1.91E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-02	0.00E+00	1.83E-01	MND
NRPR <sub>M</sub> [MJ]	2.35E+02	6.54E+00	3.04E+01	0.00E+00	2.66E+02	0.00E+00	1.79E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.81E-01	0.00E+00	2.39E+00	MND
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	2.35E+02	6.54E+00	3.04E+01	0.00E+00	2.66E+02	0.00E+00	1.79E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.81E-01	0.00E+00	2.39E+00	MND
NRSF [MJ]	4.53E-01	0.00E+00	2.27E-02	0.00E+00	0.00E+00	0.00E+00	3.09E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m <sup>3</sup> ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND



Table 21: Output Flows and Waste Results

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	5.13E-05	2.53E-08	2.57E-06	0.00E+00	1.15E-07	0.00E+00	3.50E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.71E-09	0.00E+00	8.39E-09	MND
NHWD [kg]	3.45E-01	1.43E-04	3.77E-01	0.00E+00	3.30E-01	0.00E+00	2.69E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.19E-05	0.00E+00	3.42E+00	MND
HLRW [kg]	6.96E-06	1.34E-08	9.19E-07	0.00E+00	2.06E-05	0.00E+00	5.15E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-09	0.00E+00	2.91E-08	MND
ILLRW [kg]	5.46E-03	1.07E-05	6.47E-04	0.00E+00	1.72E-02	0.00E+00	3.99E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-06	0.00E+00	2.32E-05	MND
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MR [kg]	0.00E+00	0.00E+00	1.06E-01	0.00E+00	0.00E+00	0.00E+00	6.89E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MER [kg]	0.00E+00	0.00E+00	1.70E-04	0.00E+00	0.00E+00	0.00E+00	1.11E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EE [MJ]	1.43E-01	0.00E+00	7.69E-03	0.00E+00	0.00E+00	0.00E+00	9.79E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

Life Cycle Assessment Interpretation

Overall for Mannington’s Cirro Resilient tile products, Global Warming (GWP), Abiotic Depletion of fossil fuels (ADP-fossil) and Acidification Potential (AP) are the impact categories of most significance. Within these impact categories, the vast majority of impacts are aggregated in the B4 module of the assessment. This represents the impacts from replacement of the product over 75 years. Apart from B4, B2 module of the life cycle of the product has the largest impact. Module B2 represents the maintenance phase. The third largest life cycle stage is A1-A3 in terms of global warming impacts which includes raw material sourcing, transportation and manufacturing.

Apart from replacement, in the maintenance phase, electricity used for powered cleaning the wet cleaning maintenance cycle has the highest impacts (43.4%). This is followed by detergent (11.3%) used to clean the tiles. One must remember while analyzing these results that these impacts are for the entire service life of the building which is 75 years.

For Cirro Resilient tiles, apart from replacement, in the sourcing and extraction stage, the largest contributors to the impacts in terms of raw materials are acrylic co-polymer (Poly methyl methacrylate) (30.2%), Isodecyl diphenyl phosphate (31.9%) and acrylic processing aid (9.4%). Within manufacturing, electricity contributes to 6.2% of overall GWP impacts while thermal energy from natural gas contributes to 2.3%.

Shipping to customer contributes around 1.8% of total GWP impacts, while, adhesive used during installation contributes around 2.4% of GWP impacts. Finally, disposal of the product to landfill contributes 0.7% to total GWP impacts.

Additional Environmental Information

*Extraordinary Effects*

*Fire*

Fire testing and performance results are mentioned in Table 1.

*Water*

Any excess water from flooding must be removed and tile should be dried as soon as possible.

Mechanical Destruction



Any damaged tiles must be removed and replaced by a qualified contractor.

### *Additional Information*

#### *Product Brochures*

<https://www.manningtoncommercial.com/products/collections/cirro/>



### References

1. Product Category Rule (PCR) for Building-Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL 10010. Version 3.2, December 12, 2018.
2. Part B: Flooring EPD Requirements. IBU. Version 2.0, September 2018.
3. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
4. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
5. ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
6. European Standard DIN EN 15804: 2012.04+A1 2013. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products (includes Amendment A1:2013)