Homogeneous Sheet Flooring

Medintech® with Diamond 10® Technology
Medintone™ with Diamond 10® Technology
Accolade™ Plus
Safety Zone™ Sheet

ACCORDING TO EN 15804, ISO 14025 AND ISO 21930

ArmstrongFlooring

150+ Years of Excellence

Our founder, Thomas Armstrong, pioneered the principle "Let the buyer have faith," standing behind his products and giving customers confidence in their purchase. More than a century later, that philosophy is alive and well in Armstrong Flooring.

We are committed to delivering solutions that reduce the environmental impact of the buildings you create. From product design and raw material selection, to production and delivery, we work to demonstrate continuous improvement to remain as strong and vital as our 150-year heritage.

Homogeneous Sheet Flooring has a uniform structure and composition throughout the entire thickness of the floor, creating a true through-pattern construction. In aseptic spaces that require infection control protocols, heat welding and flash coving is recommended. Diamond 10® Technology, available on Medintech™ and Medintone™, provides an enhanced level of performance, standing up to commercial demands such as heavy traffic and staining to keep floors beautiful for years to come.

Lifecyle Impact Categories

Cradle to grave environmental impacts for 1 m^2 of Homogeneous Sheet Flooring with Diamond 10® Technology flooring assuming a 1-year service life.

Primary Energy
121.92 MJ

Eutrophication Potential
3.50E-03 kg $(PO_4)^{3-}$-eq.

Global Warming Potential
12.38 kg CO^2-eq.
(Embodied Carbon,
A1-A3 = 0.80 kg CO_2e/ft^2)

Ozone Depletion Potential
2.07E-09 kg R11-eq.

Acidification Potential
0.05 kg SO^2-eq.

Photochem Ozone Creation Potential
0.85 kg O^3-eq.

Flooring Components:

Limestone Flour, Polyvinyl chloride (PVC), Dioctyl Terephthalate (DOTP), Blended Dibenzoates, Recycled Material, Acrylate, Pigments

Walk On. Walk Strong.

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This document is a Type III Environmental Product Declaration by Armstrong Flooring, Inc. that is certified by ASTM as conforming to the requirements of ISO 14025, EN 15804 and ISO 21930 ASTM has assessed that the Life Cycle Assessment (LCA) information fulfills the requirements of ISO 14040 in accordance with the instructions listed in the product category rules cited below. The intent of this document is to further the development of environmentally compatible and sustainable construction methods by providing comprehensive environmental information related to potential impacts in accordance with international standards.

Declaration Number	EPD-0005
Program Operator	ASTM International - 100 Barr Harbor Drive, West Conshohocken, PA, 19428, USA www.astm.org
Manufacturer	Armstrong Flooring, Inc.- 2500 Columbia Avenue, Lancaster, PA 17603
Declared Product & Functional Unit	Homogeneous Sheet Flooring , 1 m^2
Reference PCR	Part A: PCR for building-related products, 2018 Part B: Flooring EPD Requirements [UL Environment], v2.0 September, 2018
Product Application	Floor covering choice in commercial spaces: • Healthcare • Education • Retail • Hospitality • Office
Product Reference Service Life	35 Years
Markets of Applicability	Australia, Asia, North America
Date of Issue	August 31, 2020
Date of Validity	5 Years
EPD Type	Product Specific
EPD Scope	Cradle to Grave
Year of Primary Data	2017-2018
LCA Software & Version	GaBi v8.7.1.30
LCI Database(s) & Version	GaBi 2017
LCIA Method	TRACI 2.1

Verification and Authorization of the Declaration

This declaration and the rules on which this EPD is based have been examined by an independent external verifier in accordance with ISO 14025 and ISO 21930.

This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:

X		X	
Tim Brooke Vice President, Certification	**Date** **August 31, 2020**	Tom Gloria External Verifier	**Date** **August 31, 2020**

ASTM certification of this EPD is not to be construed as representing aesthetics or any other attributes not specifically addressed, nor should it be construed as an ASTM endorsement of the subject of the EPD or a recommendation for its use. There is no warranty by ASTM, express or implied, as to any finding or other matter in the EPD, or as to any product covered by the EPD. The EPD holder is liable for the information and evidence on which the EPD is based.

2.0 Product Introduction

2.1 Company Description

Armstrong Flooring, Inc. (NYSE: AFI) is a global leader in the design and manufacture of innovative flooring solutions that inspire beauty wherever your life happens. Headquartered in Lancaster, Pennsylvania, Armstrong Flooring is a leading manufacturer of resilient products across North America. The company safely and responsibly operates 8 manufacturing facilities globally, working to provide the highest levels of service, quality and innovation to ensure it remains as strong and vital as its 150-year heritage. Learn more ArmstrongFlooring.com.

2.2 Product Description

Homogeneous Sheet Flooring has a uniform structure and composition throughout the entire thickness of the floor, creating a true through-pattern construction. In aseptic spaces that require infection control protocols, heat welding and flash coving is recommended. Diamond 10® Technology, available on Medintech™ and Medintone™, provides an enhanced level of performance, standing up to commercial demands such as heavy traffic and staining to keep floors beautiful for years to come. Accolade Plus and Safety Zone Sheet homogeneous sheet are produced in Australia. Both feature a durable homogeneous construction for excellent indentation and gouge resistance and have a low-maintenance polyurethane coating.

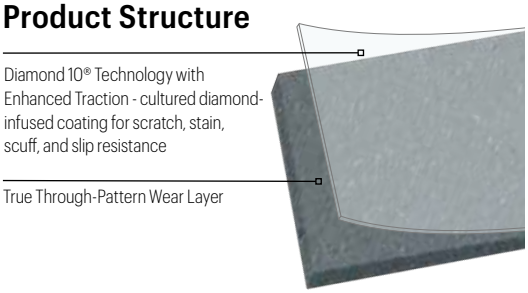
2.2.1 Brands

Medintech® with Diamond 10® Technology, Medintone™ with Diamond 10® Technology
Accolade™ Plus, Safety Zone™ Sheet

2.2.2 Specifications

Homogeneous Sheet Flooring meets or exceeds the performance requirements of ASTM F1303, Standard Specification for Vinyl Sheet Floor Covering With Backing and ISO 10582, Type I,
Resilient floor coverings—Homogeneous polyvinyl chloride floor covering.

Figure 1. Example product structure for Medintech® with Diamond 10® Technology



2.2.3 Product Specific EPD

This EPD Is intended to represent product specific life cycle assessment results for the Armstrong Flooring brands in Section 2.2.1.

2.3 Application

Homogeneous Sheet Flooring is a widely used commercial resilient flooring option and is routinely used with great success in healthcare and education segments. Properly installed and maintained, homogeneous sheet provides decades of proven performance across all commercial segments.

2.4 Declaration of Methodological Framework

The Life Cycle Assessment (LCA) was performed according to ISO 14040 and followed the PCR instructions. The cradle-to-grave LCA encompasses all relevant life cycle stages and modules including raw material production; transport of raw materials to the production facility; manufacturing of flooring; packaging; transportation to job site; use phase; and end of life including disposal or recycling. Detailed information regarding cut-off and allocation procedures are in sections 2.5 and 2.9.

2.5 Technical Data

Table 1: Homogeneous Sheet Technical Data

Table 1 below represents all products presented in this EPD. To determine the average weight, the mass of each Homogeneous Sheet was used proportionally to determine the overall average value in the chart.

Armstrong Homogeneous Sheet		Average Value	Unit	Min. Value	Max. Value
Product Thickness		3.2 (0.125″)	mm (in.)	–	–
Wear Layer Thickness		3.2 (0.125″)	mm (in.)	–	–
Product Weight		7030	g/m²	–	–
Product Form	Sheet	–	–	20 m	30m

2.6 Market Placement / Application Rules

All Armstrong Homogeneous Sheet Flooring meets or exceeds the performance requirements of ASTM F1913, Standard Specification for Vinyl Sheet Floor Covering Without Backing and ISO 10581, Type II, Resilient floor coverings — Homogeneous Sheet Flooring polyvinyl chloride. It meets the below performance requirements for the following test methods:

Performance	Test Method	Requirement	Performance vs. Requirement
Total Thickness	ASTM F 386	≥ 0.075 in.	Meets
Residual Indentation	ASTM F 1914	≤ 0.007 in.	Meets
Static Load Resistance @ 250 psi	ASTM F 970	≤ 0.005 in.	Meets
Flexibility	ASTM F 137	1 ½ inch mandrel no cracks or breaks in wear surface	Meets
Resistance to Chemicals	ASTM F 925	No more than slight change in surface dulling, attack or staining	Meets
Resistance to Heat	ASTM F 1514	ΔE ≤ 8	Meets
Resistance Light	ASTM F 1515	ΔE ≤ 8	Meets
Additional Testing			
Fire Test Data – Flame Spread	ASTM E 648	0.45 W/cm2 or more - Class I	Meets
Fire Test Data – Smoke Evolution	ASTM E 662	450 or less	Meets
Fire Test Data – Canada	CAN\ULC S-102.2	Use dependent	Flame Spread - 15 Smoke Developed - 90
Static Load Resistance	ASTM F970*	≤ 0.005 in.	2000 psi
Wear Group Classification per EN649-volume loss	EN660-2	–	Wear Group T ≤ 2.0 mm3
Bacteria Resistance	ISO 846: Part C	–	No Observed Growth
Ramp Test	DIN 51130	–	R10
ADA Standards for Accessible Design	Chapter 3 Section 302.1	Floor surfaces shall be stable, firm and slip-resistant	Meets
Antistatic Properties	EN 1815	≤ 2.0 kV	Meets (antistatic)
Static Coefficient of Friction**	ASTM D2047/UL 410	≥ 0.5	Meets

*Testing at loads above 250 psi is outside the scope of the test method. Since testing is conducted on uninstalled flooring, results do not consider the performance of the adhesive, underlayment, or subfloor. These test results are not an indicator of the installed flooring system performance.
**Using the James Machine as described in D2047 and as directed in UL 410 for floor covering materials (FCM) using a leather foot under dry conditions. The application of site-applied floor sealers, polishes and other types of finishes routinel used to maintain resilient flooring materials will change the walking surface and consequently the SCOF value.

2.7 Material Composition

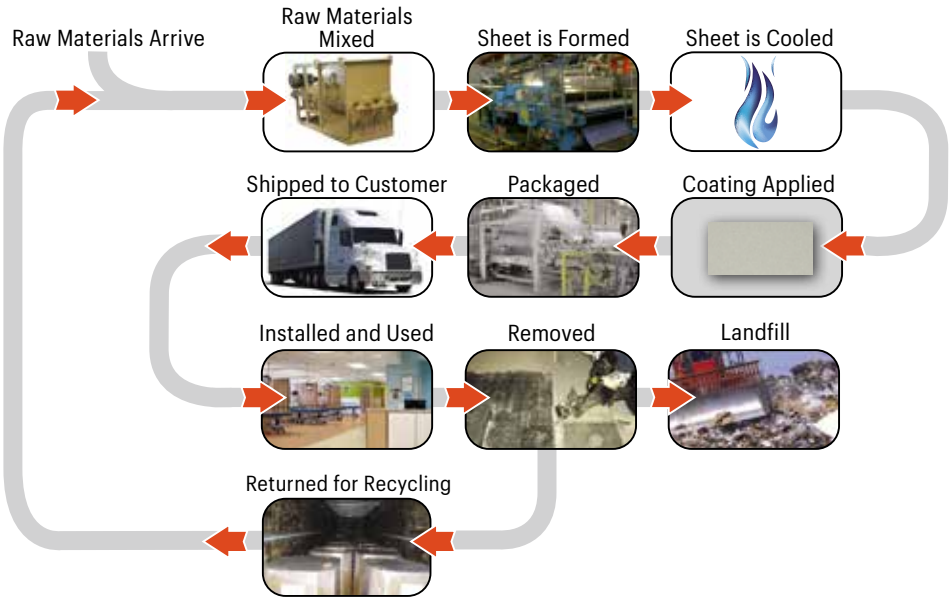
Table 3: Material Composition for Homogeneous Sheet

Material Content	Function	Casrn	Quantity (% by weight)		Availability	
			Homogeneous	Homogeneous with Diamond 10® Technology		
Limestone Flour	Filler	1317-65-3	40-45%	40-45%	Abundant Mineral	Non-Renewable
Polyvinyl chloride (PVC)	Binder/Film	9002-86-2 9003-22-9	35-40%	35-40%	Fossil Limited	Non-Renewable
Dioctyl Terephthalate (DOTP)	Plasticizer	6422-86-2	10-15%	10-15%	Fossil Limited	Non-Renewable
Blended Dibenzoates	Plasticizer	120-55-8 19224-26-1 21738-31-4	1-2%	1-2%	Fossil Limited	Non-Renewable
Recycled Material	Binder	N/A	0.1-1%	0%	Fossil Limited	Non-Renewable
Acrylate	Coating	52408-84-1	0.1-1%	0.1-1%	Fossil Limited	Non-Renewable
Pigments	Titanium Dioxide	13463-67-7	1-3%	1-3%	Abundant Mineral	Non-Renewable
	Colored Pigment	Various	0.1-1%	0.1-1%		

2.8 Manufacturing

Homogenous Sheet Vinyl is primarily used in commercial flooring applications and is comprised mostly of limestone in a vinyl binder matrix. The manufacturing process involves the hot mixing of the raw materials milled and calendared into a hot sheet that is then cooled and packaged for shipment. The sheets have a factory applied coating that provides for low maintenance which can provide lower cost of ownership and lower life-cycle cost assessments. After packaging, the Homogeneous Sheet rolls are shipped and installed.

Figure 2: Process for Armstrong Flooring Homogeneous Sheet



2.9 Packaging

Armstrong Flooring Homogeneous Sheet Flooring is rolled and wrapped in craft paper and stored horizontally in re-usable shipping containers. All packaging can be recycled, however, the life cycle assessment model assumed all packaging was landfilled.

2.10 Installation

Armstrong Flooring Homogeneous Sheet Flooring must be installed in strict accordance with the Armstrong Flooring Guaranteed Installation Systems manual, F-5061. This comprehensive guide to Armstrong flooring installation provides all the information needed to properly install Armstrong Homogeneous Sheet Flooring to ensure it will look great and perform exactly as it should. Visit armstrongflooring.com/commercial for more information.

2.11 Use Conditions

Recommended maintenance practices are provided in the installation guide and are required as part of the warranty. Warranty details can be found at armstrongflooring.com/commercial. For Homogeneous Sheet Flooring, the recommended maintenance is representative of medium intensity maintenance, as shown in Table 5 and Figure 3. Because maintenance procedures often vary depending on the building owner's maintenance practices, level of use, and traffic conditions, Table 5 provides low, medium and high maintenance scenarios. The normalized environmental impacts associated with these hypothetical scenarios are shown in Figure 3. The low intensity maintenance scenario results in lower environmental impacts. For example, less scrubbing means less water consumption and a lower eutrophication potential.

2.12 Reference Service Life & Estimated Building Service Life

Per the PCR, this product has a 30 year reference service life and is intended for a building with a 75-year estimated service life.

2.13 Reuse, Recycling & Energy Recovery

Armstrong Flooring Homogeneous Sheet Flooring can be recycled through the On&On® Recycling Program provided it meet program requirements. See www.armstrongflooring.com/reclaim

2.14 Disposal

At the end of life, this product is assumed to be disposed per PCR requirements (UL, 2018) as shown in Table 4. Waste classification is based on the Resource Conservation and Recovery Act. Disposal in municipal landfill or commercial incineration facilities is permissible and should be done in accordance with local, state, and federal regulations.

Table 4: End of Life Assumptions

Component	Recycled	Landfilled	Incinerated
Product	0%	100%	0%
Paper Packaging	75%	20%	5%

2.15 Further Information

Please visit www.armstrongflooring.com/commercial for additional information regarding Armstrong Flooring Homogeneous Sheet flooring products.

3.1 Functional Unit

The functional unit for this EPD is 1 m^2 of 2.0 mm Homogeneous Sheet Flooring for use over 1 year. Flooring System View: In order to understand the complete view of a flooring system, life cycle information is included for the total flooring system based on 1 square meter (m^2) view. This includes the flooring, adhesives and finishes applied during the use stage.

3.2 System Boundaries

The system boundaries studied as part of this life cycle assessment include the following stages which are shown in Table 4:

Production stage – Modules A1 to A3 which include the extraction manufacture and transportation of raw materials, flooring production.

Construction Stage – Modules A4-A5 which include the transportation to job site and installation.

Use Stage – Includes on Modules B2 (Use) and B4 (Replacement) as the other modules B1, B3 and B5-B7 are declared as having zero impact as no repair or refurbishment is expected once the product is installed. The use stage accounts for cleaning of the floor.

End-of-Life – Modules C1-C4 which includes disposal.

Each module includes provisions of all relevant materials, products and energy. Potential impacts and waste are consider in the module in which they occur. Per the PCR, capital goods and infrastructure flows are assumed to not significantly affect LCA results or conclusions and thus are excluded from the analysis.

Table 5: Construction Works Assessment Information

Production Stage			**Construction Stage**		**Use Stage B1 and B3-B7 are Declared as Having Zero Impact as no Repair or Refurbishment is Expected Once the Product is Installed. The Use Stage Accounts for Cleaning of the Floor.**							**End-Of-Life Stage**			
Extraction & Upstream Production A1	Transport to Factory A2	Manufacturing A3	Transport to Site A4	Installation A5	Use B1	Maintenance B2	Repair B3	Replacement B4	Refurbishment B5	Operational Energy Use B6	Operational Water Use B7	De-construction / Demolition C1	Transport to waste processing or Disposal C2	Waste Processing C3	Disposal C4
X	X	X	X	X		X		X				X	X	X	X

3.3 Product for Use Phase (Module B1-B7)

For this study, it was assumed that Homogeneous Sheet Flooring would last 35 years and therefore would need to be replaced 1.14 times over the building's useful life if properly installed and maintained. The useful life indicated in the PCR for flooring is 75 years. Recommended maintenance practices are provided in the Armstrong® Installation Guide and required as part of the warranty. For Homogeneous Sheet Flooring, the recommended maintenance is representative of medium intensity maintenance, as shown in Table 5 and Figure 3. Because maintenance procedures often vary depending on the building owner's maintenance practices, level of use, and traffic conditions, Table 5 provides low, medium and high maintenance scenarios. The normalized environmental impacts associated with these hypothetical scenarios are shown in Figure 3. The low intensity maintenance scenario results in lower environmental impacts. For example, less scrubbing means less water consumption and a lower eutrophication potential.

Table 6: Estimated Maintenance Intensity & Assumptions

Maintenance Schedule	Number of Times Performed in 1 Year (365 Days)			Additional Resource Consumption
	Low	Medium	High	
Sweep /Dry Mop	260	260	260	None
Damp Mop	26	52	104	Water, pre-diluted cleaner
Scrubbing/Spray Buff	6	12	24	Floor finish, electricity

3.4 Units

The PCR require SI units for all LCA results.

3.5 Estimations and Assumptions

Transportation

Per the PCR (UL, 2018) a distance of 800 km (497 miles) by diesel-powered truck is used to represent the distribution of product to the installation site. For products manufactured outside of the United States, inbound transportation by cargo ship is also included. Additionally, transportation is assumed to be 161 km (100 miles) by diesel-powered truck for the following:

- Product to Building site
- Installation waste to disposal
- Deconstructed product to end of life destination

3.6 Cut-off Rules

Cut-off rules are consistent with PCR (UL, 2018). No known flows were deliberately excluded.

3.7 Data Sources

All gate-to-gate, primary foreground data was collected for the flooring manufacturing process. This foreground data was from annual production for the year of 2017. Relevant background data was taken from the database provided in the GaBi 8.7.1.30 software system for life cycle engineering. No data set was over 10 years old. The GaBi database provides the life cycle inventory data for the raw and process materials obtained from the background system.

3.8 Data Quality

A variety of tests and checks were performed throughout the project to ensure high quality of the completed LCA. Checks included data verification and triangulation against several sources including published LCA studies. Overall, the data quality is considered to be good to high quality.

Temporal: All of the primary data is taken from 12 months of continuous operation in the 2017 calendar year. All secondary data were obtained from the GaBi 2018 databases.

Geographical: All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used. Geographical representativeness is considered to be high.

Technological: All primary and secondary data were modeled to be specific to the technologies or technology mixes under study Where technology-specific data were unavailable, proxy data were used. Technological representativeness is considered to be high.

3.9 Period under review

Primary data was collected during 2018. This analysis is intended to represent production in 2017.

3.10 Allocation

No co-product or multi-input process allocation occurs in the product system. For reuse, recycling, and recovery allocation, the cut-off allocation approach is adopted in the case of any recycled content, which is assumed to enter the system burden-free. Only environmental impacts from the point of recovery and forward (e.g., collection, sorting, processing, etc.) are considered. With the exception of bio-based packaging waste, product and packaging waste is modeled as being disposed in a landfill rather than incinerated or recycled. Plastic and other construction waste is assumed to be inert in landfills so no system expansion or allocation is necessary as landfill gas is not produced. In the case of biobased packaging waste disposed during installation, landfill gas from the decomposition of this waste is assumed to be collected and used to produce electricity. It is assumed that this recovered energy offsets energy produced by the U.S. average grid.

3.11 Comparability and Benchmarking

This EPD compares Accolade™ Plus and Safety Zone Sheet – which have urethane coatings and Medintech® and Medintone™ with Diamond 10® Technology. These results are comparable and acceptable according to the PCR and ISO standards, because background datasets, modeling assumptions, and time periods are the same.

Life Cycle Assessment Scenarios

The following information is required by the PCR to be documented.

Table 7: Transportation to the Building Site (A4)

Name	Value	Unit
Fuel Type	Diesel	–
Liters of Fuel	35	L/100km
Vehicle Type	Truck (trailer)	–
Transportation Distance	800	km
Capacity Utilization (including Empty Runs, Mass Based)	78	%
Gross Density of Products Transported	2.1	kg/m^2
Capacity Utilization Volume Factor	1	–

Table 8: Installation into the building (A5)

Name	Value	Unit
Ancillary Materials	0.37	kg
Electricity Consumption	0.02	MJ
Waste Materials at the Construction Site	0.26	kg

Table 9: Reference Service Life

Name	Value	Unit
Reference Service Life	35	years

Table 10: Maintenance (B2)

Name	Value	Unit
Maintenance Process Information (Cite Source)	AFI Maintenance Guide	
Maintenance Cycle (Reference Service Life)	1560 (weekly)	Cycles/RSL
Maintenance Cycle (Estimated Service Life)	3,900 (weekly)	Cycles/ESL
Net Freshwater Consumption: Municipal Water to POTW	0.11	kg/ESL
Ancillary Materials (Pre-diluted Cleaner)	306.7	L/ESL
Energy Input for Spray Buffing	5.67	kWh/ESL

Table 11: Replacement (B4)

Name	Value	Unit
Reference Service Life	75	Years
Replacement Cycle	1.5	–
Ancillary Materials (Adhesive)	0.56	kg
Electricity Consumption	0.03	MJ
Waste Materials at the Construction Site	0.39	kg

Table 12: End of Life (C1-C4)

Name	Description	Value	Unit
Collection Process	Collect Separately	3.3	kg
Disposal	Product or Materials for Final Desposition	3.3	kg

4.0 Life Cycle Assessment Results

The results in this EPD represent product specific results for one square meter of Armstrong Flooring products. Caution should be used when trying to compare the results presented in this EPD to other products. Transport to Site (A4) results below reflect transport for products sold in North America (NA), Asia, and Australia.

4.1 Life Cycle Assessment Impact Results

Results for the life cycle assessment are presented in the tables below. The Product Category Rules for Flooring require impacts be calculated for a building life of 75 years. This means that during a 75 year time frame, the floor is manufactured, installed, maintained, and replaced multiple times depending upon the floor's reference service life. The estimated reference service life for Homogeneous Sheet is provided in Table 9. The total 75-year impacts are calculated by adding the values from all of the modules plus 74 times the impact in module B2. Additional, impacts for a 1-year service life including disposal are shown in the tables below.

Table 13: Impact Assessment Results for 1 m² of Medintech® and Medintone™ with Diamond 10® Technology

Medintech® & Medintone™ with Diamond 10® Technology	TRACI 2.1 Impact Category	Global Warming Air, incl. biogenic carbon	Ozone Depletion Air	Acidification	Eutrophication	Smog Air	Resources, Fossil fuels
	UNITS	kg CO2 eq.	kg CFC 11 eq.	kg SO2 eq.	kg N eq.	kg O3 eq.	MJ
Production	A1-A3	8.59	4.99E-10	2.16E-02	2.35E-03	0.35	25.93
Transport (NA)	A4	0.78	-3.41E-15	1.67E-02	6.45E-04	0.32	1.40
Transport (Asia)	A4	0.32	-1.74E-15	1.55E-03	1.28E-04	0.04	0.61
Transport (AU)	A4	0.54	-2.53E-15	8.70E-03	3.73E-04	0.17	0.99
Install	A5	2.78	1.57E-09	1.31E-02	4.22E-04	0.15	1.60
Maintain	B2	0.03	1.13E-15	6.92E-05	2.09E-05	0.00	0.05
Replace	B4	14.035	0.000	0.059	0.004	0.960	33.364
Transport	C2	0.067	-3.61E-16	3.23E-04	2.67E-05	0.007	0.127
Disposal	C4	0.133	-6.87E-15	6.01E-04	3.07E-05	0.012	0.263
Recycling	D	0	0	0	0	0	0
Total	75 YEARS (NA)	28.895	4.43E-09	0.117	0.009	1.891	66.420
Total	1 YEAR (NA)	12.38	2.07E-09	0.052	3.50E-03	0.85	29.37

Table 14: Impact Assessment Results for 1 m² of Accolade™ Plus

Accolade™ Plus	TRACI 2.1 Impact Category	Global Warming Air, incl. biogenic carbon	Ozone Depletion Air	Acidification	Eutrophication	Smog Air	Resources, Fossil fuels
	UNITS	kg CO2 eq.	kg CFC 11 eq.	kg SO2 eq.	kg N eq.	kg O3 eq.	MJ
Production	A1-A3	10.12	5.10E-10	3.11E-02	3.34E-03	0.57	29.53
Transport (NA)	A4	0.84	-3.64E-15	1.88E-02	7.18E-04	0.37	1.51
Transport (Asia)	A4	0.54	-2.53E-15	0.01	3.72E-04	0.17	0.98
Transport (AU)	A4	0.32	-1.74E-15	1.55E-03	1.28E-04	0.04	0.61
Install	A5	3.15	1.56E-09	1.53E-02	4.74E-04	0.21	2.70
Maintain	B2	0.03	1.13E-15	6.91E-05	2.09E-05	0.00	0.05
Replace	B4	16.276	0.000	0.075	0.005	1.318	38.865
Transport	C2	0.067	-3.60E-16	3.22E-04	2.66E-05	0.007	0.126
Disposal	C4	0.133	-6.86E-15	6.00E-04	3.06E-05	0.012	0.262
Recycling	D	0	0	0	0	0	0
Total	75 YEARS (NA)	33.089	0.000	0.147	0.011	2.561	76.725
Total	1 YEAR (NA)	14.34	2.07E-09	0.066	4.61E-03	1.16	34.18

4.2. Life Cycle Inventory Results

Tables 15 and 16 provide life cycle inventory results for products included in this EPD. Inventory data are are not included for non-renewable primary energy resources used as raw materials, use of secondary materials (SM), use of renewable secondary fuels (RSF), or use of non-renewable secondary fuels (NRSF) as values for these inventory categories are zero.

Table 15: Resources Use for 1 m² of Medintech® and Medintone™ with Diamond 10® Technology

Medintech® & Medintone™ with Diamond 10® Technology	Resource Use Parameters	Total use of renewable primary energy resources	Renewable primary energy used as energy carrier	Total use of non-renewable primary energy resources	Non-renewable primary energy used as energy carrier	Use of net fresh water resources (FW)
	UNITS	[MJ, LHV]	[MJ, LHV]	[MJ, LHV]	[MJ, LHV]	[m³]
Production	A1-A3	14.66	14.66	248.05	248.05	0.08
Transport (NA)	A4	0.16	0.16	0.00	0.00	0.03
Transport (Asia)	A4	0.16	0.16	0.00	0.00	0.02
Transport (AU)	A4	0.16	0.16	0.00	0.00	0.01
Install	A5	0.04	0.04	0.00	0.00	6.32E-04
Maintain	B2	0.07	0.07	0.00	0.00	-1.06E-03
Replace	B4	30.23	30.23	517.84	517.84	0.21
Transport	C2	0.03	0.03	1.02	0.00	1.14E-04
Disposal	C4	0.16	0.16	2.26	0.00	2.48E-04
Recycling	D	0.00	0.00	0.00	0.00	0.00
Total	75 YEARS (NA)	50.58	50.58	786.61	786.61	0.23
Total	1 YEAR (NA)	15.12	15.12	262.20	262.20	0.10

Table 16: Resources Use for 1 m² of Accolade™ Plus

Accolade™ Plus	Resource Use Parameters	Total use of renewable primary energy resources	Renewable primary energy used as energy carrier	Total use of non-renewable primary energy resources	Non-renewable primary energy used as energy carrier	Use of net fresh water resources (FW)
	UNITS	[MJ, LHV]	[MJ, LHV]	[MJ, LHV]	[MJ, LHV]	[m³]
Production	A1-A3	16.29	16.29	283.80	283.80	0.08
Transport (NA)	A4	0.16	0.16	11.69	11.69	0.03
Transport (Asia)	A4	0.15	0.15	7.34	7.34	0.02
Transport (AU)	A4	0.14	0.14	4.73	4.73	0.01
Install	A5	0.04	0.04	8.47	8.47	6.19E-04
Maintain	B2	0.07	0.07	0.64	0.64	-1.06E-03
Replace	B4	33.50	33.50	517.84	615.75	0.22
Transport	C2	0.03	0.03	1.02	1.02	1.14E-04
Disposal	C4	0.16	0.16	2.26	2.26	2.48E-04
Recycling	D	0.00	0.00	0.00	0.00	0.00
Total	75 YEARS (NA)	55.31	55.31	968.73	968.73	0.25
Total	1 YEAR (NA)	16.59	16.59	305.62	305.62	0.11

Table 17: Outflows and Waste Categories for 1 m² of Medintech® and Medintone™ with Diamond 10® Technology

Medintech® & Medintone™ with Diamond 10® Technology	Outflows and Waste Categories	Hazardous Waste Disposed (HWD)	Non-Hazardous Waste Disposed (NHWD)	High Level Radioactive Waste Disposed (HLRW)	Intermediate Low Level Radioactive Waste (ILLRW)	Exported Energy, Electrical	Exported Energy, Thermal
	UNITS	kg	kg	kg	kg	[MJ, LHV]	[MJ, LHV]
Production	A1-A3	7.22E-04	1.00E+00	-6.99E-06	-5.50E-03	0	0
Transport (NA)	A4	3.78E-08	2.26E-04	-2.41E-08	-1.79E-05	0	0
Transport (Asia)	A4	3.72E-08	1.73E-04	-1.23E-08	-9.95E-06	0	0
Transport (AU)	A4	3.75E-08	1.90E-04	-1.69E-08	-1.30E-05	0	0
Install	A5	3.16E-09	2.48E-01	-1.23E-08	-9.78E-06	0	0
Maintain	B2	5.85E-10	1.31E-03	-5.02E-08	-4.09E-05	0	0
Replace	B4	1.44E-03	8.91E+00	-1.42E-05	-1.12E-02	0	0
Transport	C2	7.71E-09	3.85E-05	-2.73E-09	-2.21E-06	0	0
Disposal	C4	7.33E-09	3.21E+00	-2.73E-08	-2.13E-05	0	0
Recycling	D	0	0	0	0	0	0
Total	75 YEARS (NA)	7.22E-04	4.46E+00	-7.10E-06	-5.59E-03	0.00E+0	0.00E+0
Total	1 YEAR (NA)	2.17E-03	1.35E+01	-2.50E-05	-1.98E-02	0.00E+0	0.00E+0

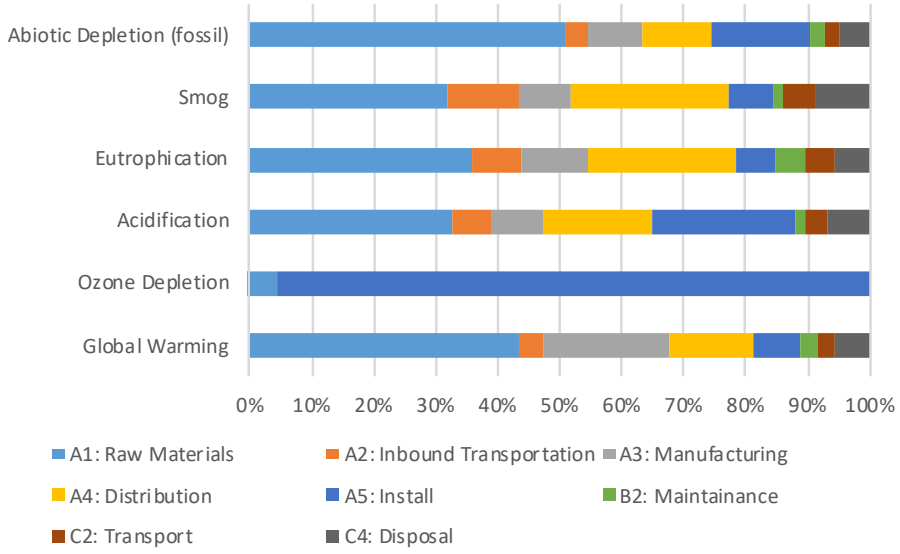
Table 18: Outflows and Waste Categories for 1 m² of Accolade™ Plus

Accolade™ Plus	Outflows and Waste Categories	Hazardous Waste Disposed (HWD)	Non-Hazardous Waste Disposed (NHWD)	High Level Radioactive Waste Disposed (HLRW)	Intermediate Low Level Radioactive Waste (ILLRW)	Exported Energy, Electrical	Exported Energy, Thermal
	UNITS	kg	kg	kg	kg	[MJ, LHV]	[MJ, LHV]
Production	A1-A3	6.48E-04	4.50E-01	-4.20E-06	-3.35E-03	0	0
Transport (NA)	A4	3.78E-08	2.13E-04	-2.35E-08	-1.74E-05	0	0
Transport (Asia)	A4	3.74E-08	1.89E-04	-1.69E-08	-1.30E-05	0	0
Transport (AU)	A4	3.72E-08	0.000173	-9.93E-06	-9.93E-06	0	0
Install	A5	3.13E-09	1.87E-01	-7.83E-09	-6.32E-06	0	0
Maintain	B2	5.84E-10	1.22E-03	-4.67E-08	-3.81E-05	0	0
Replace	B4	1.30E-03	7.24E+00	-8.60E-06	-6.87R-03	0	0
Transport	C2	7.70E-09	3.58E-05	-2.54E-09	-2.06E-06	0	0
Disposal	C4	7.31E-09	2.98E+00	-2.54E-08	-1.98E-05	0	0
Recycling	D	0	0	0	0	0	0
Total	75 YEARS (NA)	6.48E-04	3.62E+00	-4.30E-06	-3.44E-03	0.00E+0	0.00E+0
Total	1 YEAR (NA)	1.94E-03	1.10E+01	-1.64E-05	-1.31E-02	0.00E+0	0.00E+0

5.0 LCA Interpretation

Under the 75-year building service life assumption, product manufacturing (A1-A3) and recommended maintenance (B2) are the largest contributors to most impacts categories considered. The production of raw materials as shown in Figure 3, represents a substantial fraction of potential impact, even over the life of a building. The potential impact of floor maintenance adds up over time and are relevant contributors to the life cycle. Transportation of the flooring product from the manufacturing facility to the installation site (A4) is a relatively minor contributor to all impact categories. Replacement (B4) is a key contributor, because it represents the production, installation and disposal of replacement products needed to satisfy the 75-year building service. The PCR assumes that all flooring product have the same durability, however more durable products will have lower impact.

Figure 3. One-Year Life Cycle Impacts for Armstrong Flooring Homogeneous Sheet with Diamond 10® Technology



6.0 Additional Environmental Information

6.1 Environment and Health During Manufacturing

All Armstrong Flooring manufacturing plants maintain an Environmental Management System (EMS) in accordance with ISO 14001 which includes continuous environmental performance targets. Manufacturing plants located outside of the United States including plants in China and Australia are third party certified to ISO 14001 and ISO 9001.

Additionally, Armstrong has a robust internal Quality Assurance process that is based on industry-accepted best practices and is led by a team of quality professionals who have been certified by the American Society for Quality. The process involves several hundred different measures made throughout the manufacturing processes.

6.2 Environment and Health During Installation and Use.

All Armstrong flooring products are tested and certified by FloorScore® to comply with the requirements of the California Department of Public Health Standard for the Testing and Evaluation of VOC emissions (CDPH v1.2).

7.0 References

CDPH. (2017) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – v1.2.

ISO. (2006) 14025: Environmental labels and declarations – Type III – environmental declarations – Principles and procedures.

ISO. (2006) 14040: Environmental management – Life cycle assessment – Principles and framework.

ISO. (2006) 14044: 2006 Environmental management – Life cycle a assessment – Requirements and guidelines.

European Standards. (2013) EN 15804+A1 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

UL (2018) Product Category Rules for Building-Related products and Services in North America – Part A life Cycle.

UL (2018) Product Category Rules for Building-Related Products and Service, Part B: Flooring EPD Requirements.

US EPA. (2012). Tool for the reduction and assessment of Chemical and other Environmental Impacts (TRACI) v 2.1.