therdex

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

THERDEX DRYBACK

ENVIRONMENTAL PRODUCT DECLARATION

therdex

THERDEX
Dryback

According to ISO 14025
and EN 15804+A2

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN ROAD NORTHBROOK, IL 60611	HTTPS://WWW.UL.COM/ HTTPS://SPOT.UL.COM/
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	PROGRAM OPERATOR RULES V2.7 2022	
MANUFACTURER NAME AND ADDRESS	Decoria Materials (JiangSu) Co.,Ltd. No.63, GuangYuan Road, Dantu Industrial Park, Zhenjiang, JiangSu Province, P.R. China	
DECLARATION NUMBER	4791557974.102.1	
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Therdex Dryback flooring; 1 m^2	
REFERENCE PCR AND VERSION NUMBER	Product Category Rules for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Standard 10010, Version 3.2 Part B: Flooring EPD Requirements, UL 10010-7, Version 2.0	
DESCRIPTION OF PRODUCT APPLICATION/USE	Luxury vinyl tile (LVT) for commercial and residential spaces	
PRODUCT RSL DESCRIPTION (IF APPL.)	Commercial: 10 Years Residential: 25 Years	
MARKETS OF APPLICABILITY	Global	
DATE OF ISSUE	May 21, 2026	
PERIOD OF VALIDITY	5 Years	
EPD TYPE	Product specific	
RANGE OF DATASET VARIABILITY	N/A	
EPD SCOPE	Cradle to grave	
YEAR(S) OF REPORTED PRIMARY DATA	2024	
LCA SOFTWARE & VERSION NUMBER	Sphera's LCA for Experts (LCA FE) v10.9.5.2	
LCI DATABASE(S) & VERSION NUMBER	Sphera's Managed LCA Content v2026.1	
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR6, TRACI v2.2, EF3.1	

The PCR review was conducted by:	UL environment PCR Peer Review Panel Jack Geibig, Chair
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Skye Tang, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera Solutions, Inc.
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Sung Mo Yeon,H.I.P. Pathway

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR 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.

1. Product Definition and Information

1.1. Description of Company/Organization

Therdex is a leading Dutch flooring brand dedicated to the development of high quality Luxury Vinyl Tile (LVT) flooring. As part of Hillfloor Group, Therdex combines design, craftsmanship and innovation to create flooring solutions that offer the beauty of natural materials together with the durability and practicality required for modern living and working environments. Through an extensive collection of carefully curated designs, Therdex serves retailers, architects and interior designers across Europe.

The vision of Therdex is founded on three key values:

- **Authenticity** | By translating the natural beauty of wood and stone into realistic flooring designs with exceptional attention to detail.
- **Reliability** | By delivering products that combine aesthetic appeal with consistent quality, durability and ease of use.
- **Sustainability** | By making responsible choices in product development, material selection and business operations, contributing to healthier and more sustainable interior spaces.

The production facilities of Therdex comply with the following standards:

- ISO 9001:2015 | Quality Management System
- ISO 14001:2015 | Environmental Management System
- ISO 45001:2018 | Occupational Health and Safety Management System
- ISO 50001:2018 | Energy Management System

1.2. Product Description

Product Identification

Therdex Dryback is a glue-down flooring system designed for demanding commercial interior environments. Available in authentic wood, stone, and decorative visuals, it provides a durable and stable flooring solution for hospitality, retail, healthcare, corporate, and other applications where appearance and dependable performance are important considerations.

Product Specification

Therdex Dryback is a resilient flooring product designed as a glue-down system for commercial applications and professionally installed using a flooring adhesive. Constructed with a durable wear layer and proprietary AMP® (Aminomethyl Propanol) polyurethane coating, it is designed to support dimensional stability, long term in-use performance, and suitability for spaces subject to heavy foot traffic, continuous use, and heavy rolling loads. The product covered by this EPD are the Therdex Dryback products.

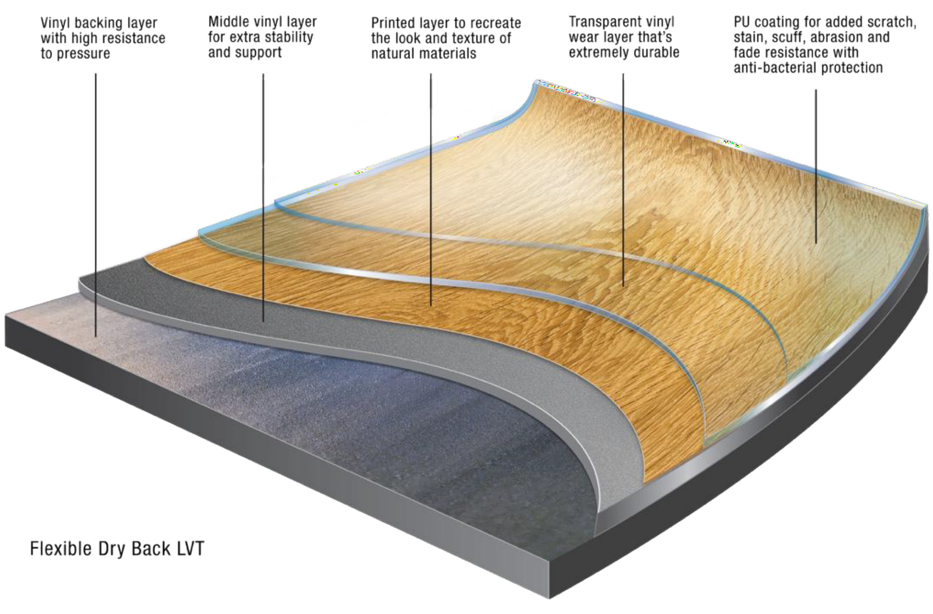

Figure 1: Construction of Therdex Dryback

Table 1: ASTM Technical Specifications of Therdex Dryback

STANDARDS	RESULTS
ASTM F3261 - RIGID POLYMERIC CORE FLOORING	CLASS I, TYPE B, GRADE 1, BACKING CLASS B
ASTM 387 – TOTAL THICKNESS	PASSES, ±0.008 IN.
ASTM 3781 – EDGE FRAGILITY	PASSES, ≥ 17 lbs.
ASTM F1914- RESIDUAL INDENTATION	PASSES, <0.007 IN.
ASTM F1914- SURFACE INTEGRITY	PASSES, NO PUNCTURE
ISO 23999- DIMENSIONAL STABILITY	PASSES, <0.2% PER LIN. FT
ISO 23999 - CURLING	PASSES, <0.08 IN.
ASTM F925- CHEMICAL RESISTANCE	PASSES
ASTM F1514 - HEAT COLOR STABILITY	PASSES, < Il8E
ASTM F1515 - LIGHT COLOR STABILITY	PASSES, < Il8E
ASTM F970- STATIC LOAD LIMIT	PASSES, 250 LBS.
ASTM E648 (NFPA 253) - CRITICAL RADIANT FLUX	CLASS I, >0.45 W/CM^2
ASTM E662 (NFPA 258) - SMOKE DENSITY	PASSES, <450
ASTM D2047 - SLIP RESISTANCE	>0.6 (DRY)
CHPS / CA SECTION 01350	COMPLIANT

Table 2: EN 10582 Technical Specifications of Therdex Dryback

STANDARDS	RESULTS
EN 17539 Length L≤ 1500 mm	PASSES, ∆L ≤ 0,5 mm
EN 17539 Length L> 1500 mm	PASSES, ∆L ≤ 0,3 mm
EN 17539 Width	PASSES, ∆AVG ≤ 0,10 mm
EN 17539 Width Squareness	PASSES, ≤ 0,20 mm
EN 17539 Straightness	PASSES, ≤ 0,30 mm/m
EN 17539 Straightness	PASSES, ≤ 0,30 mm/m
EN 17539 Flatness FW	PASSES, CONCAVE ≤ 0,15 %, CONVEX ≤ 0,20 %
EN 17539 Flatness FL	PASSES, CONCAVE ≤ 0,50 %, FL, CONVEX ≤ 1,00 %
EN 17539 Openings	PASSES, AVG ≤ 0,15 mm
EN 17539 Openings	PASSES, MAX ≤ 0,20 mm
EN 17539 Height Differences	PASSES, AVG ≤ 0,10 mm

Facility-Specific/Product-Average EPD

This declaration is for Therdex Dryback flooring. Only the LCA results of the representative specification are presented in this declaration. While allocating energy and materials within the production site, allocation was carried out based on either the average annual mass or average annual surface area produced.

1.3. Application

The LVT product covered in this declaration is for use in corporate offices, retail spaces, residential spaces, hospitality, and a variety of other commercial environments.

1.4. Declaration of Methodological Framework

In this project, a full LCA approach was considered with some simplification on data modeling using secondary data from Sphera's Managed LCA Content v2026.1 for most background systems. The EPD analysis uses a cradle-to-grave system boundary. No known flows are deliberately excluded from this EPD.

To calculate the LCA results for the Use Stage, a reference service life (RSL) of 10 years was assumed for commercial applications and an RSL of 25 years was used for residential applications.

Additional details on assumptions, cut-offs, and allocation procedures can be found in section 2.4, 2.5, and 2.9, respectively.

1.5. Technical Requirements

The technical specifications for the Dryback product are provided in

Table 3.

Table 3: Technical Data for Therdex Dryback

NAME		AVERAGE VALUE	MIN VALUE	MAX VALUE	UNIT
PRODUCT THICKNESS		2.0	2.0	3,5	MM
WEAR LAYER THICKNESS {WHERE APPLICABLE}		0.55	0.15	0.70	MM
PRODUCT WEIGHT		4.34	4,000	5,200	G/M[2]
PRODUCT FORMAT	TILES		298.4 X 603.2	587.5 X 1212.8	MM
	PLANKS		145.0 X 665.0	298.5 X 1814.8	MM

1.6. Properties of Declared Product as Delivered

Therdex transparently declares the composition and environmental impact of Therdex Dryback products with a Health Product Declaration (HPD), Declare® label. In addition, Therdex Dryback products also have the technical specifications shown in Table 1 & 2 and meet the criteria of the following certifications and standards:

- SCS Assure®
- UL GREENGUARD Gold
- SCS FloorScore®
- Eurofins Indoor Air Comfort Gold
- TÜV Proficert

1.7. Material Composition

The main raw materials used to produce Therdex Dryback are polyvinyl chloride (PVC) resins and calcium carbonate (CaCO3) along with internal recycled LVT scrap. In addition, a plasticizer, stabilizers, pigments, lubricants, and other materials are used.

Table 4: Average Material Composition of Therdex Dryback

COMPONENT	MATERIALS	LVT
Substrate	Calcium Carbonate ($CaCO_3$)	42.9%
Substrate	Polyvinyl Chloride (PVC)	31.2%
Substrate	LVT Scrap (Internally Recycled LVT Scrap)	14.4%
Substrate	Polyethylene (PE)	0.0%
Substrate - Plasticizer	Dioctyl terephthalate (DOTP)	9.6%
Miscellaneous	Other	1.9%

1.8. Manufacturing

The manufacturing process of Therdex Dryback includes preparing the base layer, undergoing lamination and continuous line processing, coating with a UV layer, gluing, cutting, profiling, and packaging.

The main raw materials used to produce Therdex Dryback are polyvinyl chloride (PVC) resins, calcium carbonate ($CaCO_3$) and recycled LVT scrap. During the production of the PVC base layer, these materials are mixed with a plasticizer, stabilizer, and other materials. Once the compound is ready, a series of heated rollers are used to squeeze the compound into a continuous sheet with a precise width and thickness. After that, the sheet is sent through a cooling process and is ready for lamination. The different layers are bonded to each other through the lamination process. Engraved rollers are then used to apply a textured design onto the surface, which is followed by the application of the UV layer. Afterwards, the core and acoustic layer (when specified) are glued to the PVC base layer. Finally, the products are cut into pieces matching the specifications, and the edges are profiled. After a quality check, the products that pass are packaged for transportation.

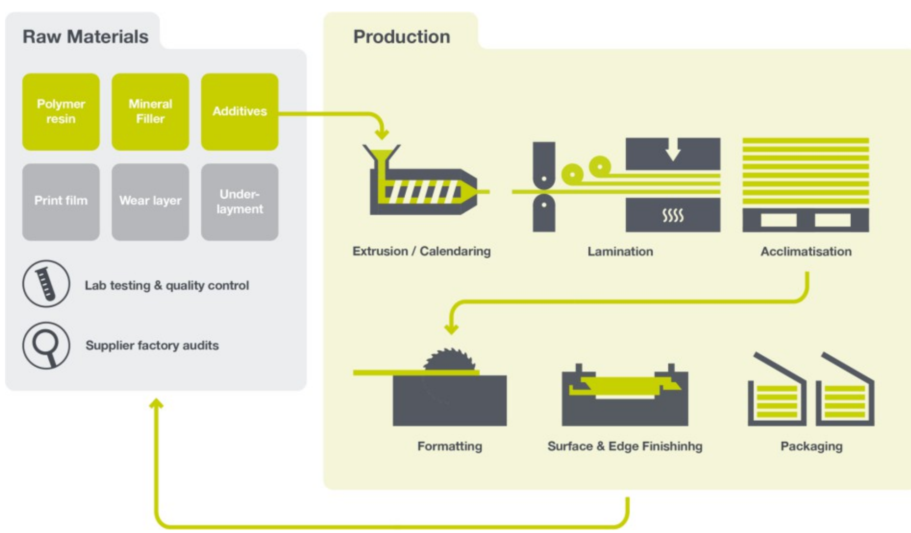

Figure 2: Production Process of Therdex Dryback

1.9. Packaging

Cardboard, wood pallets, wood top boards, polyethylene film and straps are the main packaging materials for the LVT product, which is marketed globally. In the LCA study, the disposal of packaging materials adopted a rough country-based weighted average disposal model following the UL PCR for Building-Related Products and Services Part A Section 2.8.5.

1.10. Transportation

The manufacturing facility is in Zhenjiang, Jiangsu, China, and all raw materials are sourced from China and transported by truck. The products are then distributed by trucks and container ships for sale and use. Table 8 demonstrates the data used for Module A4.

1.11. Product Installation

Therdex Dryback is a straight edge, glue-down flooring product that must be permanently adhered to the subfloor, which requires thorough subfloor preparation prior to installation. The installation process involves using knives, trowels, a suitable adhesive, and a roller to ensure the flooring is pressed firmly into the glue bed. As such tools are reusable, the production and disposal stage of any tools was omitted from the LCA study. It is essential that the subfloor is even, flat, and dry before installation begins. According to Therdex estimates, approximately 5% of the total material is cut off as waste during installation.

1.12. Use and Maintenance

After installation, only routine vacuuming, cleaning, and surface conditioning are required for regular maintenance and upkeep of the product. The cleaning schedule depends on multiple factors, including weight capacity, terminal function, the amount of dust entering the building, and more. For the purposes of this EPD, average maintenance is presented based on typical installations. The calculations are based on the maintenance routine presented in Table 6 and Table 7.

1.13. Reference Service Life and Estimated Building Service Life

As required by the Part A PCR section 4, the building estimated service life (ESL) is 75 years. A reference service life (RSL) of 10 years was assumed for commercial applications and an RSL of 25 years was used for residential applications. The flooring is assumed to be replaced at the end of the RSL until the ESL is met. Therefore, 6.5 replacements are required for commercial applications (75/10 – 1 = 6.5) and 2 replacements are required for residential applications (75/25 – 1 = 2). This only affects the results in module B4. An RSL of 10 will increase the burdens in module B4 by a factor of 2.25 [(6.5 – 2)/2 = 2.25].

1.14. Reuse, Recycling, and Energy Recovery

The manufacturer has a partnership with a recycler in Europe for pre-consumer recycling of luxury vinyl tile (LVT) flooring. Therdex is also currently working with its large retail customers to develop a take-back program for the reuse and recycling of LVT flooring that reached the end of its usefull life. However, in this study all the flooring was assumed to be landfilled in Europe at end of life as required by Part A PCR.

1.15. Disposal

For this LCA study, the LVT product sold globally, but selected datasets and parameters are representative of Europe as that is the largest market. For the disposal of the used product, a country-based weighted average disposal model was adopted, following disposal routes and waste classification referenced in PCR part A section 2.8.5 and 2.8.6. For products in Europe, this is 50% recycling, 13% incineration, and 37% landfilling. The landfilling model was from Sphera's MLC v2026.1. The waste scenario assumed 32 km of road transportation (C2) from an installation site to a municipal solid waste (MSW) treatment site based on the US EPA's WARM model.

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

In this study, the functional unit was defined as 1 m^2 of Therdex Dryback flooring product.

Table 5: Functional Unit Information

NAME	VALUE	UNIT
FUNCTIONAL UNIT	1	m^2
MASS	4.34	kg

2.2. System Boundary

The life cycle stages considered in this LCA study are from cradle-to-grave.The following modules have been declared:

- A1-A3: Product stage (raw material acquisition, transport to manufacturing site and manufacturing)
- A4-A5: Construction stage (transport to user site, installation)
- B1-B7: Use and maintenance stage (use, maintenance, repair, replacement, refurbishment and energy & water usage) However, only B2 and B4 have associated environmental emissions or impacts.
- C1-C4: End of life stage (deconstruction, transport, waste processing and disposal). However, only C2 and C4 have associated environmental emissions or impacts.

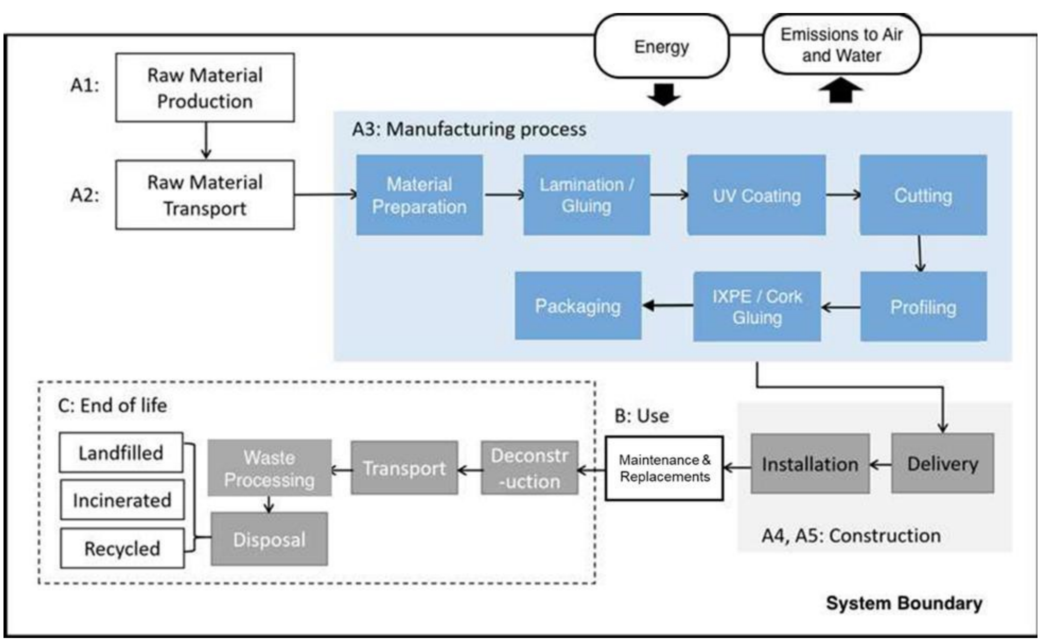

Figure 3. System Boundary

The LCA study traced all energy and material inputs back to the extraction of resources for each life-cycle stage of the products. In addition, the study quantified emissions from the whole system, and included various waste management scenarios.

2.3. Product for Maintenance Phase (Modules B1-B7)

For the calculations of maintenance phase (Module B2), the necessary cleaning inputs are provided in Table 5 and Table 6. Additionally, the flooring is assumed to be replaced at the end of the RSL until the 75-year ESL is met. Therefore, 6.5 replacements are required for commercial applications (75/10 – 1 = 6.5) and 2 replacements are required for residential applications (75/25 – 1 = 2). The replacements (B4) consider all impacts associated with production, distribution, installation, and end-of-life for the replaced flooring.

Table 6: Cleaning and Maintenance

CLEANING PROCESS	CLEANING FREQUENCY	CONSUMPTION OF ENERGY AND RESOURCES
VACUUMING	WEEKLY	ELECTRICITY
MOPPING	WEEKLY	WATER AND DETERGENT

Table 7: Inputs in Maintenance Stage

INPUT	AMOUNT	UNITS	SCENARIO
WATER	5.8	$L/m^2/year$	BASED ON WEEKLY VACUUM AND WEEKLY MOPPING
ELECTRICITY	0.02	$kWh/m^2/year$	
DETERGENT	119	$g/m^2/year$	

2.4. Cut-off Criteria

The following procedures were followed for the exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process were included in the calculation where data was available. Data gaps were filled by conservative assumptions with average or generic data. Any assumptions for such choices were documented;
- As all available data from production processes were considered, all material and energy flows contributing more than 1% of mass or energy for any modules are considered as required by the PCR.

Material and energy flows known to have the potential to cause significant emissions into air, water or soil related to the environmental indicators of this study were included in the assessment. After reviewing the Material Safety Data Sheets and relevant physical, chemical and other information of the flows listed in table above, no significant negative emission to the environment from above listed flows was identified.

Other processes that contribute to obviously less than 1% of overall mass and energy contribution were cut off, which include:

- Storage phases and sales of product
- Handling operations at the distribution center and retail outlet
- Secondary and transit packaging
- Transport from distribution warehouse to retail outlet and from retail outlet to consumer household or commercial center

2.5. Data Sources

The study used secondary data from the Sphera Managed LCA Content (MLC) 2026.1 database (https://lcadatabase.sphera.com/). In the study, the key parameters for producer-specific foreground data were based on the 2024 calendar year of averaged data from the manufacturer. The life-cycle inventory includes data collected from a variety of publicly available sources, taking into consideration the degree to which it was technologically, temporally, and geographically representative. The study utilized the accurately regionalized datasets from the 2026.1 MLC to the greatest extent possible as documented in the LCA report.

2.6. Data Quality

The data quality requirements for this study were as follows:

- Measured primary data are considered to be of the highest precision, followed by calculated data, literature data, and estimated data. The goal is to model all relevant foreground processes using measured or calculated primary data.
- Completeness is judged based on the completeness of the inputs and outputs per unit process and the completeness of the unit processes themselves. The goal is to capture all relevant data in this regard.
- Consistency refers to modelling choices and data sources. The goal is to ensure that differences in results reflect actual differences between product systems and are not due to inconsistencies in modelling choices, data sources, emission factors, or other artefacts.
- Reproducibility expresses the degree to which third parties would be able to reproduce the results of the study based on the information contained in this report. The goal is to provide enough transparency with this report so that third parties are able to approximate the reported results. This ability may be limited by the exclusion of confidential primary data and access to the same background data sources.
- Representativeness expresses the degree to which the data matches the geographical, temporal, and technological requirements defined in the study's goal and scope. The goal is to use the most representative primary data for all foreground processes and the most representative industry-average data for all background processes. Whenever such data were not available (e.g., no industry-average data available for a certain country), best-available proxy data was employed.

2.7. Period under Review

The study used primary data collected from 2024.

2.8. Allocation

This study assumed that in-plant recycling for the production of the base layer was a closed loop, meaning that the study allocated all of the environmental impacts from the recycling of the base layer, cutting, and profiling scraps and all of the environmental benefits of using recycled material to avoid waste generation during the production of the base layer to the process of production.

To be conservative, the environmental benefits of recycling and energy recovery were not included in the study for the recycling and disposal processes at the end-of-life stage.

For process-related allocations, the study distinguished between multi-input and multi-output processes.

Multi-output processes

While allocating energy and auxiliary materials within the production site, allocation was carried out on the basis of either the average annual mass or the average annual surface area produced. The decision to use average annual mass or average annual surface area was based on the relationship of the input to the environmental impacts. In most cases, the input amount increases linearly with the mass of product produced. However, the amount of energy and materials used in the annealing and UV coating processes is proportional to the surface area of product produced. Accordingly, the allocation of energy and material related to these types of processes was based on surface area rather than mass.

The allocation procedures used in the MLC background datasets are documented in https://lcadatabase.sphera.com/

End-of-Life Allocation

End-of-life allocation followed the substitution approach based on the perspective that material that is recycled into secondary material at end of life is technically able to substitute an equivalent amount of virgin material. Hence a credit is given to account for this substitutability. To avoid double counting the benefits of recycled content, waste materials collected for recycling in EoL are first used to satisfy the scrap demand of the manufacturing stage before being sent to recycling and crediting in EoL. This 'net scrap' approach rewards both end of life recycling as well as the use of recycled content. Only paper and cardboard packaging is externally recycled for this product.

2.9. Comparability

No comparisons or benchmarking are included in this EPD. LCA results across EPDs can be calculated with different background databases, modeling assumptions, geographic scope and time periods, all of which are valid and acceptable according to the Product Category Rules (PCR) and ISO standards. The user of the EPD should take care when comparing EPDs from different companies. Assumptions, data sources, and assessment tools may all impact the uncertainty of the final results and make comparisons misleading.

3. Life Cycle Assessment Scenarios

The study considers the LVT product is purchased and used in Europe. The study estimated oceanic and road transportation distance for product delivery by referring to external resources. Table 8 shows the data used for transport in Module A4.

Table 8: Transport to the building site (A4)

NAME	ROAD	OCEAN	UNIT
Fuel type	Diesel	Heavy Oil	
Liters of fuel	31.10	13,100	l/100km
Vehicle type	Heavy-Heavy Duty 8b	Container Ship (43,000 DWT)	
Transport distance	800	19,300	km
Capacity utilization (including empty runs, mass based)	67%	70%	%
Gross density of products transported	1,605	1,605	kg/m^3
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	1	1	-

Table 9: Installation into the building (A5)

NAME	VALUE	UNIT
Ancillary materials		kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)		m^3
Other resources		kg
Electricity consumption		kWh
Other energy carriers		MJ
Product loss per functional unit	0.22	kg
Waste materials at the construction site before waste processing, generated by product installation	0.22	kg
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)[a,b]	Product: 0.11 | 0.08 | 0.03| 0.22 Pulp: 0.03 | 0.006 | 0.002 | 0.04 Wood: 0.05 | 0.11| 0.04 | 0.20 Plastic: 0.0015 | 0.0015 | 0.0012 | 0.004	kg
Biogenic carbon contained in packaging	Pulp: 0.42 Wood: 0.29 Plastic: 0.0 Total:0.07	$kg\ CO_2$
Direct emissions to ambient air, soil and water		kg
VOC content	N/A	$\mu g/m^3$

a) Includes packaging of product lost during installation
b) Mass to recycling | landfill | incineration | total

Table 10: Reference Service Life

NAME	VALUE	UNIT
RSL	10 (Commercial use) 25 (Residential use)	years
Declared product properties (at the gate) and finishes, etc.	Luxury Vinyl Tile	M^2
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)		
An assumed quality of work, when installed in accordance with the manufacturer's instructions		
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature		
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)	Prevent water and moisture from accumulating underneath walk-off mats	
Use conditions, e.g. frequency of use, mechanical exposure.	Commercial/ Residential use	
Maintenance, e.g. required frequency, type and quality of replacement components	Weekly vacuuming Weekly mopping	

Table 11: Maintenance (B2)

NAME	VALUE	UNIT
Maintenance process information (cite source in report)	Weekly vacuum and weekly mopping	-
Maintenance cycle	Weekly vacuum and weekly mopping	Cycles/ RSL
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	5.8 city water disposed to sewer	$L/m^2/year$
Ancillary materials specified by type (e.g. cleaning agent)	119 (cleaning agent)	$g/m^2/year$
Other resources		kg
Energy input, specified by activity, type and amount	Electricity consumption 0.266	$kWh/m^2/year$
Other energy carriers specified by type		kWh
Power output of equipment		kW
Waste materials from maintenance (specify materials)		kg
Direct emissions to ambient air, soil and water		kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);		

The disposal of the used LVT products adopted a country-based weighted average disposal model following disposal routes and waste classification referenced in PCR Part A Section 2.8.5 and 2.8.6 (i.e., 100% landfilling in the US). The LCA study used the end-of-life disposal treatment process (C4) from MLC 2026.1.

For the waste scenario, the study assumed a moderate distance of 32 km for the road transportation (C2) required from an installation site to a MSW treatment site based on the US EPA's WARM model. Since the tile is manually removed from the floor, inputs and outputs were omitted for deconstruction (C1), and since no process is required prior to disposal, inputs and outputs were omitted from waste processing as well (C3) stages. Table 12 shows the data used in modules C1-C4.

Table 12: Replacement (B4)

NAME	VALUE	UNIT
Replacement cycle	1	Number/ RSL
Replacement cycle	6.5 (Commercial use) 2 (Residential use)	Number/ ESL
Energy input, specified by activity, type and amount		kWh
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)		m^3
Ancillary materials specified by type (e.g. cleaning agent)		kg
Replacement of worn parts, specify parts/materials		kg
Direct emissions to ambient air, soil and water		kg
Further assumptions for scenario development, e.g. frequency and time period of use		As appropriate

Table 13: End of life (C1-C4)

NAME		VALUE	UNIT
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)			
Collection process (specified by type)	Collected separately	4.33	kg
	Collected with mixed construction waste	0	kg
Recovery (specified by type)	Reuse	0	kg
	Recycling	2.2	kg
	Landfill	1.6	kg
	Incineration	0.0	kg
	Incineration with energy recovery	0.6	kg
	Energy conversion efficiency rate		
Disposal (specified by type)	Product or material for final deposition	0	kg
Removals of biogenic carbon (excluding packaging, installation loss, and replacements)		0.20	kg CO_2

In this study, all waste at the end of life stage is considered to be managed based on Table 2 from the UL Part A PCR.

4. Life Cycle Assessment Results

Table 14: Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION 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[b]	X	X[b]	X	X[b]	X[b]	X[b]	X[b]	X	X[b]	X	MND

a) X – Module declared
b) No environmental emissions are considered from these modules
c) MND – Module not declared

4.1. Life Cycle Impact Assessment Results

To analyze the environmental impact of each process, an LCIA was conducted using EF3.1 methodology required by EN 15804+A2. Results are also provided using IPCC AR6 method (for global warming potential) and TRACI v2.2 method (for other impact categories) on the chosen representative LVT product. The result was allocated by stages, as shown in tables below. Module C1 is zero for results as deinstallation is assumed to be done manually with negligible burdens.

Note that the results are based on 25 years' usage, as the representative product will primarily be used for commercial purposes. For residential applications (RSL = 10 years), all results would remain same except B4, which will increase by a factor of 2.5 as 6.5 replacements will be necessary instead of the two necessary for a 25-year RSL.

Table 15: EN 15804+A2 – Impact Assessment Results

EF 3.1 IMPACT CATEGORY	A1-A3	A4	A5	B2	B4	C2	C3	C4	D	TOTAL
GWP -total [kg CO_2 eq]	7.60E+00	1.32E+00	1.75E+00	5.08E+00	2.17E+01	2.63E-02	7.75E-01	7.74E-01	-6.75E+00	3.23E+01
GWP, fossil [kg CO2 eq]	8.00E+00	1.31E+00	1.20E+00	4.75E+00	2.22E+01	2.62E-02	7.71E-01	7.73E-01	-6.73E+00	3.23E+01
GWP, biogenic [kg CO2 eq]	-4.03E-01	7.07E-04	5.54E-01	3.28E-01	-4.75E-01	2.03E-05	3.04E-03	2.37E-04	-1.87E-02	-1.12E-02
GWP, luluc [kg CO2 eq]	4.29E-03	1.23E-03	5.06E-04	3.77E-03	1.23E-02	5.04E-05	6.44E-04	1.57E-04	-3.10E-03	1.99E-02
ODP [kg CFC-11 eq]	4.39E-10	2.12E-12	2.65E-11	6.06E-11	8.96E-10	9.49E-15	9.36E-12	1.02E-12	-3.98E-10	1.04E-09
AP [mole H^+ eq.]	4.08E-02	3.32E-02	4.78E-03	7.62E-03	1.51E-01	6.15E-05	6.34E-04	6.17E-04	-4.74E-02	1.91E-01
EP, freshwater [kg P eq.]	3.78E-05	9.62E-07	5.18E-06	3.19E-04	1.12E-04	4.96E-08	1.08E-06	1.46E-05	-7.17E-06	4.83E-04
EP, marine [kg N eq.]	6.71E-03	8.22E-03	1.18E-03	3.37E-03	3.08E-02	2.83E-05	1.68E-04	1.74E-04	-6.18E-03	4.45E-02
EP, terrestrial [mole of N eq.]	7.17E-02	9.00E-02	1.18E-02	2.41E-02	3.34E-01	3.09E-04	2.01E-03	2.20E-03	-6.94E-02	4.67E-01
POCP [kg NMVOC eq.]	2.42E-02	2.33E-02	3.81E-03	1.16E-02	9.81E-02	5.83E-05	4.10E-04	4.87E-04	-2.50E-02	1.37E-01
RU, minerals and metals [kg Sb-eq]	9.74E-07	3.44E-08	2.96E-07	4.63E-06	2.62E-06	3.91E-09	1.08E-07	9.24E-09	-3.51E-07	8.33E-06
RU, fossils [MJ]	1.50E+02	1.60E+01	2.45E+01	1.04E+02	3.63E+02	3.37E-01	4.85E+00	1.39E+00	-1.23E+02	5.41E+02
Water use [m^3 world equiv.]	1.55E+00	5.11E-03	1.10E-01	5.02E-01	3.48E+00	2.11E-04	9.29E-02	1.13E-01	-1.18E+00	4.68E+00

Table 16: ISO 21930 – Impact Assessment Results

IMPACT CATEGORY	A1-A3	A4	A5	B2	B4	C2	C3	C4	D	TOTAL
IPCC AR6										
GWP excl. biogenic CO_2 [kg CO_2 eq]	8.02E+00	1.32E+00	1.47E+00	4.86E+00	2.24E+01	2.63E-02	7.74E-01	7.74E-01	-6.74E+00	3.29E+01
GWP excl. biogenic CO_2 [kg CO_2 eq]	7.60E+00	1.32E+00	1.75E+00	5.08E+00	2.17E+01	2.63E-02	7.75E-01	7.74E-01	-6.75E+00	3.23E+01
TRACI 2.2										
GWP excl. biogenic CO_2 [kg CO_2 eq]	7.86E+00	1.30E+00	1.40E+00	4.76E+00	2.20E+01	2.60E-02	7.71E-01	7.72E-01	-6.61E+00	3.22E+01
GWP excl. biogenic CO_2 [kg CO_2 eq]	7.45E+00	1.30E+00	1.68E+00	4.98E+00	2.13E+01	2.60E-02	7.72E-01	7.72E-01	-6.62E+00	3.17E+01
AP [kg SO_2 eq]	3.32E-02	2.82E-02	4.03E-03	6.52E-03	1.25E-01	5.55E-05	6.17E-04	5.38E-04	-3.83E-02	1.60E-01
EP freshwater [kg P eq]	1.71E-05	4.34E-07	2.54E-06	1.44E-04	5.32E-05	2.24E-08	4.86E-07	7.90E-06	-3.24E-06	2.22E-04
EP marine [kg N eq]	1.07E-02	1.44E-02	1.79E-03	3.45E-03	5.16E-02	4.73E-05	2.63E-04	3.10E-04	-1.06E-02	7.19E-02
PM [kg PM2.5 eq]	2.55E-03	2.87E-03	3.25E-04	3.85E-04	1.10E-02	2.67E-06	3.15E-05	3.46E-05	-2.80E-03	1.44E-02
ODP [kg CFC-11 eq]	5.83E-10	2.81E-12	3.48E-11	7.48E-11	1.19E-09	1.18E-14	1.16E-11	1.26E-12	-5.28E-10	1.37E-09
POCP [kg O_3 eq]	3.96E-01	5.24E-01	6.59E-02	1.35E-01	1.89E+00	1.20E-03	8.54E-03	1.05E-02	-3.97E-01	2.63E+00
CML 2016										
ADP_{fossil} [MJ, LHV]	1.47E+02	1.60E+01	2.40E+01	9.76E+01	3.54E+02	3.35E-01	3.33E+00	1.28E+00	-1.20E+02	5.24E+02

4.2. Life Cycle Inventory Results

Table 17: EN 15804 – Resource Use

PARAMETER	A1-A3	A4	A5	B2	B4	C2	C3	C4	D	TOTAL
PERE [MJ, LHV]	1.20E+01	3.11E-01	1.94E+00	1.84E+01	3.01E+01	1.79E-02	3.05E+00	3.73E-01	-9.51E+00	5.67E+01
PERM [MJ, LHV]	2.58E+00	0.00E+00	1.29E-01	0.00E+00	5.13E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.84E+00
PERT [MJ, LHV]	1.46E+01	3.11E-01	2.07E+00	1.84E+01	3.53E+01	1.79E-02	3.05E+00	3.73E-01	-9.51E+00	6.45E+01
PENRE [MJ, LHV]	1.00E+02	1.60E+01	2.20E+01	8.11E+01	2.63E+02	3.37E-01	4.85E+00	1.39E+00	-1.23E+02	3.66E+02
PENRM [MJ, LHV]	5.02E+01	0.00E+00	2.51E+00	2.30E+01	9.98E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E+02
PENRT [MJ, LHV]	1.50E+02	1.60E+01	2.45E+01	1.04E+02	3.63E+02	3.37E-01	4.85E+00	1.39E+00	-1.23E+02	5.41E+02
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
RSF [MJ, LHV]	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
NRSF [MJ, LHV]	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
FW [m3]	4.06E-02	1.87E-04	5.48E-03	2.63E-02	9.64E-02	9.23E-06	3.13E-03	2.74E-03	-2.90E-02	1.46E-01

Table 18: EN 15804 – Output Flows and Waste Categories

PARAMETER	A1-A3	A4	A5	B2	B4	C2	C3	C4	D	TOTAL
HWD [kg]	3.50E-08	4.40E-10	1.71E-08	3.99E-08	4.65E-07	4.78E-11	1.99E-07	6.56E-10	-2.54E-08	7.32E-07
NHWD [kg]	1.43E-01	1.16E-03	2.27E-01	5.40E-01	5.42E+00	5.01E-05	5.63E-02	2.56E+00	-6.28E-02	8.88E+00
RWD [kg]	1.12E-03	1.07E-05	1.54E-04	2.31E-03	2.92E-03	8.21E-07	5.42E-04	3.88E-05	-9.27E-04	6.17E-03
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
MFR [kg]	0.00E+00	0.00E+00	1.02E-01	0.00E+00	2.77E+00	0.00E+00	1.39E+00	0.00E+00	0.00E+00	4.27E+00
MER [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
EEE [MJ, LHV]	0.00E+00	0.00E+00	2.40E-01	0.00E+00	2.45E+00	0.00E+00	0.00E+00	1.16E+00	0.00E+00	3.85E+00
EET [MJ, LHV]	0.00E+00	0.00E+00	2.63E-01	0.00E+00	5.45E+00	0.00E+00	0.00E+00	2.66E+00	0.00E+00	8.37E+00

Table 19: EN 15804 – Optional LCIA Indicators

PARAMETER	A1-A3	A4	A5	B2	B4	C2	C3	C4	D	TOTAL
PM	4.37E-07	5.94E-07	6.16E-08	6.82E-08	2.09E-06	6.59E-10	5.47E-09	6.41E-09	-4.69E-07	2.79E-06
IRP	8.07E-02	1.09E-03	1.57E-02	3.28E-01	2.60E-01	7.91E-05	8.26E-02	5.50E-03	-8.91E-02	6.84E-01
ETP-fw	1.17E+02	1.79E+01	1.65E+01	5.90E+01	2.91E+02	3.01E-01	1.24E+00	1.36E+00	-1.11E+02	3.94E+02
HTP-c	4.47E-09	2.84E-10	4.28E-10	2.31E-09	9.93E-09	5.69E-12	7.66E-11	3.06E-11	-2.62E-09	1.49E-08
HTP-nc	6.12E-08	6.72E-09	1.04E-08	1.46E-07	1.53E-07	2.05E-10	2.90E-09	9.30E-10	-3.81E-08	3.44E-07
SQP	6.53E+01	1.02E+00	8.26E+00	9.26E+00	1.43E+02	6.48E-02	1.71E+00	3.57E-01	-1.53E+00	2.28E+02

Figure 4 shows the contributions to GWP total for each module based on the end-of-life scenario. Recycling shows the largest credits, while incineration has smaller credits and significant emissions from product combustion. Landfill has minimal emissions and credits because the product has minimal biogenic C, and it does not anaerobically biodegrade.

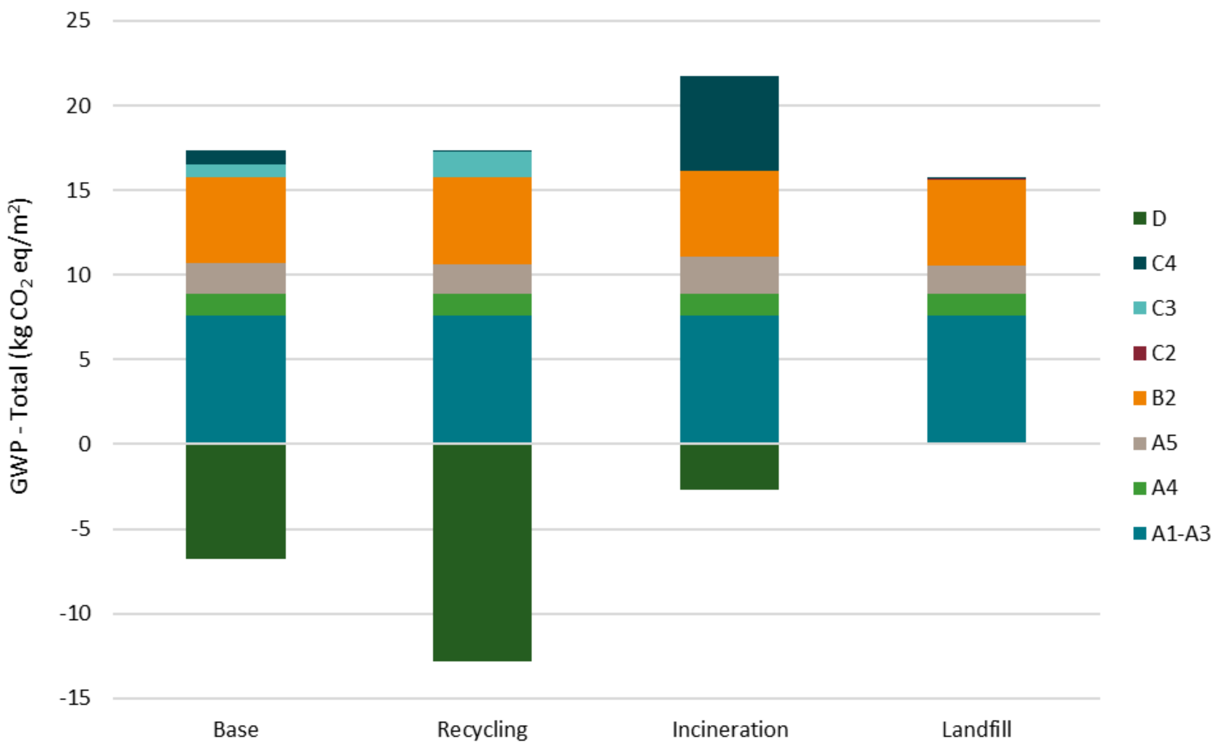

Figure 4: Contributions to GWP for each waste management scenario for LVT (excludes B4)

5. LCA Interpretation

Analysis of impact categories on various life cycle stages reveals that the replacement, production, transportation (oceanic and road), and maintenance of the LVT product are the main contributors to its environment impacts. The Use Stage (B2 and B4) results are sensitive to the choice of RSL and ESL. Using a 25-year RSL reduces cradle-to-grave impacts by over 50% compared to a 10-year RSL, and over a single year the maintenance impacts are negligible. However, the 75-year ESL significantly increases their contributions to the results. The process contribution analysis reveals that PVC raw materials, transportation, and maintenance contribute the most to the environmental impacts.

The LCA study has been carried out based on available information, including that from regional and global databases and experience, to make the results as accurate, complete and representative as possible.

6. Additional Environmental Information

6.1. Environment and Health During Manufacturing

No substances required to be reported as hazardous, as listed in the "List of Toxic Chemicals Severely Restricted on the Import and Export in China (Circular No. 65 [2005]) and Measures for the Administration of Restricted Use of Hazardous Substances in Electrical and Electronic Products (Circular No. 32 [2016])", are associated with the production of this product.

6.2. Environment and Health During Installation

Instructions should be followed as indicated on the Safety Data Sheets and installation guidelines. More information can be found at https://novafloor.us/tech-information/

6.3. Extraordinary Effects

Fire

ASTM E648 Critical Radiant Flux: Class I, >0.45 W/cm^2
ASTM E662 Smoke Density: Passes, <450
EN 13501-1: Bfl-s1

Water
In daily use, prevent water and moisture from accumulating underneath walk-off mats. Exposure to flooding for long periods may result in damage to the product.

Mechanical Destruction
Performance requires proper installation according to Therdex installation guidelines available at https://novafloor.us/tech-information/

6.4. Further Information

Therdex Rigid Click flooring is certified with Eurofins Indoor Air Comfort Gold, GREENGUARD Gold, and FloorScore®. The total VOC emissions of the product are no more than 0.5 mg/m3 after a test period of 14 days and less than 100 µg/m^3 after 28 days according to EN 16516.The product complies with California DPH Section 01350 Version 1.2 for the school classroom, private office, and single-family residence parameters.

7. References

UL ENVIRONMENT

UL Environment General Program Instructions April 2017, version 2.1

Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL Environment (September 2022, version 4.0)

Part B: Flooring EPD Requirements UL 10010-7, v.2.0. 2018

SUSTAINABILITY REPORTING STANDARDS

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

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LCA DATA

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