**ENVIRONMENTAL** PRODUCT DECLARATION

# NEEDLEFELT FORTE TILE

FORBO FLOORING SYSTEMS
TEXTILE FLOOR COVERING

Needlefelt Forte Tile 9600T smoke, 96017T marine, 96047T Pacific

FLOORING SYSTEMS

The robust, hardwearing properties of needlefelt floors make them ideal for areas with heavy traffic or where chairs with castors are likely to be used, such as in offices and retail establishments. The textile look and range of colouring will blend harmoniously and inadvertently into any interior design scheme. Needlefelt often provides a cost-efficient alternative to conventional broadloom carpeting in heavily used areas that require a practical and durable floor covering.

Forbo was the first flooring manufacturer to publish a complete Life Cycle Assessment (LCA) report verified by CML in 2000 to create full transparency that is independently evaluated. To offer further transparency this EPD is also including additional information to show the impacts on human health and eco-toxicity.
For more information visit;
www.forbo-flooring.com

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

# ENVIRONMENTAL PRODUCT DECLARATION

FLOORING SYSTEMS

**Needlefelt Forte Tile**
Textile Floor covering

**According to ISO 14025 and EN 15804**

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

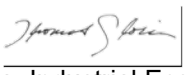
| | |
|---|---|
| PROGRAM OPERATOR | UL Solutions |
| DECLARATION HOLDER | Forbo Flooring B.V.<br>Industrieweg 12<br>P.O. Box 13<br>NL-1560 AA Krommenie |
| DECLARATION NUMBER | 4790857517.102.1 |
| DECLARED PRODUCT | Needlefelt Forte Tile Textile Floor Covering |
| REFERENCE PCR | EN 15804+A2: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products<br>EN 16810:2017 Resilient, textile and laminate floor coverings – Environmental product declarations – Product category rules |
| DATE OF ISSUE | March 1, 2024 |
| PERIOD OF VALIDITY | 5 Years |
| CONTENTS OF THE DECLARATION | Product definition and information about building physics<br>Information about basic material and the material's origin<br>Description of the product's manufacture<br>Indication of product processing<br>Information about the in-use conditions<br>Life cycle assessment results<br>Testing results and verifications |
| The PCR review was conducted by: | European Standards<br>CEN/TC 134<br>www.en-standard.eu/ |
| This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories | Cooper McCollum |

# ENVIRONMENTAL PRODUCT DECLARATION

forbo
FLOORING SYSTEMS

**Needlefelt Forte Tile-**
Textile Floor covering

**According to ISO 14025 and EN 15804**

| ☐ INTERNAL ☒ EXTERNAL | Cooper McCollum, UL Solutions |
|---|---|
| This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by: |  Thomas P. Gloria, Industrial Ecology Consultants |

This EPD conforms with EN 15804

Environment

FLOORING SYSTEMS

**Needlefelt Forte Tile-**
Textile Floor covering

According to ISO 14025 and EN 15804

# 1 Product Definition

## 1.1 Description of Company/Organization

Part of Forbo Flooring Systems, Needlefelt are a high quality fibre bonded broadloom and modular flooring system specifically designed for commercial flooring spaces. Manufactured in Reims, in France, Needlefelt is available in a selection of coarse fibre and fine fibre constructions in numerous colour options.

Making Needlefelt has always been done in a way to achieve the lowest carbon footprint; the starting point for innovation and development. The Forbo organization has key environmental focus areas to displaying a carbon-negative product portfolio, using renewable electricity and biogas, becoming a zero-waste company and actively contributing to the circular economy.

For its complete manufacturing of Needlefelt, Forbo holds all the main certifications. For environmental performance **ISO 14001**, for quality **ISO 9001, SA8000** for social accountability and **ISO 45001** for Occupational Health and Safety Management Systems. In addition, Needlefelt meet the criteria G.U.T. for indoor pollutants, odours and VOC's.

## 1.2 Product Classification and description

This declaration covers Needlefelt Forte Tile. Forte Tile is a textile floor covering complying with all the requirements of the EN1307 Class 33 specification. The raw materials used in the construction of Needlefelt products are chosen for their low volatile organic compound levels combined with their high level of recycled content.

The recycled content of the product is  63%

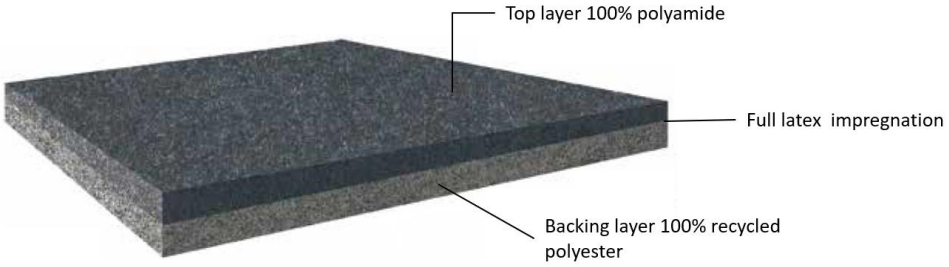



**Figure 1: Illustration of Needlefelt**

The declaration refers to the declared/functional unit of 1m² installed flooring product.

## 1.3 Range of application

Needlefelt Forte Tile is classified in accordance with EN1307 to be installed in the following use areas defined in EN-ISO 10874:


## 1.4 Product Standard

The products considered in this EPD have the following technical specifications:

- Meets or exceeds all technical requirements EN1307 Class 33

Needlefelt Forte Tile meet the requirements of
EN 14041 and BS EN 14041 Essential characteristics

| | | |
|---|---|---|
| EN 13501-1 | Reaction to fire | Bfl - s1, G, NCS |
| EN 13893 | Slip resistance | μ ≥ 0.30 |
| ISO 6356 | Body voltage | ≤ 2.0 kV |
| EN 12667 | Thermal conductivity | 0.06 W/mK |

Emission testing :

- 01350 Indoor Air Quality Standard: Indoor Air Comfort Gold standard
- Prodis G.U.T

## 1.5 Accreditation

All Forbo Flooring Systems' manufacturing operations have certified Management System in accordance with:

- ISO 9001 Quality Management System
- ISO 14001 Environmental Management System
- ISO 45001 Occupational Health and Safety Management Systems
- SA 8000 Social Accountability standard

### 1.6 Delivery status

*Table 1: Specification of delivered product*

| Characteristics | Nominal Value | Unit |
|---|---|---|
| Product thickness | 6.2 ± 10% | mm |
| Product weight | 1350 | g/m$^2$ |
| Tile size | 50 x 50 | cm |

## 2 Material Content

### 2.1 Material Content of the Product

*Table 2: Composition of Needlefelt Forte Tile*

| Component | Material | Availability | | | Amount [%] | Origin |
|---|---|---|---|---|---|---|
| | | Renewable | Recycled | Non-Renewable | | |
| Staple fiber | Nylon 6<br>Polyester | | <br>Post consumer | Limited | 18.9%<br>63% | Europe<br>Europe |
| Binder | Carboxylated SBR latex | | | Limited | 14.8% | Europe |
| Substrate | PE foil | | | Limited | 3.3% | Europe |

### 2.2 Production of Main Materials

**Nylon 6:** Nylon 6 is synthesized by ring-opening polymerization of caprolactam. During polymerization, the amide bond within each caprolactam molecule is broken, with the active groups on each side re-forming two new bonds as the monomer becomes part of the polymer backbone.

**Polyester:** Polyester is a category of polymers that contain the ester functional group in their main chain. As a specific material, it most commonly refers to a type called polyethylene terephthalate (PET).

**Carboxylated SBR latex:** Made by the polymerization of styrene and butadiene with several percent of carboxylic acid.

**PE foil:** used as a substrate, provides better dimensional stability during processing

## 3 Production of the Floor Covering

### 3.1 Manufacturing

Needlefelt is produced in several stages starting with the needle punching of the underlayer (consists of consolidating a sheet of fibres by making penetrations of special needles). The underlayer is needle punched with the same technology. These two layers are needle punched together. Then the product is sent to the finishing line: a latex is deposited on the back of the product and goes between two cylinders which regulates penetration of the latex. Inspection is done and edges are cut. Finally the floor covering is cut into 50x50 tiles, boxed and is sent to the warehouse department.

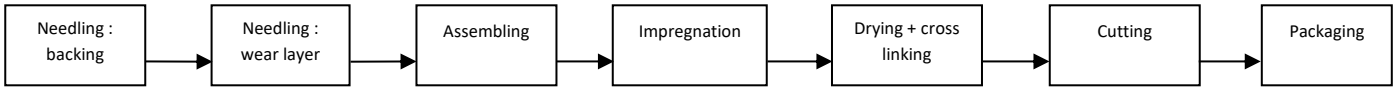



Figure 2: Production process of Needlefelt Forte Tile

## 4 Delivery and Installation of the Floor Covering

### 4.1 Delivery

A worldwide distribution by truck and container ship is utilized. On average every square meter of Needlefelt Forte Tile is transported as follows:

- Transport distance 40 t truck (Euro 5) 694 km
- Transport distance 7.5 t truck (Euro 5) 257km
- Capacity utilization trucks (including empty runs) 100%
- Transport distance Ocean ship 0 km
- Capacity utilization Ocean ship 100%

### 4.2 Installation

Because of the specific techniques used during the installation of Needlefelt, approximately 4% of the material is cut off as installation waste. For installation of Needlefelt on the floor, as a scenario has been modeled assuming a 0.35 kg/m$^2$ of flooring adhesive is applied to the sub-floor.

Post production waste during the installation process may be recycled as floor covering through the manufacturers' facilities or thermally recycled in a waste incineration plant. Since the major part of Needlefelt is sold in Europe, the European electricity grid mix is used in the calculations for the energy recovery during incineration.

## 5 Use stage

The service lifetime of a floor covering for a certain application on a floor is too widespread to give one common number. For this EPD model the reference service lifetime (RSL) is set to one year. This means that all impacts for the use phase are based on the cleaning and maintenance model for one year. Depending on the area of use, the technical lifetime advised by the manufacturer and the estimated time on the floor by the customer, the service lifetime

can be determined. The use phase impacts should be multiplied with the foreseen service life to arrive at the total environmental impact.

### 5.1 Cleaning and Maintenance

| Level of use | Cleaning Process | Cleaning Frequency | Consumption of energy and resources |
|---|---|---|---|
| Commercial/Residential | Vacuuming | Daily | Electricity |
| | Spot/spill clean | As spill occurs | Spotting agent |
| | Wet cleaning | Four times each year | Hot water<br>Neutral detergent |

For the calculations the following cleaning regime is considered:

- Dry cleaning with a 1.5 kW vacuum cleaner for 0.21 min/$m^2$ every day. This equates to 1.92 kWh/$m^2$*year.
- Four times a year wet cleaning with 0.062 l/$m^2$ water and 0.0008 kg/$m^2$ detergent. This result in the use of 0.248 l/$m^2$*year water and 0.0032 kg/$m^2$*year detergent. The wet cleaning takes place without power machine usage. The waste water treatment of the arising waste water from cleaning is considered (Data source from Forbo GaBi model).

The cleaning regime that is recommended in practice will be highly dependent on the use of the premises where the floor covering is installed. In high traffic areas more frequent cleaning will be needed compared to areas where there is low traffic. The use of an entrance mat of at least four steps will reduce the cleaning frequency.

The cleaning regime used in the calculations is suitable for high traffic areas.

### 5.2 Prevention of Structural Damage

All newly laid floor covering should be covered and protected with a suitable non-staining protective covering if other building activities are still in progress.

## 6 End of Life

The deconstruction of installed Needlefelt from the floor is done mechanically and the electrical energy needed for this is estimated to be 0.03kWh/sqm. This amount of energy is included in the calculations.
For the end of life stage two scenarios have been calculated assuming that the flooring is either 100% incinerated or 100% landfilled.

## 7 Life Cycle Assessment

A full Life Cycle Assessment has been carried out according to ISO 14040 and ISO 14044.

A1-3 : Product Stage (Raw material acquisition, transportation to Manufacturing and Manufacturing)
A4-5 : Construction process stage (Transport Gate to User, installation flooring)
B2 : Use Stage (Maintenance of the floor). For floor coverings the modules B1, B3 to B7 are not relevant to the environmental performance of a product.
C1-4 : End of Life Stage (Deconstruction, transport, waste processing, Disposal). Two different End of Life scenarios are declared and the results are indicated separately in module C. Each scenario is calculated as a 100% scenario:
Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
Scenario 2: 100% landfill disposal
D : Benefits and loads beyond the system boundary (Reuse, recovery, recycling potential)

End of life scenario 1: 100% Municipal Waste Incineration (MWI) with $R_1$ > 60%

- C3-1 (Waste processing): Impact from waste incineration, generated electricity and steam are listed in the result table as exported energy
- C4-1 (Disposal): The product waste leaves the system in module C3-1 and causes no additional impact
- D-1 (Recycling potential): Benefits for generated energy due to incineration of product waste at the end-of-life

End of life scenario 2: 100% landfill disposal

- C3-2 (Waste processing): Landfill disposal needs no waste processing and causes no additional impact
- C4-2(Disposal): Impact from landfill disposal
- D-2 (Recycling potential): Benefits for generated energy due to landfill disposal of product waste at the end of life

Modules C3-2 and C4-1 cause no additional impact and are therefore not displayed in the result tables.

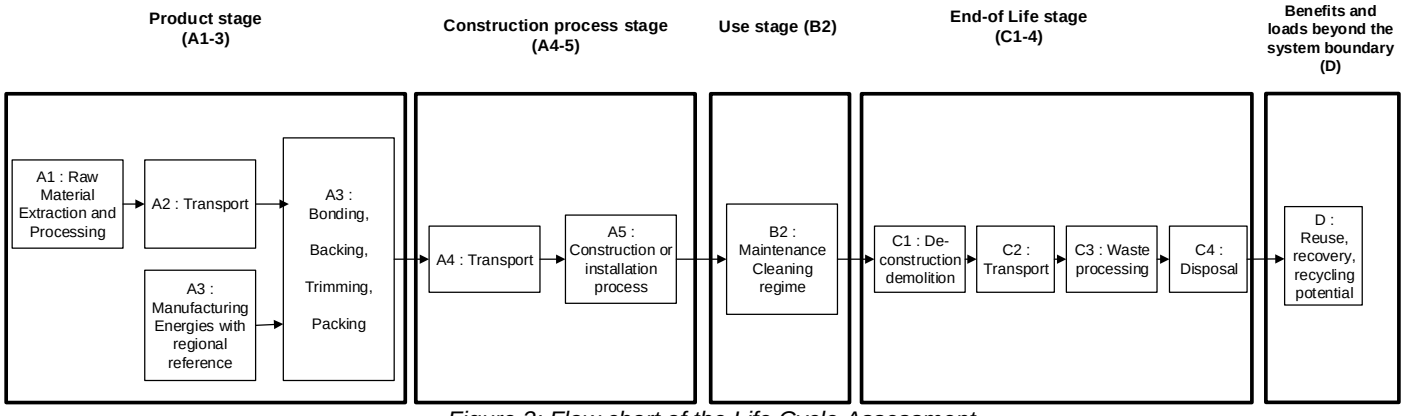



*Figure 3: Flow chart of the Life Cycle Assessment*

Comparisons of different floor coverings are only allowed, where EN 15804 consistent and/or preverified background data and EN 15804 consistent calculation methods and database versions are used and when the building context is

taken into account, i.e. on the basis of the same use-classification (EN ISO 10874), same service life and comparable assumptions for the end of life.

### 7.1 Description of the Declared Functional Unit

The functional unit is one square meter of installed product and the use stage is considered for one year of service life.

### 7.2 Cut off Criteria

The cut-off criteria shall be 1% of renewable and non-renewable primary energy usage and 1% of the total mass of the unit process. The total neglected input flows per module shall be a maximum of 5% of energy usage and mass.

In practice, in this assessment, all data from the production data acquisition are considered, i.e. all raw materials used as per formulation, use of water, electricity and other fuels, the required packaging materials, and all direct production waste. Transport data on all considered inputs and output material are also considered.

### 7.3 Allocations

In the present study some allocations have been made. Detailed explanations can be found in the chapters below.

### 7.4 Co-product allocation

No co-product allocation occurs in the product system.

### 7.5 Allocation of multi-input processes

The Production and End of Life stage include incineration plants. In these processes different products are treated together within a process. The allocation procedures followed in these cases are based on a physical classification of the mass flows or calorific values.

Credits from energy substitution are allocated to the production stage, because the gained energy from energy substitution is lower than the energy input in this stage. The same quality of energy is considered.

### 7.6 Allocation procedure of reuse, recycling and recovery

The installation waste and end of life waste is fed into incineration processes. Incineration processes include cogeneration processes which give thermal and power energy as outputs. It is assumed that this recovered energy offsets that produced by the European average grid mix and thermal energy generation from natural gas. The gained energy is declared in module D as avoided environmental burden. Generated electricity and steam due to the incineration of installation and end of life waste are listed in the result table as exported energy.

### 7.7 Description of the allocation processes in the LCA report

The description of allocation rules in of this LCA report meets the requirements of the PCR.

# 8 LCA Data

As a general rule, specific data derived from specific production processes or average data derived from specific production processes have been used as the first choice as a basis for calculating an EPD.

For life cycle modeling of the considered products, the GaBi 10 Software System for Life Cycle Engineering, developed by Sphera has been used. All relevant LCA datasets are taken from the GaBi 10 software database. The datasets from the database GaBi are documented in the online documentation. To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

## 8.1 Data Quality

The requirements for data quality and LCA data correspond to the specifications of the PCR.

Foreground data are based on 1 year averaged data (year 2023). The reference ages of LCA datasets vary but are given in the table in the Appendix. The time period over which inputs to and outputs from the system is accounted for is 100 years from the year for which the data set is deemed representative. The technological LCA of the collected data reflects the physical reality of the declared product. The datasets are complete, conform to the system boundaries and the criteria for the exclusion of inputs and outputs and are geographical representative for the supply chain of Forbo flooring.

For life cycle modeling of the considered products the GaBi 10 Software System for Life Cycle Engineering, developed by Sphera, is used. All relevant LCA datasets are taken from the GaBi 10 software database. The last revision of the used data sets took place within the last 10 years.

## 8.2 System Boundaries

Production Stage includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage.

Transport and Installation Stage includes provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction stage. These information modules also include all impacts and aspects related to any losses during this construction stage (i.e. production, transport, and waste processing and disposal of the lost products and materials). For the transportation a worldwide distribution is considered.

Use Stage includes provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage. These information modules also include all impacts and aspects related to the losses during this part of the use stage (i.e. production, transport, and waste processing and disposal of the lost products and materials).

End of Life Stage includes provision and all transports, provision of all materials, products and related energy and water use. It also includes any declared benefits and loads from net flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state in the form of reuse, recovery and/or recycling potentials.

## 8.3 Power mix

The selection of LCA data for the electricity generation is in line with the PCR.
The products are manufactured in Reims, France. The GaBi 10 hydro power dataset have therefore been used (reference year 2023). The energy supplier is providing Forbo with a certificate every year.

## 8.4 $CO_2$-Certificates

No $CO_2$-certificates are considered in this study.

## 8.5 Life Cycle Inventory Analysis

In the table 3 the environmental impacts are presented for all the lifecycle stages with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal.

Table 3: Results of the LCA – Environmental impact for Needlefelt Forte Tile (one year)

| **Parameter** | A1-A3 | A4 | A5 | B2 | C1 | C2 | C3/1 | C4/2 | D/1 | D/2 |
|---|---|---|---|---|---|---|---|---|---|---|
| GWP - total [kg CO2 eq.] | 1,46E+00 | 2,24E-01 | 1,77E-01 | 6,39E-01 | 2,23E-03 | 1,12E-02 | 2,35E+00 | 2,08E+00 | -3,32E-01 | 0,00E+00 |
| GWP - fossil [kg CO2 eq.] | 1,83E+00 | 2,19E-01 | 1,74E-01 | 6,32E-01 | 2,20E-03 | 1,12E-02 | 6,36E-01 | 1,80E-01 | -3,30E-01 | 0,00E+00 |
| GWP - biogenic [kg CO2 eq.] | -3,78E-01 | 3,57E-03 | 2,60E-03 | 6,99E-03 | 2,39E-05 | -1,56E-04 | 1,71E+00 | 1,90E+00 | -1,87E-03 | 0,00E+00 |
| GWP - luluc [kg CO2 eq.] | 2,13E-04 | 1,08E-03 | 1,55E-05 | 6,74E-05 | 2,37E-07 | 1,02E-04 | 7,01E-06 | 7,64E-05 | -2,13E-05 | 0,00E+00 |
| ODP [kg CFC-11 eq.] | 1,53E-10 | 1,02E-14 | 5,89E-13 | 1,38E-10 | 4,02E-14 | 9,67E-16 | 2,67E-13 | 1,56E-13 | -2,57E-12 | 0,00E+00 |
| AP [Mole of H+ eq.] | 7,69E-03 | 6,93E-04 | 3,53E-04 | 1,33E-03 | 4,65E-06 | 3,84E-05 | 1,92E-03 | 4,83E-04 | -4,09E-04 | 0,00E+00 |
| EP - freshwater [kg P eq.] | 8,98E-05 | 4,26E-07 | 2,94E-07 | 2,47E-06 | 8,12E-09 | 4,03E-08 | 7,27E-08 | 1,83E-05 | -5,31E-07 | 0,00E+00 |
| EP - marine [kg N eq.] | 8,21E-04 | 3,33E-04 | 9,85E-05 | 3,20E-04 | 1,11E-06 | 1,76E-05 | 8,73E-04 | 9,56E-04 | -1,20E-04 | 0,00E+00 |
| EP - terrestrial [Mole of N eq.] | 2,88E-02 | 3,74E-03 | 1,08E-03 | 3,33E-03 | 1,16E-05 | 1,99E-04 | 9,90E-03 | 1,77E-03 | -1,28E-03 | 0,00E+00 |
| POCP [kg NMVOC eq.] | 6,80E-03 | 6,34E-04 | 2,76E-04 | 8,52E-04 | 2,97E-06 | 3,50E-05 | 2,25E-03 | 1,05E-03 | -3,33E-04 | 0,00E+00 |
| ADPF [MJ] | 3,06E+01 | 1,59E+00 | 4,49E+00 | 1,31E+01 | 4,58E-02 | 1,50E-01 | 9,06E-01 | 1,39E+00 | -6,03E+00 | 0,00E+00 |
| ADPE [kg Sb eq.] | 1,26E-07 | 7,53E-09 | 7,35E-09 | 9,60E-08 | 3,38E-10 | 7,13E-10 | 2,46E-09 | 2,45E-09 | -2,36E-08 | 0,00E+00 |
| WDP [m³ world equiv.] | 2,19E+01 | 1,35E-03 | 7,83E-03 | 1,49E-01 | 4,85E-04 | 1,27E-04 | 2,69E-01 | 6,82E-03 | -3,12E-02 | 0,00E+00 |

Caption: GWP - total = global warming potential; GWP - fossil = global warming potential (fossil fuel only); GWP - biogenic = global warming potential (biogenic); GWP - luluc = global warming potential (land use only); ODP = ozone depletion; AP = acidification terrestrial and freshwater; EP - freshwater = eutrophication potential (freshwater); EP - marine = eutrophication potential (marine); EP-terrestrial = eutrophication potential (terrestrial); POCP = photochemical ozone formation; ADPE = abiotic depletion potential (element), ADPF = abiotic depletion potential (fossil) WDP = water scarcity

## 8.6 Interpretation

The interpretation of the results has been carried out considering the assumptions and limitations declared in the EPD, both methodology- and data-related for a one year usage.
In almost all of the impact categories the production stage (A1-A3) has the main contribution to the overall impact. The raw material supply, in particular PA 6 and latex are the key contributors for these impact categories.
Forbo declares in the EPD a worldwide distribution which has a limited effect on most of the impact categories. Only for GWP-luluc, AP, EP-marine & terrestrial and POCP there is a significant share of the total caused by the trucks used to transport the product.
The installation of Needlefelt Forte has for all the environmental indicators a minor impact of 0-5% of the total environmental impact, caused by the adhesive and the disposal of the cutting waste.
In the Use stage the electricity needed to vacuum the floor is the main contributor. The cleaning regime used in the calculations is a worst-case scenario which will be in practice almost always be lower.

## 8.7 Resource use

In table 4 the parameters describing resource use are presented for all the lifecycle stages for a one year usage with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal.

Table 4: Results of the LCA – Resource use for Needlefelt Forte Tile (one year)

| | A1 | A2 | A3 | A4 | A5 | B2 | C1 | C2 | C3 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| PERE [MJ] | 5,31E+00 | 1,12E-01 | 2,98E-01 | 7,79E+00 | 2,74E-02 | 1,06E-02 | 1,61E-01 | 1,25E-01 | -1,76E+00 | 0,00E+00 |
| PERM [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 |
| PERT [MJ] | 5,31E+00 | 1,12E-01 | 2,98E-01 | 7,79E+00 | 2,74E-02 | 1,06E-02 | 1,61E-01 | 1,25E-01 | -1,76E+00 | 0,00E+00 |
| PENRE [MJ] | 4,33E+01 | 1,59E+00 | 4,49E+00 | 1,31E+01 | 4,58E-02 | 1,51E-01 | 9,07E-01 | 1,39E+00 | -6,03E+00 | 0,00E+00 |
| PENRM [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 |
| PENRT [MJ] | 4,33E+01 | 1,59E+00 | 4,49E+00 | 1,31E+01 | 4,58E-02 | 1,51E-01 | 9,07E-01 | 1,39E+00 | -6,03E+00 | 0,00E+00 |
| SM [kg] | 1,01E+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] | 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] | 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] | 5,13E-01 | 1,24E-04 | 6,33E-04 | 6,29E-03 | 2,21E-05 | 1,17E-05 | 6,34E-03 | 2,03E-04 | -1,42E-03 | 0,00E+00 |

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

## 8.8 Waste categories and output flows

In table 5 other environmental information describing different waste categories and output flows are presented for all the lifecycle stages with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal.

Table 5: Results of the LCA – Output flows and Waste categories for Needlefelt Forte Tile (one year)

| | A1 | A2 | A3 | A4 | A5 | B2 | C1 | C2 | C3 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| HWD [kg] | 6,33E-09 | 5,89E-12 | 4,81E-10 | -1,02E-09 | -3,59E-12 | 5,57E-13 | 7,22E-11 | 1,17E-10 | -3,20E-10 | 0,00E+00 |
| NHWD [kg] | 3,95E-02 | 2,29E-04 | 1,81E-03 | 9,82E-03 | 3,36E-05 | 2,17E-05 | 3,06E-02 | 9,79E-01 | -2,98E-03 | 0,00E+00 |
| RWD [kg] | 3,45E-04 | 2,06E-06 | 3,12E-05 | 2,07E-03 | 7,29E-06 | 1,95E-07 | 3,36E-05 | 1,64E-05 | -4,66E-04 | 0,00E+00 |
| 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 | 1,35E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+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] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 4,19E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| EET [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 7,54E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

### 8.9 Biogenic Carbon content

Table 6: Information describing the biogenic carbon content at the factory gate

| Biogenic carbon content | Unit (kg $CO_2/m^2$) |
|---|---|
| Biogenic carbon content in product | 0.40 |
| Biogenic carbon content in accompanying packaging | 0.15 |
| Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of $CO_2$ | |

## 9 Additional Environmental Impact Indicators

To be fully transparent Forbo Flooring does not only want to declare the environmental impacts required in the PCR, but also the additional environmental impact indicators according to the European Standard EN15804+A2 with two End of Life scenarios:

- Scenario 1: 100% Municipal Waste Incineration (MWI) with R1 > 60%
- Scenario 2: 100% landfill disposal.

Table 7: Results of the LCA – Environmental impacts one lifecycle (one year) – Needlefelt Forte Tile-

| | A1 | A2 | A3 | A4 | A5 | B2 | C1 | C2 | C3 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| PM [Disease incidences] | 6,36E-08 | 4,36E-09 | 2,77E-09 | 1,12E-08 | 3,91E-11 | 2,48E-10 | 5,95E-09 | 4,62E-09 | -3,47E-09 | 0,00E+00 |
| IR [kBq U235 eq.] | 7,43E-02 | 2,97E-04 | 3,35E-03 | 3,45E-01 | 1,21E-03 | 2,81E-05 | 5,25E-03 | 2,43E-03 | -7,76E-02 | 0,00E+00 |
| ETF-fw [CTUe] | 1,16E+01 | 1,11E+00 | 1,55E+00 | 5,77E+00 | 2,02E-02 | 1,05E-01 | 3,07E-01 | 3,28E+00 | -1,32E+00 | 0,00E+00 |
| HTP-c [CTUh] | 3,28E-10 | 2,25E-11 | 7,43E-11 | 1,92E-10 | 6,74E-13 | 2,13E-12 | 6,83E-11 | 6,63E-11 | -6,68E-11 | 0,00E+00 |
| HTP-nc [CTUh] | 1,75E-08 | 1,77E-09 | 5,49E-09 | 4,73E-09 | 1,66E-11 | 1,45E-10 | 6,59E-09 | 7,28E-09 | -2,08E-09 | 0,00E+00 |
| SQP [Pt] | 1,23E+03 | 6,62E-01 | 2,52E-01 | 5,12E+00 | 1,80E-02 | 6,27E-02 | 1,83E-01 | 1,20E-01 | -1,16E+00 | 0,00E+00 |
| Caption: PM = Particulate matter emissions; IR = Ionizing radiation, human health; ETF-fw = Eco-toxicity (freshwater); HTP-c = Human toxicity, cancer effects; HTP-nc = Human toxicity, non-cancer effects, SQP = Soil quality potential/ Land use related impacts | | | | | | | | | | |

### 9.1 Interpretation

The interpretation of the results has been carried out considering the assumptions and limitations declared in the EPD, both methodology- and data-related for a one year usage.

As with the mandatory environmental impact categories, the production phase is dominant in the contribution of the total lifespan of the additional environmental impact indicators. This is largely due to the production of the raw materials.
A much smaller impact is coming from the thermal energy used to manufacture the Needlefelt Forte Tile.

## 9.2 Disclaimers to the declaration of core and additional environmental impact indicators

According to the "ILCD Handbook: Recommendations for Life Cycle Impact Assessment in the European context" the recommended characterization models and associated characterization factors are classified according to their quality into three levels:

- Type 1 (recommended and satisfactory),
- Type 2 (recommended but in need of some improvements)
- Type 3 (recommended, but to be applied with caution).

*Table 10: Classification of disclaimers to the declaration of core and additional environmental impact indicators*

| ILCD classification | Indicator | Disclaimer |
|---|---|---|
| ILCD Type 1 | Global Warming Potential (GWP) | None |
| | Depletion potential of the stratospheric ozone layer (ODP) | None |
| | Potential incidence of disease due to PM emissions (PM) | None |
| ILCD Type 2 | Acidification potential, Accumulated Exceedance (AP) | None |
| | Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater) | None |
| | Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine) | None |
| | Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | None |
| | Formation potential of tropospheric ozone (POCP) | None |
| | Potential Human exposure efficiency relative to U235 (IRP) | 1 |
| ILCD Type 2 | Abiotic depletion potential for non-fossil resources (ADP-minerals&metals) | 2 |
| | Abiotic depletion potential for fossil resources (ADP-fossil) | 2 |
| | Water (user)deprivation potential, deprivation-weighted water consumption (WDP) | 2 |
| | Potential Comparative Toxic Unit for ecosystems (ETP-fw) | 2 |
| | Potential Comparative Toxic Unit for humans HTP-c) | 2 |
| | Potential Comparative Toxic Unit for humans HTP-nc) | 2 |
| | Potential Soil quality index (SQP) | 2 |
| Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator | | |
| Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator. | | |

## 10 References


| | |
|---|---|
| GABI 10 2012 | SPHERA AG; GaBi 10: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2017. |
| GABI 10 2012D | GaBi 10: Documentation of GaBi 10: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2017. http://documentation.gabi-software.com/ |
| UL ENVIRONMENT | UL Environment's Program Operator Rules |
| PE 2012<br>ILCD Handbook: General guide for Life Cycle Assessment - Detailed guidance | Description of Selected Impact Categories, SPHERA AG, 2012<br>European Commission-Joint Research Centre - Institute for Environment and Sustainability: International Reference Life Cycle Data System (ILCD) Handbook- Recommendations for Life Cycle Impact Assessment in the European context. First edition November 2011. EUR 24571 EN. Luxemburg. Publications Office of the European Union; 2011 |
| **STANDARDS AND LAWS** | |
| DIN EN ISO 14044 | Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006); German and English version EN ISO 14044 |
| ISO 14025 2006 | DIN EN ISO 14025: Environmental labels and declarations — Type III environmental declarations — Principles and procedures |
| ISO 14040 2006 | Environmental management - Life cycle assessment - Principles and framework (ISO 14040); German and English version EN ISO 14040 |
| CEN/TR 15941 | Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; German version CEN/TR 15941 |
| EN15804:2012+A2:2019+AC:2021 | EN 15804: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products |
| EN16810:2017 | Resilient, textile and laminate floor coverings – Environmental product declarations – Product category rules |
| CPR | REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC |
| EN-ISO 10874<br>EN 1307 | Resilient, Textile and laminate floor coverings – Classification<br>Textile floor coverings - Specification |