Environmental Product Declaration according to ISO 14025

nora systems GmbH
noraplan® 913
Rubber Floor Coverings

Declaration number
EPD-NOR-2010111-E

Institut Bauen und Umwelt e.V.
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EPD–NOR–2010111–E

**Product line noraplan® 913**

**Rubber floor coverings continuously vulcanised in sheets**

in various colours and designs

This declaration is an Environmental Product Declaration according to /ISO 14025/ describing the specific environmental performance of the mentioned construction products in Germany. It shall promote the development of environmentally and health-friendly building.

In this validated declaration, all relevant environmental data are disclosed.

The declaration is based on the PCR document „Textile, Laminate and Resilient Floor Coverings“, 31-01-2008.

This validated declaration authorises the use of the label of the Institut Bauen und Umwelt e.V.

It exclusively applies to the products mentioned, three years from date of issue.

The holder of the declaration is liable for underlying data and evidence.

The declaration is complete and provides in detailed form:

- information on base materials and material origin
- descriptions of the product manufacture
- descriptions of the product processing and installation
- information on the use stage, extraordinary influences and end-of-life stage
- results of the life cycle assessment
- evidence and testing results

28 December 2010

**Date of issue**

**Signatures**

Prof. Dr.-Ing. Horst J. Bossemayer (President of the Institut Bauen und Umwelt e.V.)

This declaration and the rules it is based on, were verified by the independent Advisory Board (SVA), according to /ISO 14025/.

**Verification of the declaration**

Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the SVA)
Dr. Birgit Grahl (Verifier appointed by the SVA)
In this Environmental Product Declaration (EPD), resilient rubber floor coverings of the nora systems GmbH product line noraplan® 913 are modelled. Specific characteristics of the noraplan® coverings are:

- **Manufacturing method:** continuously vulcanised rubber floor coverings in sheets
- **Covering structure:** single-layer
- **Composition:** natural and synthetic rubber, minerals from natural sources, colour pigments, and processing aids
- **Emissions performance:** nora floor coverings meet the requirements of the DIBt [German Institute for Building Technology] approval procedure (Health-related Evaluation Procedure (AgBB)). In addition, they were awarded the German “Blue Angel – health-friendly because of low emissions” (Der Blaue Engel – Schützt die Gesundheit, weil emissionsarm) according to the Basic Award Criteria /RAL-UZ 120/ for resilient floor coverings.

High-performance resilient floor coverings for professional use e.g. in health care (hospitals, senior and nursing homes, doctor’s surgeries etc.), office and administration areas, shops and stores, residential buildings, schools and nursery schools.

The **Life Cycle Assessment** (LCA) was carried out according to ISO 14040 (/DIN EN ISO 14040/) and ISO 14044 (/DIN EN ISO 14044/), corresponding to the requirements of the IBU Handbook on Type III Declarations and the specific rules for resilient floor coverings. Specific data on the analysed products as well as data from the “GaBi 4” database were used as the data base. The LCA covers the life cycle stages of the raw materials production, energy generation and manufacture, including transports, as well as scenarios of the use and end-of-life of the products.

**Results of the Life Cycle Assessment: 1 m² floor covering, incl. cut for installation (2.0 mm)**

<table>
<thead>
<tr>
<th>Evaluation category</th>
<th>Unit</th>
<th>Production A1-A3</th>
<th>Installation A4-A5</th>
<th>Use stage (maintenance 1 year) B2</th>
<th>End-of-Life C1-C3</th>
<th>Next product system D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary energy (non renewable)</td>
<td>[MJ]</td>
<td>178,2</td>
<td>0,1</td>
<td>5,2</td>
<td>4,8</td>
<td>-33,7</td>
</tr>
<tr>
<td>Primary energy (renewable)</td>
<td>[MJ]</td>
<td>1,5E+01</td>
<td>-6,4E-01</td>
<td>1,0E-01</td>
<td>1,0E-01</td>
<td>-1,7E-02</td>
</tr>
<tr>
<td>Abiotic depletion potential (ADP elements)</td>
<td>[kg Sb-e]</td>
<td>1,5E-04</td>
<td>5,0E-09</td>
<td>1,5E-07</td>
<td>1,5E-07</td>
<td>-1,2E-07</td>
</tr>
<tr>
<td>Abiotic depletion potential (ADP fossil fuels)</td>
<td>[MJ]</td>
<td>1,7E+02</td>
<td>9,5E-02</td>
<td>4,5E+00</td>
<td>4,2E+00</td>
<td>-3,4E+01</td>
</tr>
<tr>
<td>Global warming potential (GWP)</td>
<td>[kg CO₂-e]</td>
<td>9,8</td>
<td>0,4</td>
<td>0,4</td>
<td>4,4</td>
<td>-2,0</td>
</tr>
<tr>
<td>Ozone depletion potential (ODP)</td>
<td>[kg R11-e]</td>
<td>2,1E-06</td>
<td>5,4E-10</td>
<td>1,9E-08</td>
<td>1,8E-08</td>
<td>-3,3E-09</td>
</tr>
<tr>
<td>Acidification potential (AP)</td>
<td>[kg SO₂-e]</td>
<td>7,6E-02</td>
<td>3,6E-03</td>
<td>1,0E-03</td>
<td>4,8E-03</td>
<td>-2,1E-03</td>
</tr>
<tr>
<td>Eutrophication potential (EP)</td>
<td>[kg PO₄³⁻-e]</td>
<td>5,0E-03</td>
<td>4,4E-04</td>
<td>2,4E-04</td>
<td>1,2E-03</td>
<td>-3,7E-04</td>
</tr>
<tr>
<td>Photochemical ozone creation potential (POCP)</td>
<td>[kg C₂H₄-e]</td>
<td>7,6E-03</td>
<td>2,2E-04</td>
<td>1,0E-04</td>
<td>3,0E-04</td>
<td>-2,2E-04</td>
</tr>
</tbody>
</table>

Prepared by nora systems GmbH, Weinheim (Germany), in cooperation with PE INTERNATIONAL, Leinfelden-Echterdingen (Germany).

Additional evidence and test results for this declaration:
- VOC measurements according to the Health-related Evaluation Procedure /AgBB-Schema/ or the Basic Award Criteria for the Blue Angel /RAL-UZ 120/.

**Evidence and verification**
Scope of validity

Product line noraplan®, designs and surface structures following the same formulation of nora systems GmbH, Weinheim/Bergstrasse, Germany. The declaration refers to floor covering thickness of 2.0 mm.

1. Product definition

Product definition

Resilient floor coverings made of rubber.

Application

Floor coverings for extremely heavy traffic areas in domestic and professional use:

- residential
- commercial
- industrial

Product standards

The following standards apply to the product line noraplan®:

- EN 1817: Resilient floor coverings - Specification for homogeneous and heterogeneous smooth rubber floor coverings.
- EN 14521: Resilient floor coverings - Specification for smooth rubber floor coverings with or without foam backing with a decorative layer.
- EN 685: Resilient, textile and laminate floor coverings - Classification.
- DIN EN 13501-1: Fire classification of construction products and building elements.
- EN 14041: Resilient, textile and laminate floor coverings - Essential characteristics.

noraplan® floor coverings comply with European technical approval standards (CE conformity and marking) and respective national approval standards for building products, e.g. the general technical approval of the German Institute for Building Technology (DIBt).

Placing on the market / Codes of practice

Direct selling to installers and distribution through specialist wholesalers.

Professional installation and cleaning/maintenance according to the nora® installation and cleaning recommendations, available at www.nora.com.

Quality control

Quality Management System certified to ISO 9001 (/DIN EN ISO 9001/)

Delivery condition / Properties

Delivery of metre goods in rolls of 1.22 m width and different lengths, or of tiles of ~ 610 x 610 mm, loose on pallets (semi-finished products). The backs of the coverings are sanded over their entire surface and have arrows indicating the installation direction.

Initial cleaning and initial polishing may only be carried out after the bonding phase of the adhesive, i.e. at the earliest 48 hours after installation.

Because of their dense and closed surface and the “nora cleanguard®” finish, noraplan® floor coverings usually don't need to be coated.

The coverings are permanently resilient, they remain dimensionally stable when bonded and have good ergonomic properties.

Technical properties

Excerpt of technical data sheets: (available at www.nora.com)

- Thickness IAW /EN 428/ 2.0 mm
- Hardness IAW /ISO 7619/ 92 Shore A
- Abrasion resistance IAW /ISO 4649/ 200 mm³
- Improvement in footfall sound absorption IAW /ISO 140-8/ 6 dB
- Anti-slip properties IAW /DIN 51130/ R9 with smooth surface, R10 with structured surface
Beside the declared floor covering with 2.0 mm thickness it is also available with 3.0 mm.
For this product version the improvement in footfall sound absorption IAW /ISO 140-8/ is 8 dB.
This floor covering is also applicable IAW /RN 685/ industrial

2. Basic materials

<table>
<thead>
<tr>
<th>Basic materials / Primary products</th>
<th>Simplified formulation of noraplan®</th>
</tr>
</thead>
<tbody>
<tr>
<td>binder: natural and synthetic rubber</td>
<td>27 %</td>
</tr>
<tr>
<td>minerals (siliceous earth, silicic acid)</td>
<td>53 %</td>
</tr>
<tr>
<td>titanium dioxide (white pigment) and various other pigments</td>
<td>11 %</td>
</tr>
<tr>
<td>auxiliary substances</td>
<td>6 %</td>
</tr>
<tr>
<td>vulcanisation system</td>
<td>4 %</td>
</tr>
</tbody>
</table>

The auxiliary substances used are waxes and antioxidants; the vulcanisation system is based on sulphur as cross linking agent, vulcanisation accelerators and zinc compounds.

Rubber: Synthetic rubber is produced by the chemical industry. In a so-called emulsion polymerisation, small molecular components react to form very long chain molecules, the polymer. The washed and dried polymer is delivered as a solid matter, compressed into bales.

Natural rubber is obtained from the sap of the tropical tree Hevea brasiliensis. After refining, the polymer goes on sale in bales. Natural rubber, a renewable resource, makes up approximately one third of the total amount of rubber in noraplan® 913.

Minerals: Powdery mineral fillers are added to the rubber compound, in order to achieve specific strength properties. nora systems GmbH mainly uses naturally occurring minerals, which are extracted by opencast mining, then fractionated into different grain sizes and dried.

Only a minor part of the minerals is produced synthetically. These materials are characterised by a special particle fineness.

Colouring: Depending on the requested colour shade of the covering, first the white pigment titanium dioxide is used as a basis for the actual colouring. Therefore there are slight differences in the proportion of the colouring components (pigments without toxic heavy metals like lead, chromium, mercury) in the compound.

Auxiliary substances: Waxes are required as processing aids. The antioxidant protects the rubber from premature degradation.

Cross-linking system: By cross-linking with elementary sulphur, a three-dimensional network between the polymer molecules is formed, originating the resilient properties of the composite. Since sulphur is not sufficiently reactive, small quantities of vulcanisation accelerators and zinc compounds have to be added.

The polymers used are – like the majority of plastics – based on crude oil. They are purchased from different European countries. Natural rubber usually originates from Southeast Asia (Thailand, Malaysia).

The natural minerals are mined in Germany. Synthetic minerals are delivered from different European countries.
The minor chemical components are mainly produced in Europe. The remaining quantities originate from the world market, but are exclusively purchased from European distributors.

### Availability of raw materials

The organic raw materials - except natural rubber – are finally based on crude oil, a potentially scarce resource. Natural rubber is obtained on plantations in tropical countries. The availability of cultivated land and uncertainties during harvesting limit the available quantities.

Normally, minerals are more available. Also specialties like the natural mineral siliceous earth are always secured for several decades by appropriate prospecting.

### 3. Manufacturing of the product

#### Manufacturing of the product

The production stages are mixing, kneading, and stretching of the blanks on the calender. The Vulcanisation is continuously executed on production lines with steam heated drum or double belt presses, where under high pressure and at a temperature of approximately 180°C sheets of 1.22 m width are produced. After the vulcanising machine, the sheets are sanded to size and either wound into rolls or, for tiles, cut to length and die-cut. The mass per unit area is 3.36 kg/m².

#### Health protection (production)

Regular measurements prove that all binding occupational exposure limit values for chemicals are consistently met, or rather, considerably under-run. In the high noise areas of heavy machines, hearing protection is used. The lifting of loads (raw materials) is facilitated in many ways through appropriate lifting assistances.

#### Environmental protection (production)

Since 1996, the nora systems GmbH subjects itself to a voluntary auditing of the environmental management system. Since then, it is registered in the EMAS (EU Eco-Management and Audit Scheme) register according to the regulations (EEC) 761/2001 (/EG-Verordnung 761/2001/). Since 2000, the environmental management system is also certified to ISO 14001 - Environmental management systems (/DIN EN ISO 4001/). As a matter of course, all requirements set by authorities (e.g. on immission control) are met.

### 4. Product processing / Installation

#### Processing recommendations

The installation of the floor covering is based on the technical regulations of /DIN 18365/ (Construction contract procedures (VOB) - Part C: General technical specifications in construction contracts (ATV) – Flooring work). Suitable subfloors are made of screed – according to VOB Part C, /DIN 18365/ - Floorcovering Work –, hard poured asphalt - according to /DIN 18354/ Asphalt flooring work –, chipboards, plywood, etc. Before installing rubber floor coverings, the subfloor generally has to be levelled.

The application of the adhesives over the entire surface is done in accordance with the installation recommendations of the nora systems GmbH, using adhesives and further auxiliary material approved and suitable for noraplan® rubber floor coverings (available e.g. at www.nora.com).

When selecting the installation materials the requirements of the basic award criteria of the Blue Angel – “Low-Emission Floor Covering Adhesive and other Installation Materials” (RAL-UZ 113) should be observed. These specifications ensure excellent health protection due to minimised emissions.

In addition, the instructions of the laying material manufacturers are generally to be followed.
Occupational safety / Environmental protection
When working with laying auxiliary material, the latest version of the German standard /TRGS 610/ is to be complied with.

Residual material
Cuttings should be used for energy recovery.

Packaging
The rolled material is wrapped on cardboard cores made of recycled cardboard (the cardboard cores are taken back and re-used) and the outer packaging is made of recyclable paper. The individual rolls are assembled vertically on wooden europool pallets (exchange system) and sealed in recyclable polyethylene foil.

5. Use stage

Cleaning and maintenance
Cleaning of the floor covering depends on the use of the premises. For a typical application (e.g. school building), the following manufacturer’s recommendations are considered in this declaration:

Intensive machine cleaning (single-disc machine with a suitable red pad / soft brush and an aqua-vacuum cleaner), once a year, with a suitable cleaning agent. The surface of the floor covering must be free of any dirt residues.

In order to achieve a uniform and compact protective film, the floor covering should be polished once a month with a suitable polishing pad or polishing brush.

Routine cleaning should be done manually, thrice weekly, with suitable microfibre covers and suitable wash polishes.

Further cleaning recommendations are available at www.nora.com.

Effects on the environment and health
Cleaning agents with a pH-value higher than 12 are not to be used.

Because of their dense surface, noraplan® rubber floor coverings don’t have to be coated during the entire period of use. In consequence, no environmentally critical cleaning liquors have to be disposed of.

Useful life
30 years. Due to their very high abrasion resistance and their single-layer structure (rubber through and through), the floor coverings hardly wear down even when extensively used. When used in the designated areas of application and under the usage conditions commonly associated, they stay fully functional and visually appealing during the indicated useful life.

6. Singular effects

Fire
Flame resistant, fire rating CfI-s1 (BfI-s1 when bonded) according to European standard /EN 13501-1/, free of halogenes, toxicologically safe in the event of fire according to the German standards /DIN 53436-1/ and /DIN 53436-2/.

Water
Resistant to water exposure to the extent to what is typical for indoor use.

Not suitable for real wet areas (e.g. showers, wading pools, etc.)

7. End of life phase

Re-use / Subsequent use / Open-loop recycling / Closed-loop recycling
Material recycling (e.g. granulating and processing into landing mats, industrial or stable mats, and coverings of sports areas), thermal recycling (e.g. use as substitute fuel in thermal power plants), or full material and thermal recycling for energy recovery in the cement industry.

Disposal
The manufacturer recommends introducing the products after their use stage into thermal recycling (waste incineration, use as a secondary fuel in the cement industry with material and thermal recycling). EWC-No. e.g. 17 0203.
8. Life Cycle Assessment

8.1 Manufacture of nora floor coverings

Declared unit Reference value is 1 m² of floor covering, incl. cut for installation (mass per unit area: 3.36 kg/m²). The material for subfloor preparation and adhesive bonding, needed during installation, is not considered.

Information on the complete floor structure can be found in Environmental Product Declarations based to the PCR „Dispersionsklebstoffe und –voranstriche“ and „Mineralische Werkmörtel“.

System boundaries The analysis of the product life cycle includes production of the basic materials (A1), transport of the basic materials (A2), manufacture of the product (A3) and of the packaging materials, and transport of the product (A4). The installation of the floor covering (with consideration of the average cutting) and the disposal of the packaging materials are described in A5. A cleaning scenario according to the manufacturer’s recommendation is described in B2. The end-of-life scenario considers the expenditure for the removal from the building (C1), transport of the material (C2), combustion of the material (C3), and the resultant credits (D).

<table>
<thead>
<tr>
<th>Production Stage</th>
<th>Construction Process Stage</th>
<th>Use Stage</th>
<th>End-of-Life Stage</th>
<th>Next product system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material supply (extraction, processing, recycled material)</td>
<td>Transport to manufacturer</td>
<td>Manufacturing</td>
<td>Transport b. building site</td>
<td>Installation into building</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Assumptions and estimates A portion of the datasets on the upstream chain of the basic material production is approximated with datasets on similar chemicals or is estimated by consolidation of existing datasets (about 10%). The assumptions about the cleaning scenario are described in chapter 5 Use stage. For the end-of-life scenario; it is assumed that 100% of the product is thermally recovered.

Cut-off criteria All data from the production data acquisition, i.e. on all raw material used as per formulation, are considered. Transport expenditures are taken into account for all essential basic materials, the dispatch of the products and the end-of-life scenario. With the LCA calculation, the production waste resulting directly from production, the electrical and thermal energy needed, and the packaging materials, are taken into account.

Machines, facilities and infrastructure used in the manufacture are ignored. Transport expenditures for the packaging are ignored. Thus, even material and energy flows with a proportion of less than 1 % are considered.

Transports Transports of the essential basic materials to nora systems GmbH, and also of the finished product to the installation site, are taken into account, based on statistical
data from nora systems GmbH.
Within the end-of-life scenario, transport is estimated as a lorry transport over 50 km.

Period under consideration
The collection of manufacturing data from 2009 and 2010 serves as the data basis.

Background data
The GaBi 4 database contains datasets for some of the basic materials used in the respective formulations. All data used are less than 6 years old.
Electrical and thermal energy are obtained from a power plant at the industrial site Weinheim, which is operated by the Freudenberg Service KG.

Data quality
For life cycle modelling of the considered products, the "GaBi 4" Software System for Life Cycle Engineering, developed by PE INTERNATIONAL, is used.
The primary data collected from the manufacturer are based on annual quantities, or are projected from measurements on the specific facilities.

Allocation
Production waste (A3) and foil packaging are fed into an energy recovery process. The energy gained is offset by equivalence processes.
Regarding the disposal of used wooden pallets, the energy expenditure for the manufacture of wood chips is taken into account and primary energy for the energy carrier wood is credited.
The manufacturing process does not create any by-products, so that an allocation in the methodological sense is not necessary.

8.2 Description of the assessment results and analysis

Life cycle inventory analysis
Mass and energy flows within the considered system boundaries are determined and related to the reference value of 1 m² of floor covering, incl. cut for installation.

Primary energy
The primary energy demand is basically determined by the expenditure for the basic material production. Considering the pure production phase ("cradle-to-gate" / A1 to A3), the expenditure for the basic materials lies at approximately 85 %, the bigger part being caused by the manufacture of the rubbers and mineral fillers. The primary energy expended during the manufacturing process has a share of approximately 14 % in relation to the whole production phase (A1-A3).
When considering the primary energy needed for the cleaning (according to the manufacturer’s recommendation) over the whole use period of 30 years, a further essential aspect becomes apparent. The expenditure for cleaning corresponds approximately to the one for the production of the basic materials and is mainly determined by the production of the assumed cleaning agent.

Due to the energy content (heating value of approximately 17 MJ) of the product, incineration during the end-of-life stage scenario results in an energy gain. This credit is accounted for in module D.
The use of renewable material (basically natural rubber) results in a significant contribution regarding renewable resources, which becomes obvious in the graphs for single energy carriers.
Figure 1: Demand on non renewable resources for the production of 1 m² noraplan® 913 (incl. cut for installation)

Figure 2: Demand on renewable resources for the production of 1 m² noraplan® 913 (incl. cut for installation).
**Table 1: LCA results: input of resources**

(reference value: 1 m² of floor covering, incl. cut for installation, mass per unit area: 3.36 kg/m²)

<table>
<thead>
<tr>
<th>noraplan 913</th>
<th>Production stage</th>
<th>Construction Process Stage</th>
<th>Use stage</th>
<th>End-of-Life Stage</th>
<th>Next product system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
</tr>
<tr>
<td>Primary energy demand (non renewable)</td>
<td>[MJ]</td>
<td>166.3</td>
<td>1.3</td>
<td>20.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Primary energy demand (renewable)</td>
<td>[MJ]</td>
<td>1.8E-01</td>
<td>1.7E-03</td>
<td>5.6E-00</td>
<td>3.2E-03</td>
</tr>
<tr>
<td>Primary energy demand (total)</td>
<td>[MJ]</td>
<td>166.3</td>
<td>1.3</td>
<td>26.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Heating value (feedstock)</td>
<td>[MJ]</td>
<td>57.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary energy demand (total without heating value)</td>
<td>[MJ]</td>
<td>108.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input secondary material</td>
<td>[kg]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Input non renewable secondary fuels</td>
<td>[MJ]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Input renewable secondary fuels</td>
<td>[MJ]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net fresh water</td>
<td>[kg]</td>
<td>1.2E+02</td>
<td>9.1E-03</td>
<td>1.4E-01</td>
<td>1.8E-02</td>
</tr>
</tbody>
</table>

**Waste**

The analysis of the waste generation is done separately for the three fractions, hazardous waste, non-hazardous waste and radioactive waste. The major part of the non-hazardous waste is stockpile material from the upstream chain of the basic materials manufacture and of the supply of primary energy carriers for the generation of electrical energy.

**Water utilisation**

A significant percentage of the water is used for the production of the basic materials. When considering the whole life cycle of the products, including their entire life span of 30 years, cleaning during the use stage contributes several times more to water utilisation than production of the basic materials (according to the cleaning scenario, approximately 4 times more than the manufacture of the product). The electrical energy credit in the end-of-life scenario also includes a credit for the saved water.

**Secondary fuels**

For the manufacture of noraplan® floor coverings no secondary materials or secondary fuels are used.

**Impact Assessment**

All impact categories are dominated by the influences of the basic material production. Within these, the rubber production causes the main impacts. An exception within the environmental impacts is the acidification potential, which is mainly determined by the production of titanium dioxide.

The manufacturing of the floor covering also contributes significantly to the environmental impacts.

The emission of volatile organic compounds during manufacture makes a contribution of about 5% to the Photochemical Ozone Creation Potential (POCP) regarding the total life cycle. Due to the combustion process in the end-of-life scenarios and the resulting credits of electrical and thermal energy, the arithmetical results for all impact categories in module D are negative emissions.

Transports have a low influence on all impact categories compared to the contributions from the other areas.
**Global warming potential for noraplan® 913 (total life cycle)**

**Table 2: LCA results: environmental impacts**

*(reference value: 1 m² of floor covering, incl. cut for installation mass per unit area: 3.36 kg/m²), (CML 2009, Center voor Milieukunde at Leiden)*

| noraplan 913 | Production stage | Construction Process Stage | Use stage | End-of-Life Stage | New product system
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resources input</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
</tr>
<tr>
<td>Abiotic depletion potential (ADP elements)</td>
<td>[kg Sb Aq]</td>
<td>1.5E-04</td>
<td>2.0E-09</td>
<td>2.6E-07</td>
<td>3.7E-09</td>
</tr>
<tr>
<td>Abiotic depletion potential (ADP fossil fuels)</td>
<td>[MJ]</td>
<td>1.4E+02</td>
<td>1.3E+00</td>
<td>2.0E+01</td>
<td>2.4E+00</td>
</tr>
<tr>
<td>Global warming potential (GWP)</td>
<td>[kg CO₂ eq]</td>
<td>7.4</td>
<td>3.9</td>
<td>2.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Ozone depletion potential (ODP)</td>
<td>[kg R11 Aq]</td>
<td>2.1E-06</td>
<td>1.8E-10</td>
<td>2.3E-08</td>
<td>3.4E-10</td>
</tr>
<tr>
<td>Acidification potential (AP)</td>
<td>[kg SO₂ Aq]</td>
<td>7.1E-02</td>
<td>2.1E-03</td>
<td>3.3E-03</td>
<td>3.4E-03</td>
</tr>
<tr>
<td>Eutrophication potential (EP)</td>
<td>[kg PO₄³⁻ Aq]</td>
<td>4.0E-03</td>
<td>2.1E-04</td>
<td>7.9E-04</td>
<td>3.8E-04</td>
</tr>
<tr>
<td>Phototoxic ozone creation potential (POCP)</td>
<td>[kg C₂H₄ Aq]</td>
<td>6.9E-03</td>
<td>1.2E-04</td>
<td>6.6E-04</td>
<td>2.1E-04</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>[kg]</td>
<td>1.4E-01</td>
<td>0</td>
<td>2.5E-02</td>
<td>0</td>
</tr>
<tr>
<td>Non-hazardous waste</td>
<td>[kg]</td>
<td>1.5E+01</td>
<td>3.2E-03</td>
<td>5.2E-01</td>
<td>6.0E-03</td>
</tr>
<tr>
<td>Radioactive waste</td>
<td>[kg]</td>
<td>4.1E-03</td>
<td>2.1E-06</td>
<td>2.8E-04</td>
<td>4.2E-06</td>
</tr>
</tbody>
</table>
9. Evidence

VOC emissions

The product has been audited at the approved test house Eurofins Product Testing A/S, Galten, Denmark.

Results:
The tested product noraplan® 913 is suitable for use in interiors, according to the “Principles for the health assessment of construction products used in interiors” (AgBB 2010).

The product further complies with the Basic Award Criteria for the Blue Angel /RAL-US 120/ for resilient floor coverings.

Measurement conditions:
temperature: 23 °C
area specific air flow rate: 1.25 m³/(m²h)

<table>
<thead>
<tr>
<th>noraplan® 913</th>
<th>measured values [µg/m³]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVOC (C₆ – C₁₆)</td>
<td>&lt; 360</td>
</tr>
<tr>
<td>Σ VOC without NIK (C₆ – C₁₆)</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>Σ SVOC (C₁₆ – C₂₂)</td>
<td>&lt; 40</td>
</tr>
<tr>
<td>carcinogenic substances</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>R-value</td>
<td>&lt; 1</td>
</tr>
</tbody>
</table>

Additionally the following relevant values are met, derived from the guidelines values for indoor air, according to the German Indoor Air Hygiene Commission (IRK):
- Styrene ≤ 30 µg/m³
- Naphthalene ≤ 2 µg/m³
- Polycyclic aromatic hydrocarbons ≤ 10 mg/kg
(PAH; 16 compounds according EPA, GC/MS-Analysis after extraction)

Leaching behaviour

The leaching behaviour of floor coverings recommended by the manufacturer for indoor use only (and, also, not for wet areas), is not relevant, since contact with soil or ground water is not expected.
10. PCR document and verification

This declaration is based on the PCR document „Textile, Laminate and Resilient Floor Covering“, 01-2008.

Review of the PCR document by the Advisory Board (SVA).
Chairman of the SVA: Prof. Dr.-Ing. Hans-Wolf Reinhardt (University of Stuttgart, IWB)

Independent verification of the declaration according to /ISO 14025/:

☐ internal  ☒ external

Validation of the declaration: Dr. Birgit Grahl
11. References

/AgBB-Schema/ Gesundheitliche Bewertung der Emissionen von flüchtigen organischen Verbindungen (VOC und SVOC) aus Bauprodukten 2010

/DIN 18353/ DIN 18353:2010-04: VOB Vergabe- und Vertragsordnung für Bauleistungen - Teil C: Allgemeine Technische Vertragsbedingungen für Bauleistungen (ATV) - Estricharbeiten


/DIN 53436-2/ DIN 53436-2:1986-08: Erzeugung thermischer Zersetzungsprodukte von Werkstoffen unter Luftzufuhr und ihre toxikologische Prüfung; Verfahren zur thermischen Zersetzung

/DIN EN 13501-1/ DIN EN 13501-1:2010-01: Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten.


/EG-Verordnung 761/2001/ Verordnung (EG) Nr. 761/2001 des Europäischen Parlaments und des Rates vom 19.03.2001


/EN 428/ EN 428:1993-11: Elastische Bodenbeläge; Bestimmung der Gesamtdicke


/Institut Bauen und Umwelt 2006/ Institut Bauen und Umwelt e.V., Königswinter (Hrsg.): Leitfaden für die Formulierung der Anforderungen an die Produktkategorien der Produktdeklarationen (Typ II), Stand 01-2006


/ISO 14020/ DIN EN ISO 14020:2002-02: Environmental labels and declarations – General principles

/ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations — Type III environmental declarations — Principles and procedures


Environmental Product Declaration
noraplan® 913

Product group: PCR „Textile, Laminate and Resilient Floor Covering“, 31.01.2008
Declaration holder: nora systems GmbH
Declaration number: EPD-NOR-2010111-E

ISO 7619:2010-10: Elastomere oder thermoplastische Elastomere – Bestimmung der Härte
RAL-UZ 120: Vergabegrundlage für Umweltzeichen / Elastische Bodenbeläge RAL-UZ 120 / April 2010
TRGS 610: Technische Regeln für Gefahrstoffe (TRGS), Ausgabe März 1998
Ersatzstoffe und Ersatzverfahren für stark lösemittelhaltige Vorstriche und Klebstoffe für den Bodenbereich