

ENVIRONMENTAL PRODUCT DECLARATION
noraplan[®] standard
RUBBER SHEET AND TILE FLOOR COVERINGS



nora[®]

For over 65 years, nora[®] rubber floor coverings have met the unique demands of facilities worldwide. Extremely durable, ergonomic, sound absorbent, stain and slip resistant, nora flooring solutions address the daily challenges of commercial applications and allow the creation of long-lasting, comfortable, quiet and safe environments.

nora's manufacturing facility maintains 3rd-party certified ISO 14001 and 9001 certifications. This declaration includes every phase of the product life cycle from the production through to installation, usage and maintenance, right up to the end of the product's life cycle in the building.

The superior performance attributes combined with an extended life cycle, 3rd-party certified low emissions and environmentally friendly maintenance make nora the perfect solution for healthcare, education and life sciences.



noraplan environcare[™], University of Tennessee Medical Center

ENVIRONMENTAL PRODUCT DECLARATION


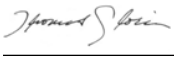
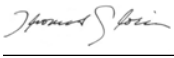


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Rubber Sheet and Tile Floor Coverings

According to ISO 14025

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 Environment
DECLARATION HOLDER	nora systems Inc.
DECLARATION NUMBER	4787273649.102.1
DECLARED PRODUCT	noraplan® standard
REFERENCE PCR	Requirements on the EPD for Floor coverings, Version 1.5, 2013
DATE OF ISSUE	April 19, 2016
PERIOD OF VALIDITY	5 Years
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	IBU
	UL Environment
	epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Wade Stout, UL Environment
	 Thomas Gloria, Industrial Ecology Consultants
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas Gloria, Industrial Ecology Consultants

ENVIRONMENTAL PRODUCT DECLARATION



noraplan[®] standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

Product Definition

Product description

This Environmental Product Declaration (EPD) covers the noraplan[®] standard range of floor coverings – a broad range of designs and colors available in sheet and tile in 2 mm and 3 mm thicknesses.

noraplan[®] standard floor coverings are homogeneous vulcanized rubber floor coverings made with natural and synthetic rubber, minerals from natural sources, color pigments, and processing aids. The noraplan[®] standard range is GREENGUARD Gold certified for low VOC emissions, Blue Angel certified and in compliance with the State of California's Department of Public Health CA 01350 Standard.

Application

noraplan[®] standard rubber floor coverings are the perfect solution for all commercial traffic applications - including healthcare, education and life sciences - where underfoot comfort, acoustics, indoor air quality, low maintenance, durability, stain and slip resistance are important.

Product standards

noraplan[®] standard rubber floor coverings meet the performance requirements of ASTM F 1859 Standard Specification for Rubber Sheet Floor Covering Without Backing as Type I

Delivery status

Delivery of sheets in rolls of 48 inches (1.22 m) width and different lengths, or of tiles of ~ 24 inches x 24 inches (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 may only be carried out after the bonding phase of the adhesive, i.e. at the earliest 72 hours after installation. Because of their dense and closed surface, noraplan floor coverings don't need to be coated. The coverings are permanently resilient, they remain dimensionally stable when bonded and have good ergonomic properties.

Product characteristics

Product Specification	Value	Note
Product thickness	0.08 inches / 2 mm	ASTM F 386
Weight per unit area	3.36 kg/m ²	EN ISO 23997

Beside the declared floor covering with 2.0 mm thickness it is also available with 3.0 mm.

ENVIRONMENTAL PRODUCT DECLARATION



noraplan® standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

Production

Base materials / Ancillary materials

Simplified formulation of noraplan® standard:

Material name	Value
Polymers (natural and synthetic rubber)	27%
Minerals	53%
Pigments	11%
Auxiliary substances and vulcanization system	9%

The formulation is checked according the current REACH candidate list. The formulation does not contain any substances of very high concern. Flame retardants are not used.

Manufacture

The production stages are weighting, mixing, and stretching of the unvulcanized blanks on a calender. The following vulcanization 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 vulcanizing machine, the sheets are backside sanded and either wound into rolls or, for tiles, cut to length and die-cut. The mass per unit area is 3.36 kg/m².

Environment and health during manufacturing

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

Since 2000, the environmental management system (existing since 1996) is certified to ISO 14001 - Environmental management systems.

As a matter of course, all requirements set by authorities (e.g. on immission control) are met.

Packaging

The rolled material is wrapped on cardboard cores made of recycled cardboard (the cardboard cores are taken back and re-used). 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.

ENVIRONMENTAL PRODUCT DECLARATION

nora[®]

noraplan[®] standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

Installation and use

Installation

All subfloors must be absorptive, permanently dry, clean, smooth and structurally sound as per ASTM F 710 — “Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring” and the nora[®] Installation Guide or if installing nora nTx, the nora nTx installation Guide.

It is the responsibility of the installing party to determine the suitability and porosity of the subfloor being covered. The area to receive flooring must be fully enclosed, weather tight and climate controlled at the normal service ambient temperature and humidity (except walk-in freezers or similar) or 68°F ± 5°F and 50% ±10% ambient relative humidity (RH) for 48 hours before, during and 72 hours after the installation. For all other substrates please contact nora's Technical Dept.

The flooring, adhesive and all accessories shall be acclimated within this area or nearby with the same climate conditions for at least 48 hours prior to installation. The use of any other manufacturer's adhesive is not permitted and will void the warranty. The procedures and recommendations described in nora's installation guides are developed to offer the best opportunity for a proper and successful nora flooring installation. Any deviation from these guidelines may result in an installation failure. Detailed installation instructions can be found at www.nora.com/us.

Condition of use

nora[®] rubber flooring requires no finishing, waxing or sealing. All nora floor coverings have a dense, nonporous and dirt-repellant surface - eliminating the need to use environmentally unfriendly and harsh cleaning chemicals.

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.

Routine cleaning should be done manually, thrice weekly, with suitable microfibre covers and neutral detergent.

Further cleaning recommendations are available at www.nora.com/us. Cleaning agents with a pH-value higher than 12 are not to be used without consulting nora's technical department.

Environment and health during use

nora[®] floor coverings meet the requirements of

- Greenguard Gold
- Blue Angel RAL-UZ 120 for resilient floor coverings
- California Specification 01350



ENVIRONMENTAL PRODUCT DECLARATION



noraplan® standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

Reference service life

30 years. Due to their very high abrasion resistance and their homogenous 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.

Extraordinary effects

Fire

Flame resistant, free of halogens, toxicologically safe in the event of fire:

Product Specification	Value	Note
Fire resistance, critical radiant flux	class 1	ASTM E 648
Smoke density, flaming/non flaming	< 450	ASTM E 662

End-of-life

Re-use phase

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 (secondary fuel for waste incineration) or utilization as secondary fuel and secondary raw material (mineral fillers) in the cement industry (material and thermal recycling).

LCA - Calculation rules

The LCA calculation is performed according EN 15804.

Declared unit

The reference unit is 1 m² of floor covering. The values of module A1-A3 refer to 1 m² produced. This EPD represents a product declaration, i.e. the production and disposal of off-cuts during installation stage are assigned to module A5. The combined modules A1-A3, A4 and A5 refer to a reference unit of 1 m² installed.

The material for subfloor preparation and adhesive bonding, needed during installation, is not considered.

ENVIRONMENTAL PRODUCT DECLARATION



noraplan® standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

System boundary

Production			Installation		Use stage							End-of-Life				Next product system
Raw material supply (extraction, processing, recycled material)	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X			X	X	MND	X	MND	MND	MND	MND	MND	X	X	MND	X	X

MND: Module not declared

The analysis of the product life cycle includes the following stages:

Production stage A1-A3:

Consideration of production of the basic materials and the manufacturing of the floor covering incl. packaging material

Transport A4:

Assumption for the transport of the products to the construction site (boat: 5600 km, truck: 3100 km)

Installation A5:

Production and incineration of the off-cut material (5%), disposal of the packaging

The pretreatment of the underground surface (prime coat, surfacer, adhesive) is not considered. This treatment depends on the building and the application and need to be specified for the particular case.

Use stage B2:

Scenario for maintenance/cleaning according to the manufacturer's recommendation

End-of-Life stage C1, C2, C4:

Scenario for the incineration of the floor covering incl. removal from the building and transport to the waste incineration plant

Benefits for the next product system D:

Credits for electrical and thermal energy from the waste incineration process of the product, the off-cuts and the packaging material

Contributions of waste flows are considered in the modules where they occur.

ENVIRONMENTAL PRODUCT DECLARATION

nora[®]

noraplan[®] standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

Estimates and assumptions

The datasets for the upstream chain of the basic material production are taken from the GaBi database. Inventories of auxiliary materials are not completely available and so are partly approximated by datasets on similar chemicals or estimated by consolidation of existing datasets.

The assumptions about the cleaning scenario are described above (condition of use). For the end-of-life scenario it is assumed that 100% of the product is thermally recovered. As transport distance in the EoL-scenario a value of 200 km per truck is considered.

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. Background data For life cycle modeling of the considered products, the GaBi 6 Software System for Life Cycle Engineering, developed by thinkstep AG, is used. Upstream data, specific information is not available, are taken from the GaBi 6 database.

Data quality

The primary data collected from the manufacturer are based on annual quantities from 2012, or are projected from measurements on the specific facilities.

The GaBi 6 database contains datasets for some of the basic materials used in the respective formulations. Database status is 2014.

Further datasets on the upstream chain of the basic material production are approximated with datasets on similar chemicals or are estimated by consolidation of existing datasets.

Electrical and thermal energy for the production are obtained from a power plant at the industrial site Weinheim, which is operated by the Freudenberg Service KG. For the natural gas fired power plant with cogeneration of heat and power current and specific data have been collected.



Allocation

Allocation for upstream data

For all refinery products, allocation by mass and net calorific value has been applied. The manufacturing route of every refinery product is modelled and the product-specific effort associated with their production is calculated.

For other materials' inventory used in the production process calculation the most suitable allocation rules are applied.

Allocation in the foreground data

The manufacturing process does not create any by-products. Regarding this aspect the software model does not include an allocation.

The total production of nora systems, Inc. include further products beside the declared product family. The values for thermal and electrical energy as well as for operating materials are assigned respectively while data collection on the site. Allocation keys are mass, area, pieces or retention time in the plant.

Allocation of waste materials

Combustible waste is fed into energy recovery processes. The quality of the thermal energy can be considered equal to the thermal energy needed for production processes. The calculation of emissions from the waste incineration plant follows a partial stream consideration for the combustion process, according to the specific composition of the incinerated material. A waste incineration plant with an R1-value lower than 0.6 is assumed.

Production waste: The energy gained is looped back in the module A1-A3.

Installation waste and product waste in the end-of-life scenario:

The environmental burdens of the incineration process of installation off-cut and the product in the end-of-life scenario are assigned to the system (A5, C4); resulting credits for thermal and electrical energy are declared in module D.

Allocation for waste paper:

Paper/corrugated board is used as packaging material and this usually includes a mix of recycled and virgin fibers. When modeling the production of paper, the scrap paper that is used in this process has been assumed to be burden free. Similarly, waste paper arising in the product life cycle is assumed to be recycled; a cut-off approach has been applied.



LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules. The values refer to the functional unit.

Transport to the construction site (A4)

Name	Value
Liters of fuel (truck) Europe	0.00565 / 100 km
Capacity utilization (incl. empty runs) Europe	85%
Liters of fuel (truck) NA	0.0136 l / 100 km
Capacity utilization (incl. empty runs) NA	78%
Liters of fuel (vessel)	0.0014 l / 100 km
Capacity utilization (incl. empty runs) vessel	48%
Gross density of products transported	1 750 kg/m ³

Installation in the building (A5)

Name	Value
Auxiliary	Depending on building conditions
Water and electricity consumption	Depending on building conditions
Material loss	5%

End of Life (C1-C4)

Name	Value
Energy recovery (waste incineration plant)	3.36 kg/m ²
Landfilling	0 kg/m ²

ENVIRONMENTAL PRODUCT DECLARATION



noraplan® standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

LCA - Results

The result of module B2 refers to a time frame of one year. For the specific application the value can be multiplied with the assumed period respectively.

The following information on environmental impacts is expressed with the impact category parameters of LCIA using characterisation factors. The selected method is CML 2001 (updated 2013, following requirements of EN 15804) and TRACI 2.1.

Indicator		Production	Installation		Use	End-of-life			Benefits and loads beyond the system boundary
CML	Unit	A1-A3	A4	A5	B2	C1	C2	C4	D
GWP	[kg CO ₂ -eq.]	9.3E+00	1.5E+00	9.5E-01	2.7E-01	6.4E-02	8.3E-02	5.0E+00	-2.1E+00
ODP	[kg CFC11-eq.]	1.5E-06	8.4E-12	8.1E-08	3.1E-11	2.3E-11	5.1E-13	1.1E-09	-6.3E-10
AP	[kg SO ₂ -eq.]	3.3E-02	1.3E-02	2.6E-03	5.7E-04	2.1E-04	3.0E-04	3.0E-03	-5.1E-03
EP	[kg PO ₄ ³⁻ - eq.]	3.0E-03	2.0E-03	2.9E-04	1.9E-04	1.2E-05	7.7E-05	3.5E-04	-3.6E-04
POCP	[kg Ethen eq.]	6.9E-03	4.4E-05	4.1E-04	1.4E-04	1.3E-05	-1.2E-05	7.4E-04	-4.1E-04
ADPE	[kg Sb eq.]	1.5E-04	1.6E-07	8.0E-06	2.4E-07	9.9E-09	1.1E-08	5.2E-07	-1.9E-07
ADPF	[MJ]	1.6E+02	2.0E+01	1.1E+01	4.8E+00	7.6E-01	1.1E+00	2.6E+01	-2.9E+01

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources

TRACI	Unit	A1-A3	A4	A5	B2	C1	C2	C4	D
GWP	[kg CO ₂ -eq.]	9.3E+00	1.5E+00	9.5E-01	2.7E-01	6.4E-02	8.3E-02	5.0E+00	-2.1E+00
ODP	[kg CFC11-eq.]	1.5E-06	8.9E-12	8.1E-08	3.3E-11	2.4E-11	5.5E-13	1.2E-09	-6.7E-10
AP	[kg SO ₂ -eq.]	3.6E-02	1.5E-02	2.9E-03	6.9E-04	2.0E-04	4.0E-04	3.2E-03	-4.9E-03
EP	[kg N- eq.]	-8.5E-04	8.3E-04	9.6E-06	3.2E-04	8.1E-06	3.6E-05	1.9E-04	-1.9E-04
Smog	[kg O ₃ - eq.]	6.2E-01	3.5E-01	5.4E-02	8.8E-03	1.7E-03	1.3E-02	5.6E-02	-5.9E-02
FF	[MJ]	2.1E+01	2.8E+00	1.4E+00	6.0E-01	4.6E-02	1.6E-01	3.1E+00	-3.6E+00

Caption: GWP = Global warming potential; ODP = Ozone Depletion; AP = Acidification potential; EP = Eutrophication; Smog =Photochemical oxidation;FF = Fossil fuel depletion

ENVIRONMENTAL PRODUCT DECLARATION



noraplan® standard
Rubber Sheet and Tile Floor Coverings

According to ISO 14025

Indicator	Unit	Production			Installation			Use			End-of-life			Benefits and loads beyond the system boundary
		A1-A3	A4	A5	B2	C1	C2	C4	D					
PERE	[MJ]	8.5E+00	-	-	-	-	-	-	-	-	-	-	-	
PERM	[MJ]	6.9E+00	-	-	-	-	-	-	-	-	-	-	-	
PERT	[MJ]	1.5E+01	3.1E-01	8.9E-01	1.4E-01	9.1E-02	1.8E-02	1.3E+00	-3.2E+00	-	-	-	-	
PENRE	[MJ]	1.2E+02	-	-	-	-	-	-	-	-	-	-	-	
PENRM	[MJ]	4.4E+01	-	-	-	-	-	-	-	-	-	-	-	
PENRT	[MJ]	1.7E+02	2.0E+01	1.1E+01	5.0E+00	9.6E-01	1.2E+00	2.8E+01	-3.5E+01	-	-	-	-	
SM	[kg]	-	-	-	-	-	-	-	-	-	-	-	-	
RSF	[MJ]	-	-	-	-	-	-	-	-	-	-	-	-	
NRSF	[MJ]	-	-	-	-	-	-	-	-	-	-	-	-	
FW	[m³]	3.4E-02	3.2E-03	4.9E-02	1.6E-03	3.8E-04	2.3E-04	1.8E-02	-6.5E-03	-	-	-	-	

Caption PERE = Use of renewable primary energy as energy carrier; PERM = Use of renewable primary energy as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy as energy carrier; PENRM = Use of non-renewable primary energy 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

Unit	A1-A3	A4	A5	B2	C1	C2	C4	D	
HWD	[kg]	2.8E-03	5.4E-04	2.9E-06	1.3E-04	1.1E-06	2.8E-07	0.0E+00	2.1E-03
NHWD	[kg]	2.3E+00	1.2E+00	6.7E-04	1.1E-01	5.0E-02	3.1E-04	0.0E+00	9.2E-01
RWD	[kg]	1.3E-03	2.4E-03	3.2E-05	1.7E-04	1.1E-04	8.0E-05	0.0E+00	8.0E-04
CRU	[kg]	-	-	-	-	-	-	-	-
MFR	[kg]	1.3E-01	0.0E+00	1.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	-
MER	[kg]	-	-	-	-	-	-	-	-
EEE	[MJ]	0.0E+00	0.0E+00	4.3E-01	0.0E+00	0.0E+00	0.0E+00	5.8E+00	-
EET	[MJ]	0.0E+00	0.0E+00	1.2E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+01	-

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

Note:

Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The indicators for waste and water are declared, the uncertainty of these values is increased

LCA - Interpretation

The main proportion of the environmental impact and the demand on primary energy is determined by the expenditure for the supply chain production. The manufacturing of the floor covering at nora systems contributes less, but still significantly to the environmental impacts in relation to the total production process.

The use stage/cleaning depends on the assumptions made for the scenario. The effects of the chosen and recommended typical cleaning scenario contribute significantly when projected to the total period of use; this is a key factor for the assessment of the floor covering.

Credits in module D result from incineration processes of installation off-cut and the product in the EoL-scenario.

References

ASTM E 648	ASTM E 648 - 15e1: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM E 662	ASTM E 662 - 15a: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
ASTM F 386	ASTM F 386 - 11: Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
ASTM F 710	ASTM F 710 - 11: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM F 1859	ASTM F 1859 - 14: Standard Specification for Rubber Sheet Floor Covering without Backing
EN 15804	EN 15804:2010-08 Sustainability of construction works –Environmental Product Declarations – Core rules for the product category of construction products
GaBi 6	GaBi 6 dataset documentation of the software-system and databases, LBP, University of Stuttgart and thinkstep AG, Leinfelden-Echterdingen, 2014 (http://www.gabi-software.com/support/gabi/gabi-6-lci-documentation/)
EN ISO 14025	EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
EN ISO 14040	EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
EN ISO 14044	EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Requirements and guidelines
EN ISO 23997	DIN EN ISO 23997: 2012-04: Resilient floor coverings - Determination of mass per unit area
PCR part A	Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, Version 1.3,2014, Institut Bauen und Umwelt e.V./ UL LLC
PCR part B	Requirements on the EPD for Floor coverings, Version 1.6, July 30, 2014, Institut Bauen und Umwelt e.V./ UL LLC; Part B Addendum: IBU PCR for Floor Coverings, V1.0 Aug. 27, 2014, ULE

ENVIRONMENTAL PRODUCT DECLARATION

nora[®]

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According to ISO 14025

The LCA was conducted and the EPD prepared by:
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thinkstep