ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*

Owner of the Declaration	Sika Netherlands B.V.
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-SIK-20180123-ICA1-EN
ECO EPD Ref. No.	ECO-
Issue date	28.01.2019
Valid to	27.01.2024

Pulastic Multifunctional Sports Floor

Sika Nederland B.V.

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com

ECO PLATFORM EPD EN 15804 VERIFIED

BUILDING TRUST

1. General Information

Name of the manufacturer

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-SIK-20180123-ICA1-EN

This declaration is based on the product category rules:
Floor coverings, 02/2018
(PCR checked and approved by the SVR)

Issue date
28.01.2019

Valid to
27.01.2024

Prof. Dr.-Ing. Horst J. Bossenmayer
(chairman of Institut Bauen und Umwelt e.V.)

Dipl. Ing. Hans Peters
(Managing Director Institut Bauen und Umwelt e.V.))

Name of the product

Owner of the declaration
Sika Nederland B.V.
Zonnebaan 56
3542 EG Utrecht
Netherlands

Declared product / declared unit
1 m² Pulastic Multifunctional Sports Floor

Scope:
This document applies to the Pulastic Multifunctional Sports Floor system manufactured by Sika Nederland B.V. in 7418 CK Deventer, Netherlands. The lifecycle assessment data are based on production data from 2017 collected by Sika Technology AG. The declared results refer to the product with the maximum layer thickness. It can be assumed that products with lower thickness and mass, but manufactured out of the same components, will show the same or less environmental impact.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
The EPD was created according to the specifications of *EN 15804+A1*. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard *EN 15804* serves as the core PCR
Independent verification of the declaration and data according to *ISO 14025:2010*
☐ internally ☒ externally

Angela Schindler
(Independent verifier)

2. Product

2.1 Information about the enterprise

Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing, and protecting in the building sector and motor vehicle industry. Sika has subsidiaries in 100 countries around the world and manufactures in over 300 factories. Sika employs more than 25,000 people and generated sales of over CHF 8.1 billion in fiscal 2019. At the end of 2019 Sika won the Swiss Technology Award for a ground-breaking new adhesive technology.

2.2 Product description/Product definition

The Pulastic Multifunctional Sports Floor is a high-end sports floor providing outstanding comfort and safety for intensive training and competition combined with outstanding resistance to mechanical loads. The sports floor is approved according to the /EN 14904/ standard in category M3. Moreover, the sports floor is approved by the /F.I.B.A./ (International Basketball Federation) and /I.H.F./ (International Handball Federation). It is manufactured under /ISO 9001/ for quality management and /ISO 14001/ for environmental care.

The material consists of a special granulate rubber shock-pad of approximately 14 mm thickness, a pore sealing and levelling layer, in which a tear-proof polyurethane layer is applied which is embedded in a cast between two layers of flexible polyurethane. Then there is a seamless polyurethane wearing surface, finished with a special slightly structured durable mat-coat finish and line marking, is applied.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration /Alternative 1a. EN 14904 Surfaces for sports areas - Indoor surfaces for multi-sports use - specification. ICS 97.220.10. For the application and use the respective national provisions apply.

2.3 Application

The Pulastic Multifunctional Sports Floor is a comfortable, durable and resistant floor for sports halls and school gymnasia, which are used for a wide variety of indoor sports on a high level as well as for multifunctional purposes. This version meets all requirements of the /N.O.C.*N.S.F. Class 1/.

The subfloor shall correspond to the manufacturer's document "Requirements prior to the installation of a Pulastic Sports Floor". The nature of the different products requires highly (manufacturer-) trained specialists to execute the installation.

2.4 Technical Data

Product Data

16 Classic colours and 16 Design colours are available as per manufacturer's colour brochure.

Technical data

Name	Value	Unit
Grammage	17.25	g/m^2
Product Form	Liquid	-
Type of manufacture	Mechanically and Manually	-
Product thickness	19.5	mm
Total thickness	19.5	mm
Layer thickness (Top layer)	5.5	mm
Shock Absorption /EN 14808/	45	%
Vertical Deformation /EN 14809/	2.2	mm
Linear Friction /EN 13036-4/	107	-
Ball Bounce /EN 12235/	97	%
Gloss /EN 2813/	5	%
Resistance to rolling load /EN 1569/	> 1500 N	-
Resistance to impact /EN 1517/	> 800 gr @ 10°C	-
Resistance to impact /EN 1517/	> 1200 gr @ 17°C	-
Resistance to indentation /EN 1516/	0.30 mm @ 5 min	-
Resistance to wear /EN ISO 5470/	< 340	mg
Flammability /EN 13501-1/	Cfl-S2	-
Improvement impact sound insulation (ΔLw) /ISO 717-2/	21	dB

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to /EN 14904:2006/ apply.

2.5 Delivery status

The Pulastic Multifunctional Sports Floor is delivered in the following condition:

- Adhesive: Two-can sets 20 kg or 5 kg.
- Shock-pad: Storage and Transport - Store the rolls horizontally in an environment where protection against damage and free flowing water is guaranteed. Roll diameter = ± 50 cm.
- Sealer: Two-can sets 20 kg or 5 kg.
- Self-levelling: Two-can sets of 20 kg (all colours).
- Coating: Two-can sets of 10 kg or 1 kg.
- Line paint: Two-can sets of 750 kg.

2.6 Base materials/Ancillary materials

System build-up

Name	Value	Unit
Tacly ST (adhesive)	0.9	kg/m2
Regupol (shock-pad)	8	kg/m2
Pulastic EG 2000 (sealing compound)	0.6	kg/m2
Pulastic GM 1500 (1st self-levelling layer)	2.1	kg/m2
Pulastic GM 700 (2nd self-levelling layer)	3	kg/m2
Pulastic GM 1500 (3rd self-levelling layer)	2.5	kg/m2
Pulastic Coating 221/W (Mat-coat finish)	0.15	kg/m2

Base materials:

- Tacly ST: Adhesive of solvent-free 2-component PU resin based on mixture of castor oil, polyol resins inert fillers and additives, cured with an MDI mixture.
- Regupol: Rubber mat containing 90% secondary material from PU granulate.
- Pulastic EG 2000: Sealing compound of solvent-free 2-component PU resin based on mixture of castor oil, polyol resins inert fillers, pigments and additives, cured with an MDI mixture.
- Pulastic GM 1500/ Pulastic GM 700: Self-levelling layers of 2-component PU resin based on mixture of castor oil, polyol resins inert fillers, pigments and additives, cured with an MDI mixture.
- Pulastic 221/W: Finish coat of water-based 2-component PU resin based on mixture of polyester polyol and pigments, inert filler, small amount of co-solvent and additives, cured with mixture of HDI Trimers.

The shock-pad arrives fully cured at the site. The other components are mixed on site, applied directly and will cure shortly after. To the best of current knowledge, these products contain no substances of very high concern (SVHC) on the /REACH Candidate List/ in a concentration exceeding 0.1% (by unit weight).

2.7 Manufacture

Various mixing machines are used for manufacturing the different materials. In these mixing machines the various raw materials are combined and mixed for a certain period. After mixing, the material is filled into cans, which are provided with a label with the product name. After mixing and filling, the products are packed in accordance with all laws and regulations. The Pulastic Multifunctional Sports Floor is manufactured under /ISO 9001/ for quality management.

2.8 Environment and health during manufacturing

As a general rule, no environmental protection measures other than those specified by law are necessary. The Pulastic Multifunctional Sports Floor is

manufactured under /ISO 14001/ for environmental care.

2.9 Product processing/Installation

The shock-pad is bonded with the adhesive on a suitable subfloor. The shock-pad is sealed with a sealing compound. Then 2 layers of polyurethane resin are applied. After curing, the floor is sealed with special sports floor coating. If desired, playing field marking can then be applied with our PU line paint.

Installation shall be carried out corresponding to the manufacturer's installation instructions, by a manufacturer-trained installer. The subfloor shall correspond to the manufacturer's general requirements. The system includes materials classified as hazardous substances, but after the reaction on-site, the polymerisation step leads to a stable and non-hazardous material. Health and safety measures (e.g. regarding ventilation or respiratory equipment) are to be taken in accordance with the information in the safety data sheets of the products.

2.10 Packaging

The shock-pad will be delivered as a single roll. The other components are in metal cans, which are assembled straight up on wooden pallets and sealed in recycable polyethylene foil. Furthermore, wooden pallets, which can be reused, are generally in use.

2.11 Condition of use

The Pulastic Multifunctional Sports Floor should be cleaned with a standard wet clean once a week as well as a recommended daily dry clean.

2.12 Environment and health during use

Due to the coating, there is very low odour and a maximum indoor clean air protection is provided during the use phase.

2.13 Reference service life

The service life could not be calculated according to /ISO15686/. Based on experience in the market, a period of 40 years was defined, assuming a facelift including grinding is done after 20 years, and provided that the Pulastic Sports Floor is properly stored, applied and maintained. As actual conditions and use may vary, this is an indicative statement and the service life may fall short of, or exceed the duration stated above.

2.14 Extraordinary effects

Fire

Even without any special fire safety features, the Pulastic Multifunctional Sports Floor complies with at least the requirements of /DIN EN 13501-1/ standard for fire classes E and Efl. In terms of the volumes applied, they only have a subordinate influence on the fire performance characteristics of the building structure in which they are installed, as networked polyurethane resins do not contribute towards spreading fire.

Water

Resistant to water exposure to the extent typical for indoor sports use. The Pulastic Multifunctional Sports Floor is chemically inert and insoluble in water.

Mechanical destruction

When the sports floor is mechanically destroyed, it is easy to repair and does not lead to any decomposition products which are harmful for the environment.

2.15 Re-use phase

The old sports floor is removed and all waste can be reused. In case of the Pulastic Sport Floors, the circular sports floor plan results in a 100% circular purchase. There is an increasing market demand in the Netherlands for recycling of sports floors, which have reached their end of life status.

2.16 Disposal

Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Surplus and non-recyclable products are disposed of via a licensed waste disposal contractor. Dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers should be avoided. The sports floor can be incinerated, recycled or taken to landfill in the end of life.

The following /EWC waste codes/ can apply: 160504*, 080111*, 160305*, 080409*, 200121*.

2.17 Further information

More information about the company and its products is available throughout the internet at www.pulastic.com or www.sika.com.

3. LCA: Calculation rules

3.1 Declared Unit

This declaration applies to 1 m^2 of Pulastic Multifunctional Sports Floor, with a thickness of 19.5 mm. The study period is 40 years.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Conversion factor to 1 kg (in kg/m^2)	0.01725	-
Grammage	0.01725	kg/m^2
Layer thickness	0.0055	m

3.2 System boundary

Type of EPD: Cradle to Grave.

The system boundaries of the EPD follow the modular structuring system described by /EN 15804/. The LCA takes into account the following modules:

- A1-A3: Manufacture of pre-products and the product, packaging, ancillary materials, processing (recycling) of secondary materials, transport to the factory, production including energy supply and emissions, waste handling (incineration of production waste, waste water treatment).
- A4: Transport to the building site.

- A5: Installation in the building (including disposal of packaging waste (incineration, recycling, reuse) and emissions during installation), production and transport of the amount of shock-pad that occurs as installation waste.
- B2: Maintenance including electricity for vacuum cleaner, water and cleaning agent as well as waste water treatment.
- B5: Refurbishment (production, transport application of the materials included in the facelift, electricity, emissions and waste processing) - (B5/1: incineration scenario, B5/2: landfill scenario, B5/3: recycling scenario).
- C1: Deconstruction and demolition (energy for the machinery to remove the floor).
- C2: Transport to waste-processing facility.
- C3: Waste processing for incineration (C3/1) or recycling (C3/3).
- C4: Impact from landfill disposal (C4/2).
- D: Potential for reuse, recovery and/or recycling as net flows and benefits.

3.3 Estimates and assumptions
Some materials in the formulation were valued with a generic chemical data set (conservative approach). The percentage by mass is < 1%.
At the end of service life, either 100% incineration (scenario 1), 100% landfill (scenario 2) or 100% recycling (scenario 3) is assumed.

3.4 Cut-off criteria
The foreground system was modelled in its entirety, excluding the necessary production machines and systems and the associated infrastructure.

3.5 Background data
The primary data provided by Sika derive from the plant at Deventer, Netherlands. The background data were taken from the databases of /GaBi software/ and /ecoinvent version 3.3/. The NL, EU-28 and DE Electrical Energy Mixes were applied.

3.6 Data quality
To simulate the product stage, data recorded by Sika from the production year 2017 were used. All other relevant background datasets were taken from generic data not older than 10 years.

3.7 Period under review
The period under review is the year 2017.

3.8 Allocation
All allocation procedures in the background datasets conform with /EN 15804/.
For the recycled input in the shock-pad in Module A1-A3, only the impacts of the processing were considered.
The benefits for the disposal of packaging, installation losses and the flooring system are credited in Module D; this also applies to the reuse of wooden pallets.
Regarding disposal through incineration, the benefits for the generated electrical and thermal energy from Module C3 were accounted for in Module D.

3.9 Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The background data were taken from the databases of GaBi 8.7 software (SP34) and ecoinvent version 3.3.

4. LCA: Scenarios and additional technical information

The following technical information serves as a basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment.

Transport to the construction site (A4)

Name	Value	Unit
Transport distance	1000	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	-	kg/m³
Capacity utilisation volume factor	100	-

Installation in the building (A5)

Name	Value	Unit
Electricity consumption	0.0185	kWh
Material loss (shock-pad)	0.08	kg

Maintenance (B2)
The values in the table refer to a maintenance period of one year (maintenance once a week) per m².

Name	Value	Unit
Water consumption	0.00403	m³
Auxiliary (soap)	0.016	kg
Electricity consumption	0.085	kWh

Replacement (B4) / Refurbishment (B5)
After 20 years, a facelift is done including grinding of 50% of the old top sealer, vacuuming and application of 1.5 kg of the base coat (1st layer) and 100% of the top sealer.

Name	Value	Unit
Electricity consumption	0.0992	kWh
Refurbishment cycle (facelift)	1	Number/ RSL

Reference service life

Name	Value	Unit
Reference service life	40	a

The selected study period is 40 years, including a facelift of the flooring system after 20 years, provided the system is professionally installed and properly used.

End of Life (C1-C4)
Three different scenarios were calculated to model the end-of-life stage. Each is a 100% scenario, but

calculating a mix would also be possible (e.g. scenario 1 at 80% and scenario 2 at 20%).

Name	Value	Unit
For thermal energy recovery (scenario 1: C3/1, C4/1, D/1)	100	%
For landfill (scenario 2: C3/2, C4/2, D/2)	100	%
For recycling (scenario 3: C3/3, C4/3, D/3)	100	%
Transport to end-of-life	100	km

5. LCA: Results

The cradle to grave results displayed below apply to 1 m² of Pulastic Multifunctional Sports Floor over a study period of 40 years, including a facelift after 20 years.

Three scenarios were calculated for the end-of-life stage, Module B5 and in Module D:
Scenario 1 (B5/1, C3/1, C4/1, D/1) represents 100% thermal energy recovery, scenario 2 (B5/2, C3/2, C4/2, D/2) describes the impacts of 100% landfill and scenario 3 (B5/3, C3/3, C4/3, D/3) refers to 100% recycling.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	MND	X	MNR	MNR	X	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² Pulastic Multifunctional Sports Floor

Parameter	Unit	A1-A3	A4	A5	B2	B5/1	B5/2	B5/3	C1	C2	C3/1	C3/2	C3/3	C4/1	C4/2	C4/3	D/1	D/2	D/3
GWP	[kg CO_2-Eq.]	2.04E+1	1.03E+0	1.45E-1	2.50E+0	6.24E+0	2.86E+0	3.37E+0	5.85E-2	9.70E-2	3.86E+1	0.00E+0	5.89E+0	0.00E+0	7.22E-1	0.00E+0	-2.03E+1	-3.98E-1	-1.56E+0
ODP	[kg CFC11-Eq.]	4.36E-7	3.58E-13	1.32E-8	9.56E-8	8.22E-8	8.22E-8	8.24E-8	2.60E-12	3.26E-14	2.16E-8	0.00E+0	2.34E-9	0.00E+0	1.55E-12	0.00E+0	-1.09E-8	-1.05E-8	-1.05E-8
AP	[kg SO_2-Eq.]	1.14E-1	2.32E-3	-2.85E-4	1.14E-2	2.26E-2	2.14E-2	2.19E-2	1.67E-4	2.17E-4	1.14E-2	0.00E+0	6.19E-3	0.00E+0	2.47E-3	0.00E+0	-3.41E-2	-3.32E-3	-5.02E-3
EP	[kg $(PO_4)^3$-Eq.]	6.73E-2	5.48E-4	-2.16E-5	7.79E-3	1.38E-2	1.35E-2	1.36E-2	1.52E-5	5.15E-5	2.74E-3	0.00E+0	1.01E-3	0.00E+0	1.69E-3	0.00E+0	-3.80E-3	-5.28E-4	-7.12E-4
POCP	[kg ethene-Eq.]	7.38E-3	-7.17E-4	4.15E-4	1.49E-3	1.19E-3	1.12E-3	1.14E-3	1.07E-5	-6.85E-5	7.11E-4	0.00E+0	4.26E-4	0.00E+0	2.50E-4	0.00E+0	-3.60E-3	-7.27E-4	-8.92E-4
ADPE	[kg Sb-Eq.]	1.54E-4	8.58E-8	-1.40E-5	7.17E-6	2.27E-5	2.26E-5	2.27E-5	2.34E-8	7.81E-9	-8.25E-6	0.00E+0	1.07E-6	0.00E+0	1.72E-7	0.00E+0	-7.62E-6	-3.83E-6	-4.04E-6
ADPF	[MJ]	4.62E+2	1.47E+1	-1.63E+0	2.35E+1	6.64E+1	6.60E+1	6.91E+1	6.25E-1	1.34E+0	8.47E+0	0.00E+0	3.87E+1	0.00E+0	1.01E+1	0.00E+0	-2.91E+2	-1.56E+1	-3.20E+1

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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 m² Pulastic Multifunctional Sports Floor

Parameter	Unit	A1-A3	A4	A5	B2	B5/1	B5/2	B5/3	C1	C2	C3/1	C3/2	C3/3	C4/1	C4/2	C4/3	D/1	D/2	D/3
PERE	[MJ]	2.00E+2	7.43E-1	7.14E-1	2.40E+1	3.95E+1	2.40E+1	4.12E+1	3.50E-1	6.75E-2	4.22E-1	0.00E+0	2.15E+1	0.00E+0	8.59E-1	0.00E+0	-6.06E+1	-1.21E+1	-1.47E+1
PERM	[MJ]	8.18E+0	0.00E+0	-5.06E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.08E+2	7.43E-1	2.08E-1	2.40E+1	3.95E+1	3.94E+1	4.12E+1	3.50E-1	6.75E-2	4.22E-1	0.00E+0	2.15E+1	0.00E+0	8.59E-1	0.00E+0	-6.06E+1	-1.21E+1	-1.47E+1
PENRE	[MJ]	3.37E+2	1.48E+1	-7.07E-1	3.47E+1	7.18E+1	7.13E+1	7.54E+1	1.03E+0	1.35E+0	1.68E+2	0.00E+0	2.08E+2	0.00E+0	1.68E+2	0.00E+0	-3.46E+2	-1.58E+1	-3.50E+1
PENRM	[MJ]	1.58E+2	0.00E+0	-2.93E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.58E+2	0.00E+0	-1.58E+2	0.00E+0	-1.58E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	4.95E+2	1.48E+1	-1.00E+0	3.47E+1	7.18E+1	7.13E+1	7.54E+1	1.03E+0	1.35E+0	1.00E+1	0.00E+0	5.04E+1	0.00E+0	1.05E+1	0.00E+0	-3.46E+2	-1.58E+1	-3.50E+1
SM	[kg]	7.20E+0	0.00E+0	7.27E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.01E+1
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m³]	1.62E+1	1.37E-3	2.14E-3	1.04E-1	3.31E+0	3.30E+0	3.30E+0	5.00E-4	1.25E-4	9.11E-2	0.00E+0	1.93E-2	0.00E+0	4.00E-4	0.00E+0	-7.75E-2	-8.65E-3	-1.23E-2

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

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 m² Pulastic Multifunctional Sports Floor

Parameter	Unit	A1-A3	A4	A5	B2	B5/1	B5/2	B5/3	C1	C2	C3/1	C3/2	C3/3	C4/1	C4/2	C4/3	D/1	D/2	D/3
HWD	[kg]	9.87E-6	7.76E-7	5.93E-9	2.92E-8	1.71E-6	1.72E-6	1.72E-6	4.16E-10	7.07E-8	2.19E-9	0.00E+0	3.27E-8	0.00E+0	6.46E-8	0.00E+0	-8.29E-7	-7.46E-7	-7.51E-7
NHWD	[kg]	6.53E-1	1.13E-3	1.54E-3	2.70E-1	2.49E-1	1.85E+0	2.50E-1	6.76E-4	1.03E-4	2.10E-2	0.00E+0	4.71E-2	0.00E+0	1.72E+1	0.00E+0	4.18E-3	1.22E-1	1.15E-1
RWD	[kg]	8.85E-3	2.02E-5	2.40E-4	4.20E-3	9.63E-4	9.26E-4	1.34E-3	1.60E-4	1.84E-6	5.02E-4	0.00E+0	4.61E-3	0.00E+0	1.56E-4	0.00E+0	-2.21E-2	-1.35E-4	-1.29E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	6.00E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.73E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	3.83E-1	0.00E+0	5.20E+0	0.00E+0	2.80E-1	0.00E+0	0.00E+0	5.96E+1	0.00E+0	3.12E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	1.18E+0	0.00E+0	1.20E+1	0.00E+0	9.00E-1	0.00E+0	0.00E+0	1.64E+2	0.00E+0	1.01E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

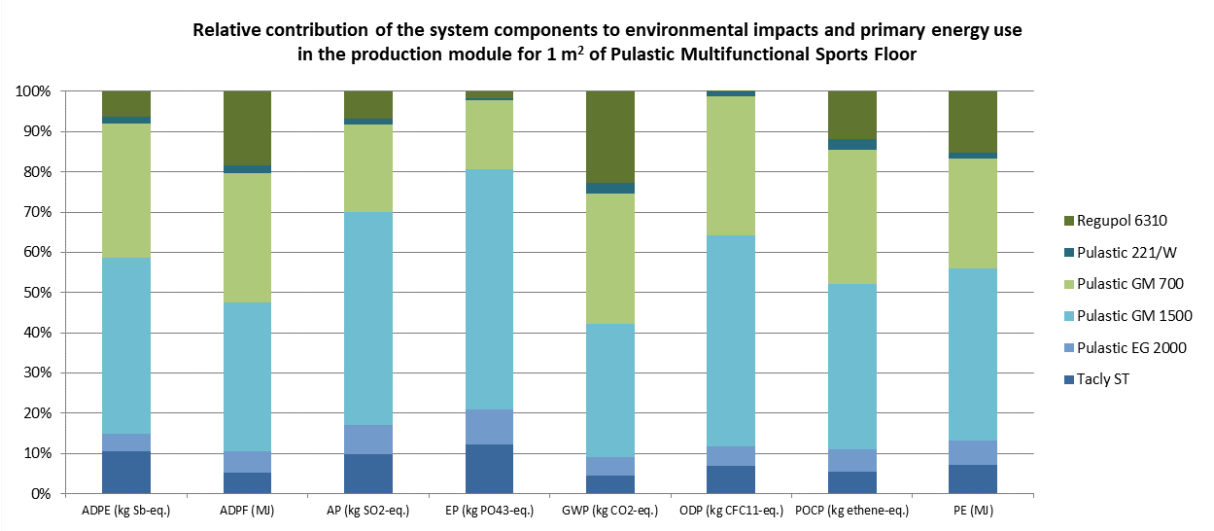
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

The indicator RWD may include a higher uncertainty, as not all applied LCI support the methodological approach, required by EN 15804.

6. LCA: Interpretation

Across all indicators, the greatest share is accounted for by the product stage A1-A3 (on average 72% in scenario 1, 77% in scenario 2 and 74% in scenario 3), with raw material provision being the highest contributor. In case of scenario 1, the incineration process (C3/1) also has a significant contribution in terms of GWP.

Furthermore, in scenario 1 (incineration), significant net benefits can be observed in module D. Due to the product stage having the highest impact, it is examined more closely in the following interpretation.



The graph shows the relative contribution of the different components of the flooring system to environmental impacts and primary energy use in the production module. It can be observed that Pulastic GM 1500 (1st and 3rd layer of the base-coat) is the highest contributing component across all indicators, followed by Pulastic GM 700 (2nd self-levelling layer). Among the raw materials, the binders account for the highest share of the impacts for Abiotic Depletion Potential for Fossil Resources (**ADPF**) (77%), Acidification Potential of Land and Water (**AP**) (80%), Eutrophication Potential (**EP**) (91%), Global Warming Potential (**GWP**) (67%), Formation Potential of Tropospheric Ozone Photochemical Oxidants (**POCP**) (66%) as well as for the total primary energy consumption (82%). In terms of Abiotic Depletion Potential for Non-Fossil Resources (**ADPE**), fillers have the highest contribution with 58%, and drying agents contribute most to Depletion Potential of the Stratospheric Ozone Layer (**ODP**) (67%).

The production module accounts for about 80% of the total primary energy consumption throughout the life cycle. About 70% of the primary energy used in this module is from non-renewable energy sources, while 30% is from renewable sources.

7. Requisite evidence

Certified according to /DIN EN ISO 9001/14001/

LGA QualiTest GmbH Institut für Warenprüfung und Qualitätsüberwachung (TÜVRheinland® LGAC)

LGA QualiTest GmbH was commissioned to determine the VOC emissions in an emission test chamber according to /DIN EN ISO 16000-9/ and to carry out a sensory evaluation (odour) for a PULASTIC 2000 flooring system. The evaluation of the test results has to be carried out according to the criteria for the "LGA tested for contaminants" certificate and Emission Classification of Building Materials, Finland (M1-Classification) respectively.

Deviating from the LGA certification criteria, during the first 7 days, it was not tested with an increased air exchange rate in order to carry out an additional evaluation according to the /AgBB/ concept (Committee for Health Evaluation of Building Products, test report QIWQ 7771089). This type of testing means tougher testing conditions.

Structure and manufacture of the sample: Rubber granule mat (volumetric weight/density 670 kg/m3, 14 mm thick), Pulastic EG 2000 (PUR leveling compound/primer) applied by the client on March 03, 2007; Pulastic GM 1500 (self-leveling PUR coating mass, 4 mm thick), applied in two coatings each 2 mm thick on March 06 and 07, 2007; Tacly adhesive: March 08, 2007; Sample received on March 14, 2007; Pulastic Coating 221/W (water-based PUR sealing), applied on the March 16, 2007 in the laboratory of the LGA QualiTest GmbH. Application rate: 2.6 g (this corresponds to 130 g/m2).

Results of the examination
The detailed results of the Pulastic flooring system are shown in the tables below.

LGA "tested for contaminants" certificate

Parameters after 7 days	LGA Requirement	Result
TVOC	< 1.5 mg/m²h	0.13 mg/m²h
Formaldehyde	<0.04 mg/m²h	0.009 mg/m²h
Determinable CMT compounds	Total < 0.01 mg/m²h	Each < 0.001 mg/m²h

Parameters after 28 days	LGA Requirement	Result
TVOC	< 0.6 mg/m²h	0.09 mg/m²h
TSVOC	< 0.1 mg/m²h	Each < 0.002 mg/m²h
Formaldehyde	< 0.012 mg/m²h	< 0.008 mg/m²h
Determinable CMT compounds	Total = 0.005 mg/m²h	Each <0.001 mg/m²h
Carcinogenic of Categories K1 and K2	<0.001 mg/m²h	<0.001 mg/m²h
Odour	Max. level 3	1.9

For the Pulastic Multifcuntional Sports Floor system the requirements for Emission Classification of Building Materials M1 and for the LGA "tested for contaminants" certificate are completely fulfilled.

8. References

/EN 14904/, /EN 14904:2006/**,** European Standard Surfaces for sports areas - Indoor surfaces for multi-sports use - Specification

/EN ISO 9001/, EN /ISO 9001:2015/, Quality management systems - Requirements; German and English version

/EN ISO 14001/, EN /ISO 14001:2015/, Environmental management systems - Requirements with guidance for use; German and English version

FIBA (Fédération Internationale de Basketball)/ , FIBA (2015): Product Category: SYNTHETIC FLOORING. Contract No: P09-2015**.**

/IHF (International Handball Federation)/ , IHF (2018): Statement of Approval for manufacturing the Pulastic Multifunctional Sports Floor at international level and according to IHF standards. Valid from the 1st of January 2018 to the 31th of December 2018.

/DIN EN 13501-1/, /DIN EN 13501-1: 2017/, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

/Product category rules for construction products, Part B/, PCR Part B (2017): Requirements on the EPD for Floor coverings.

/GaBi 8.7/, *Universität* Stuttgart and thinkstep (1992-2018): Software and databases for life cycle assessments.

/Ecoinvent Version 3.3/, Swiss Centre for Life Cycle Inventories, Ecoinvent Centre (2016): Databases for life cycle assessments.

/N.O.C.*N.S.F. Class 1/, Dutch sports organization. Nederlands Olympisch Comité (**NOC**) and the Nederlandse Sport Federatie (**NSF**).

/European Commission/, European Commission (2000): European List of Waste, Commission Decision 2000/532/EC.

/EN 14808/, /EN 14808:2005/, Surfaces for sports areas. Determination of shock absorption.

/EN 14809/, /EN 14809:2005/, Surfaces for sports areas. Determination Determination of vertical deformation.

/AgBB/, Committee for Health Evaluation of Building Products, test report QIWQ 7771089.

/NEN-EN 13036/, /NEN-EN 13036-4:2011/, Road and airfield surface characteristics. Tests methods.

/NEN-EN 1223/, /NEN-EN 12235:2013/**,** Surfaces of sports areas. Determination of vertical ball behaviour.

/NEN-EN-ISO 2813/, /NEN-EN-ISO 2813/, Paints and varnishes - Determination of gloss value at 20 degrees, 60 degrees and 85 degrees.

/NEN-EN 1569/, NEN-EN 1569:1999/, Surfaces for sports areas - Determination of the behaviour under a rolling load NEN-EN.

/NEN-EN 1517/, /NEN-EN 1517:1999/, Surfaces for sports areas - Determination of resistance to impact.

/NEN-EN 1516/, /NEN-EN 1516:1999/, Surfaces for sports areas - Determination of resistance to indentation.

/NEN-EN-ISO 5470-1/, /NEN-EN-ISO 5470-1:2016/,

Rubber- or plastics-coated fabrics - Determination of abrasion resistance - Part 1: Taber abrader.

/NEN-EN 13501-1/, /NEN-EN 13501-1:2007+A1:2009/, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

/NEN-EN-ISO 717/, /NEN-EN-ISO 717-2:2013/, Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation.

/ISO 16000/, /ISO 16000-9:2006/, Indoor air -- Part 9: Determination of the emission of volatile organic compounds from building products and furnishing -- Emission test chamber method.

/Pulastic/ Pulastic (2011): Method Statement Pulastic sports surfaces. Edition 01/05/2011 Identification Nr.: MS/E/GR/0511. General requirements.

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
Sika Technology AG
Tüffenwies 16
8048 Zürich
Switzerland

Tel +41 (0)58 436 40 40
Fax +41 (0)58 436 43 43
Mail product.sustainability@ch.sika.com
Web **www.sika.com/sustainability**

Owner of the Declaration
Sika Nederland B.V.
Zonnebaan 56
3542EG Utrecht
Netherlands

Tel +31 30 241 01 20
Fax +31 30 241 44 82
Mail info@nl.sika.com
Web **www.pulastic.com**