Declaration of conformity for products with Model EPDs

The Association of the European Adhesive & Sealant Industry (FEICA), of which Sika is a member, has developed so-called Model Environmental Product Declarations (Model EPDs) and had them independently verified by the Institute Construction and Environment (IBU). These IBU verified Model EPDs have been made publicly available by FEICA and IBU. The Model EPDs depict the current production technology in Europe. Based on the product formulations it was checked if our products were covered by the Model EPDs.

This Declaration confirms that the product(s)

**Sikasil® 670 Fire, Sikasil® 905, Sikasil® C, Sikasil® E, Sikasil® N Plus, Sikasil® Pool, Sanisil®**

produced in Europe are covered by the attached Model EPD „Silicone-based construction sealants“ *(Declaration number EPD-FEI-20150323-IBG1-EN)*. This means that the Life Cycle Assessment (LCA) data and the remaining content of the attached Model EPD apply to the above mentioned product and may thus be used for the evaluation of the sustainability of buildings where the product is applied.

Sika Services AG

Mark Schneider  
Global Product Sustainability

Ralf Heinzmann  
Target Market Sealing & Bonding Function

Zurich, February 2020

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Internet: www.sika.com
ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025 and EN 15804

<table>
<thead>
<tr>
<th>Owner of the Declaration</th>
<th>FEICA - Association of the European Adhesive and Sealant Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme holder</td>
<td>Institut Bauen und Umwelt e.V. (IBU)</td>
</tr>
<tr>
<td>Publisher</td>
<td>Institut Bauen und Umwelt e.V. (IBU)</td>
</tr>
<tr>
<td>Declaration number</td>
<td>EPD-FEI-20150323-IBG1-EN</td>
</tr>
<tr>
<td>ECO EPD Ref. No.</td>
<td>ECO-00000350</td>
</tr>
<tr>
<td>Issue date</td>
<td>02.02.2016</td>
</tr>
<tr>
<td>Valid to</td>
<td>01.02.2022</td>
</tr>
</tbody>
</table>

Silicone-based construction sealants
FEICA - Association of the European Adhesive and Sealant Industry

www.bau-umwelt.com / https://epd-online.com
1. General Information

**FEICA - Association of the European Adhesive and Sealant Industry**

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

**Silicone-based construction sealants**

Owner of the Declaration
FEICA - Association of the European Adhesive and Sealant Industry
Avenue E. van Nieuwenhuyse 4
1160 Brussels
Belgium

**Declaration number**
EPD-FEI-20150323-IBG1-EN

**This Declaration is based on the Product Category Rules:**
Building sealants, 07.2014
(PCR tested and approved by the SVR)

**Issue date**
02.02.2016

**Valid to**
01.02.2022

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

Dr. Burkhard Lehmann
(Managing Director IBU)

**Declared product / Declared unit**
1 kg silicone-based construction sealant; density 1.0 - 1.5 g/cm³

**Scope:**
This validated Declaration entitles the holder to bear the symbol of the Institut Bauen und Umwelt e.V. It exclusively applies for products produced in Europe and for a period of five years from the date of issue. This EPD may be used by FEICA members and their members provided it has been proven that the respective product can be represented by this EPD. For this purpose a guideline is available at the FEICA secretariat. The members of FEICA are listed on its website. 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.

**Verification**
The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to ISO 14025/

- [ ] internally  [x] externally

*Mr. Oliver Müller*
(Independent verifier appointed by SVR)

2. Product

### 2.1 Product description

**Silicone-based construction sealant, filled or unfilled, transparent or pigmented.**

Silicone-based construction sealants are manufactured from reactive siloxane and so-called silicone oil, sometimes using fillers, extenders, colour pigments, cross-linkers, bonding agents and catalysts. They permanently and elastically seal joints planned for the building. Silicone-based construction sealants fulfill key functions. Ingress of moisture into the structure via the joints is prevented by joint sealants. By using silicone-based sealants the fitness for use of the building and the service life are decisively extended. The product displaying the highest environmental impacts was used as a representative product for calculating the Life Cycle Assessment results (worst case-approach).

### 2.2 Application

**Module 1: Façade sealants**

Silicone-based construction sealants are used for the elastic sealing of joints. The areas of application for façade sealants include expansion joints (movement joints) and/or connection joints already existing in exterior walls and on window and door frames (including the inside section). All these sealants fulfill key functions of the building.

**Module 2: Sealants for glazing**

Silicone-based construction sealants are used for the elastic sealing of joints which may be subject to movement. Sealants for glazing are used in the following areas:

- Glass to glass
- Glass to frame
- Glass to porous substrates

**Module 3: Sanitary sealants**

The areas of application for silicone-based sanitary sealants are joints in sanitary areas and kitchens. Joints sealed using sanitary sealants comprise connection joints between sanitary furnishings and the wall, connection joints between the floor and wall or movement joints across surfaces, for example.
2.3 Technical Data

Module 1: Façade sealants

The minimum requirements on water and airtightness as per Table ZA.1 of /EN 15651-1:2012/ apply: see table

Module 2: Sealants for glazing

The minimum requirements on water and airtightness as per Table ZA.1 of /EN 15651-2:2012/ apply: see table

Module 3: Sanitary sealants

The minimum requirements on water and airtightness as per Table ZA.1 of /EN 15651-3:2012/ apply: see table

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>1 - 1.5</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Elastic recovery /EN ISO 7389/</td>
<td>only for module 2:</td>
<td>%</td>
</tr>
<tr>
<td>Loss of volume /EN ISO 10563/</td>
<td>value to be declared by the manufacturer</td>
<td>%</td>
</tr>
<tr>
<td>Resistance to flow /EN ISO 7390/</td>
<td>value to be declared by the manufacturer</td>
<td>mm</td>
</tr>
<tr>
<td>Tensile properties /EN ISO 8339/</td>
<td>only for module 1 and 3:</td>
<td>%</td>
</tr>
<tr>
<td>Adhesion/cohesion properties at maintained extension after immersion in water /EN ISO 10590/</td>
<td>only for module 1:</td>
<td>NF*</td>
</tr>
<tr>
<td>Adhesion/cohesion properties at maintained extension after immersion in water for sealants in class XS and/or adhesion/cohesion properties after immersion in water for sealants in class S /EN ISO 10590:2005/, /EN ISO 10590/</td>
<td>only for module 3:</td>
<td>NF*</td>
</tr>
<tr>
<td>Adhesion/cohesion properties after immersion in water plastic sealants /EN ISO 10591/</td>
<td>only for module 1:</td>
<td>%</td>
</tr>
<tr>
<td>Adhesion/cohesion properties after exposure to heat, water and artificial light /EN ISO 11431/</td>
<td>only for module 2:</td>
<td>NF*</td>
</tr>
</tbody>
</table>

* NF: Passed-Failed criteria. The sealant class must also be indicated for the declared product.

2.4 Placing on the market / Application rules

For the placing on the market in the EU/EFTA (with the exception of Switzerland) products falling under the Industrial Safety Regulation and Federal Pollution Control Act.

For the application and use of the products the respective national provisions apply.

2.5 Delivery status

Pasty in containers made of plastic, foil or metal. Typical container sizes contain 50 ml to 1000 ml of product.

A combination of HDPE (high-density polyethylene) cartridges, cardboard and pallets was modelled for the LCA.

2.6 Base materials / Ancillary materials

Silicone-based construction sealants are manufactured from reactive siloxane and silanes, sometimes using fillers. The cross-linking reaction occurs through the effects of humidity in air when installed.

On average, the products covered by this EPD contain the following ranges of base materials and ancillary materials referred to:

- Siloxanes: 45-90 wt.%
- Silanes: 2-10 wt.%
- Silicone plasticizers: 0-30 wt.%
- Mineral fillers: 0-40 wt.%
- Fumed silica: 2 wt.%
- Mineral oil: 0-30 wt.%
- Pigments: 0-20 wt.%
- Water: 0-20 wt.%
- Additives: <5 wt.%

These ranges are average values and the composition of products complying with the EPD can deviate from these concentration levels in individual cases. More detailed information is available in the respective manufacturer's documentation (e.g. product data sheets).

In individual cases, it is possible that substances on the list of materials of particularly high concern for inclusion in /Annex XIV of the REACH regulation 2011/ are contained in concentrations exceeding 0.1%. If this is the case, this information can be found on the respective safety data sheet.

2.7 Manufacture

Silicone-based sealants are generally manufactured by mixing the ingredients and then filling them into the delivery containers. The quality of the products and safe handling thereof is ensured by the corresponding regulations such as /EN ISO 9001:2008-12/ and the provisions outlined in the relevant regulations such as the Industrial Safety Regulation and Federal Pollution Control Act.

2.8 Environment and health during manufacturing

As a general rule, no other environmental or health protection measures other than those specified by law are necessary.

2.9 Product processing/Installation

Silicone-based construction sealants are usually processed manually on site using suitable tools. In most cases, the products are inserted into joints using cartridge guns, whereby health and safety measures (gloves and goggles, ventilation) are to be taken and consistently adhered to in accordance with the information on the safety data sheet and conditions on site. VOC-emissions may occur.

2.10 Packaging

A detailed description of packaging is provided in section 2.5. Empty containers and clean foils can be recycled.

2.11 Condition of use

During the use phase, silicone-based sealants are fully cross-linked and hardened. They are durable products which protect buildings and
significantly contribute towards their appearance, function and sustainability.

2.12 Environment and health during use
Option 1 – Products for applications outside indoor areas with permanent stays by people
During use, silicone-based construction sealants lose their reactive capacity and are inert. No risks are known for water, air and soil if the products are used as designated.

Option 2 – Products for applications inside indoor areas with permanent stays by people
When used in indoor areas with permanent stays by people, evidence of the emission performance of construction products in contact with indoor air must be submitted according to national requirements. No further influences on the environment and health by emanating substances are known.

2.13 Reference service life
Sealants fulfill key functions in buildings. They decisively improve the usability of building structures and significantly extend their original service lives. Information supplied by the manufacturer on maintenance and care must be observed.

2.14 Extraordinary effects

Fire
Even without any special fire safety features, joint sealants comply with at least the requirements of /EN 13501-1:2009/ for fire class E. In terms of volumes used, sealants generally have no or only a minor influence on the fire characteristics (e.g. smoke gas development) of the building in which they are applied.

Water
Silicone-based construction sealants are insoluble in water. They are often used to protect building structures from damaging water ingress / the effects of flooding.

Mechanical destruction
The mechanical destruction of silicone sealants does not lead to any decomposition products which are harmful for the environment or health.

2.15 Re-use phase
According to present knowledge, no environmentally-hazardous effects in terms of landfilling are to be generally anticipated through dismantling and recycling of components to which hardened silicone sealants adhere.

2.16 Disposal
Silicone sealants which cannot be recycled can be hardened. Empty containers are directed to the recycling process. Only a low volume of silicone sealants is incurred in the disposal of components in which they are used. Low levels of adhesion do not play any role in terms of disposal. They do not impair the disposal / recycling of other components / building materials. Hardened residual product mechanically removed from substrates must be disposed of as commercial/site waste.
The following European Waste Codes waste (EWC) codes can apply:
Product residue:
/EWC 2000/532/EC 080409/
/EWC 2000/532/EC 080410/ with the exception of those covered by /EWC 2000/532/EC 08 04 09/

2.17 Further information
More information is available in the manufacturer's product or safety data sheets and is available on the manufacturer's Web sites or on request. Valuable technical information is also available on the associations' Web sites.

3. LCA: Calculation rules

3.1 Declared Unit
This EPD refers to the declared unit of 1 kg silicone-based construction sealant with a density of 1 - 1.5 kg/l in the mixing ratio required for processing the components in accordance with the PCR Part B for Building sealants.
The results of the Life Cycle Assessment provided in this declaration have been calculated from the product with the highest environmental impact (worst-case scenario). With the information about the consumption per running meter together with width and depth of the joint, the results can be calculated into a declared unit of l/m.

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Declared unit</td>
<td>1 kg</td>
<td></td>
</tr>
<tr>
<td>Conversion factor to 1 kg</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

3.2 System boundary
Modules A1-A3, A4, A5 and D are taken into consideration in the LCA:
- A1 Production incl. provision of energy, production of packaging as well as auxiliaries and consumables, waste treatment
- A4 Transport to site
- A5 Installation (disposal of packaging & installation losses and emissions during installation)
- D Credits from incineration of packaging materials & installation losses and recycling the metal container

The declaration is therefore from "cradle to gate - with options".

3.3 Estimates and assumptions
Where no specific /GaBi/ processes were available, the individual recipe ingredients of formulation were estimated on the basis of information provided by the manufacturer or literary sources.

3.4 Cut-off criteria
All raw materials submitted for the formulations and production data were taken into consideration.
The manufacture of machinery, plants and other infrastructure required for production of the products under review was not taken into consideration in the LCA. Transport of packaging materials is also excluded.

### 3.5 Background data
Data from the /GaBi/ 6 database was used as background data. Where no background data was available, it was complemented by manufacturer information and literary research.

### 3.6 Data quality
Representative products were applied for this EPD and the product in a group displaying the highest environmental impact was selected for calculating the LCA results. The datasets are less than 5 years old. Production data and packaging are based on details provided by the manufacturer. The formulation used for evaluation refers to a specific product.

### 3.7 Period under review
Representative formulations were accepted by FEICA Ltd and collected in 2011.

### 3.8 Allocation
No allocations were applied for production. A multi-input allocation with a credit for electricity and thermal energy was used for incineration of production residues and packaging materials. The credits achieved through packaging disposal are declared 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. In this case, 1 kg construction sealant was selected as the declared unit. Depending on the application, a corresponding conversion factor such as the specific use per running meter must be taken into consideration.

### 4. LCA: Scenarios and additional technical information
The following technical information forms the basis for the declared modules or can be used for developing specific scenarios in the context of a building evaluation if modules are not declared (MND).

#### Transport to the building site (A4)

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litres of fuel</td>
<td>0.0016</td>
<td>l/100km</td>
</tr>
<tr>
<td>Transport distance</td>
<td>1000</td>
<td>km</td>
</tr>
<tr>
<td>Capacity utilisation (incl. empty runs)</td>
<td>85</td>
<td>%</td>
</tr>
<tr>
<td>Gross density of products transported</td>
<td>1000 - 1500</td>
<td>kg/m³</td>
</tr>
<tr>
<td>Capacity utilisation volume factor</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Installation into the building (A5)

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material loss</td>
<td>0.01</td>
<td>kg</td>
</tr>
<tr>
<td>VOC in the air (NMVOC)</td>
<td>0.05</td>
<td>kg</td>
</tr>
</tbody>
</table>
### 5. LCA: Results

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

<table>
<thead>
<tr>
<th>PRODUCT STAGE</th>
<th>CONSTRUCTION STAGE</th>
<th>USE STAGE</th>
<th>END OF LIFE STAGE</th>
<th>BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material</td>
<td>Supply</td>
<td>Transport</td>
<td>Maintenance</td>
<td>Use</td>
</tr>
<tr>
<td>A1</td>
<td>X</td>
<td>X</td>
<td>A2</td>
<td>A3</td>
</tr>
<tr>
<td>Transport</td>
<td>A4</td>
<td>Assembly</td>
<td>Repair</td>
<td>Replacement</td>
</tr>
<tr>
<td>Manufactured</td>
<td>B1</td>
<td>Use</td>
<td>B2</td>
<td>C1</td>
</tr>
<tr>
<td>Transport</td>
<td>B3</td>
<td>Maintenance</td>
<td>B3</td>
<td>C2</td>
</tr>
<tr>
<td>from the</td>
<td>B4</td>
<td>Repair</td>
<td>B3</td>
<td>C3</td>
</tr>
<tr>
<td>gate to the</td>
<td>B5</td>
<td>Replacement</td>
<td>B4</td>
<td>C4</td>
</tr>
<tr>
<td>site</td>
<td>B6</td>
<td>Refurbish</td>
<td>B6</td>
<td>D</td>
</tr>
<tr>
<td>Use</td>
<td>B7</td>
<td>Operational energy</td>
<td>A1-A3</td>
<td>A5</td>
</tr>
<tr>
<td>Maintenance</td>
<td>A1</td>
<td>Use</td>
<td>A5</td>
<td>D</td>
</tr>
</tbody>
</table>

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 kg silicone-based construction sealant

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming potential</td>
<td>kg CO₂-Eq.</td>
<td>7.08E+0</td>
<td>5.61E-3</td>
<td>6.23E-1</td>
<td>-3.14E-1</td>
</tr>
<tr>
<td>Depletion potential of the stratospheric ozone layer</td>
<td>kg CFC11-Eq.</td>
<td>1.77E-9</td>
<td>2.31E-14</td>
<td>1.63E-12</td>
<td>-1.05E-10</td>
</tr>
<tr>
<td>Acidification potential of land and water</td>
<td>kg PO₄₃-Eq.</td>
<td>3.41E-2</td>
<td>1.44E-5</td>
<td>5.96E-5</td>
<td>-3.48E-4</td>
</tr>
<tr>
<td>Eutrophication potential</td>
<td>kg PO₄₃-Eq.</td>
<td>2.71E-3</td>
<td>3.98E-6</td>
<td>1.65E-5</td>
<td>-3.01E-5</td>
</tr>
<tr>
<td>Formation potential of tropospheric ozone photochemical oxidants</td>
<td>kg CH₂O-Eq.</td>
<td>3.19E-3</td>
<td>3.19E-6</td>
<td>1.80E-5</td>
<td>-4.85E-5</td>
</tr>
<tr>
<td>Abiotic depletion potential for non-fossil resources</td>
<td>kg Sb-Eq.</td>
<td>4.74E-4</td>
<td>2.20E-10</td>
<td>4.00E-9</td>
<td>-3.20E-8</td>
</tr>
<tr>
<td>Abiotic depletion potential for fossil resources</td>
<td>MJ</td>
<td>1.19E+2</td>
<td>7.73E-2</td>
<td>8.00E-2</td>
<td>-4.39E+0</td>
</tr>
</tbody>
</table>

### RESULTS OF THE LCA - RESOURCE USE: 1 kg silicone-based construction sealant

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable primary energy as energy carrier</td>
<td>MJ</td>
<td>3.70E+1</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>Renewable primary energy resources as material utilization</td>
<td>MJ</td>
<td>0.00E+0</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>Total use of renewable primary energy resources</td>
<td>MJ</td>
<td>3.70E+1</td>
<td>4.33E-3</td>
<td>9.25E-3</td>
<td>-5.51E-1</td>
</tr>
<tr>
<td>Non-renewable primary energy as energy carrier</td>
<td>MJ</td>
<td>1.23E+2</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>Non-renewable primary energy resources as material utilization</td>
<td>MJ</td>
<td>0.00E+0</td>
<td>IND</td>
<td>IND</td>
<td>IND</td>
</tr>
<tr>
<td>Total use of non-renewable primary energy resources</td>
<td>MJ</td>
<td>1.35E+2</td>
<td>7.76E-2</td>
<td>9.55E-2</td>
<td>-5.37E+0</td>
</tr>
<tr>
<td>Use of secondary material</td>
<td>kg</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Use of renewable secondary fuels</td>
<td>MJ</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Use of non-renewable secondary fuels</td>
<td>MJ</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Use of net fresh water</td>
<td>m³</td>
<td>7.46E-2</td>
<td>7.60E-6</td>
<td>1.40E-3</td>
<td>-1.11E+3</td>
</tr>
</tbody>
</table>

### RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg silicone-based construction sealant

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
<th>A5</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous waste disposed</td>
<td>kg</td>
<td>2.94E-5</td>
<td>3.68E-8</td>
<td>2.79E-6</td>
<td>-1.56E-6</td>
</tr>
<tr>
<td>Non-hazardous waste disposed</td>
<td>kg</td>
<td>1.31E+0</td>
<td>1.10E-5</td>
<td>2.35E-3</td>
<td>-1.62E-3</td>
</tr>
<tr>
<td>Radioactive waste disposed</td>
<td>kg</td>
<td>6.26E-3</td>
<td>1.06E-7</td>
<td>6.17E-6</td>
<td>-3.92E-4</td>
</tr>
<tr>
<td>Components for reuse</td>
<td>kg</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Materials for recycling</td>
<td>kg</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Materials for energy recovery</td>
<td>kg</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Exported electrical energy</td>
<td>MJ</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>1.00E-4</td>
<td>0.00E+0</td>
</tr>
<tr>
<td>Exported thermal energy</td>
<td>MJ</td>
<td>0.00E+0</td>
<td>0.00E+0</td>
<td>2.40E-4</td>
<td>0.00E+0</td>
</tr>
</tbody>
</table>

### 6. LCA: Interpretation

All impacts are associated with the production phase (A1-A3). The most significant contribution to the production phase impacts is the upstream production of raw materials as main driver. The majority of life cycle energy consumption takes place during the production phase (A1-A3). Significant contributions to Primary Energy Demand – Non-renewable (PENRT) derive from the energy resources used in the production of raw materials. The largest contributor to Primary Energy Demand – Renewable (PERT) is the consumption of renewable energy resources required for the generation and supply of electricity. During manufacturing (A1-A3) some influence also arises due to the wooden pallets and paper used as packaging that need solar energy for photosynthesis. It should be noted that Primary Energy Demand – Renewable (PERT) generally represents a small percentage of the production phase primary energy demand with the bulk of the demand coming from non-renewable energy resources.

CO₂ is the most important contributor to Global Warming Potential (GWP). For the Acidification Potential (AP), NOₓ and SO₂ contribute to the largest share. Transportation to the construction site (A4) and the installation process (A5) make a negligible contribution to almost all impacts. The only exception is the photochemical ozone creation potential (POCP) that is significantly influenced by the installation of the product due to emissions of volatile compounds of maximum 5%. This leads to a contribution of the installation phase of up to 85% on the overall life cycle of the product. Emissions associated with the manufacturing of product (A3) only have a minor influence on POCP.
POCP is only one of the analysed environmental impact categories. All other potential impacts would increase with greater transportation distances, showing that transportation is a process leading to net environmental burdens. Furthermore, even for POCP, transportation processes needed for supply of materials and product distribution only have limited counterbalance effects on the overall LCA results. Energy credit from incineration of packaging material reported in module D show a negligible influence on the overall results.

7. Requisite evidence

VOC
Special tests and evidence have not been carried out or provided within the framework of drawing up this Model EPD. Some EU member states require special documentation on VOC emissions into indoor air for specific areas of application. This documentation, as well as documentation for voluntary VOC labelling, has to be provided separately and is specific for products in question.

Evidence pertaining to VOC emissions shall show
- either an attestation of compliance with,
- or documentation of test data that are required in, any of the existing regulations or in any of the existing voluntary labelling programs for low-emitting products, as far as these
  (1) include limits for the parameters TVOC, TSVOC, carcinogens, formaldehyde, acetaldehyde, LCI limits for individual substances (including but not limited to the European list of harmonized LCIs), and the R value;
  (2) base their test methods on /CEN/TS 16516/ (or /EN 16516/, after the on-going revision of /CEN/TS 16516/);
  (3) perform testing and apply the limits after 28 days storage in a ventilated test chamber, under the conditions specified in /CEN/TS 16516/; some regulations and programs also have limits after 3 days, on top of the 28 days limits; (4) express the test results as air concentrations in the European Reference Room, as specified in /CEN/TS 16516/.

Examples of such regulations are the Belgian /Royal Decree C-2014/24239/, or the German /AgBB/.
Examples of such voluntary labelling programs are EMICODE, Blue Angel or Indoor Air Comfort.

Relevant test results shall be produced either by an /ISO 17025/ accredited commercial test lab, or by a qualified internal test lab of the manufacturer.
Examples for the applied limits after 28 days storage in a ventilated test chamber are:
- TVOC: 1000 µg/m³
- TSVOC: 100 µg/m³
- Each carcinogen: 1 µg/m³
- Formaldehyde: 100 µg/m³
- LCI: different per substance involved
- R value: 1 (meaning that, in total, 100% of the combined LCI values must not be exceeded).

Informative Annexes (2 tables):
The table shown below is an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 3 days storage in a ventilated test chamber.

<table>
<thead>
<tr>
<th>Sum of carcinogens, C1A, C2A [µg/m³]</th>
<th>Formaldehyde [µg/m³]</th>
<th>Acetaldehyde [µg/m³]</th>
<th>Sum of Form- and Acet-aldehyde</th>
</tr>
</thead>
<tbody>
<tr>
<td>German DBfT/AgBB regulation</td>
<td>10 000</td>
<td>10</td>
<td>+/-</td>
</tr>
<tr>
<td>draft Lithuanian regulation</td>
<td>10 000</td>
<td>10</td>
<td>+/-</td>
</tr>
<tr>
<td>EMICODE EC1</td>
<td>1 000</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>EMICODE EC1 PLUS</td>
<td>750</td>
<td>10</td>
<td>50</td>
</tr>
</tbody>
</table>

The table above provides an overview of the most relevant regulations and specifications as of April 2015, as regards requirements after 28 days storage in a ventilated test chamber. Some details may be missing in the table due to lack of space. Values given represent maximum values/limits.
8. References

PCR 2013, Part A
_Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU). Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report; 2013-04
www.bau-umwelt.de

PCR 2012, Part B
Product Category Rules for Building Products, Part B: Requirements on the EPD for construction sealants, 2013-07
www.bau-umwelt.de

EN ISO 9001:2008-12
Quality management systems – Requirements

ISO 16000-3:2002-08
Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds by sampling using a pump

ISO 16000-6:2004-12
Indoor air – Part 6: Determination of volatile organic compounds indoors and in test chambers by sampling on TENAX TA®, thermal desorption and gas chromatography using MS or FID

EN ISO 16000-8:2008-04
Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishings – Emission test chamber method

EN ISO 16000-11:2006-06
Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishings – Sampling, storage of samples and preparation of test specimens
CEN/TS 16516:2013-10
Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

Royal Decree C-2014/24239
Belgisch Staatsblad 8 MEI 2014, p. 60603. — Koninklijk besluit tot vaststelling van de drempelniveaus voor de emissies naar het binnenmilieu van bouwproducten voor bepaalde geoochte gebruiken

EN 17025: 2007-05
General requirements for the competence of testing and calibration laboratories

GaBi 6 2014
GaBi 6: Software and database for comprehensive analysis. LBP, University of Stuttgart and thinkstep AG, 2014

GaBi 6 2014b
GaBi 6: Documentation of GaBi 6 data sets from the data base for comprehensive analysis LBP, University of Stuttgart and thinkstep AG, 2014 http://documentation.gabi-software

EN 15651:2012-12

EN ISO 10563:2005-10
Building construction – Sealants – Determination of change in mass and volume

EN ISO 8339: 2005-09
Building construction – Sealants – Determination of tensile properties (Extension to break)

EN ISO 10590:2005-10
Building construction – Sealants – Determination of tensile properties of sealants at maintained extension after immersion in water

EN ISO 10591:2005-10
Building construction – Sealants - Determination of adhesion/cohesion properties of sealants after immersion in water

EN ISO 7390:2004-04
Building construction – Jointing products – Determination of resistance to flow of sealants

EN ISO 11431:2003-01
Building construction – Jointing products – Determination of adhesion/cohesion properties of sealants after exposure to heat, water and artificial light through glass

EN ISO 7389:2004-04
Building construction – Jointing products – Determination of elastic recovery of sealants

Annex XIV to REACH Directive
Approval – List of candidates and Annex XIV


RAL UZ 113:2011-06
Basis for awarding the "Low emission floor covering adhesives and other installation materials" environmental certificate

EN 13501-1:2010-01
Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

List of Technical Building Regulations: 2012-09

EWC 080410: 2000/532/EC
European Waste Catalogue / Ordinance on European List of Wastes
Adhesive and sealant compound waste

EWC 080409: 2000/532/EC
European Waste Catalogue / Ordinance on European List of Wastes
Waste adhesives and sealants containing solvents or other dangerous substances

AgBB evaluation scheme for VOC from construction products:2012-06
Procedure for health-related evaluation of the emissions of volatile organic compounds (VOC and SVOC) from construction products, Committee for the Health-related Evaluation of Building Products, Dessau-Roßlau, Germany

EMICODE
of the GEV Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V., Düsseldorf; www.emicode.com/, valid as at: July 2010

Décret n° 2011-321 du 23 mars 2011
relatif à l’étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils (French VOC Directive)

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin(pub.): Generation of Environmental Product Declarations (EPDs);

General principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013/04
www.bau-umwelt.de

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product
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