Large size fibre-cement panels
SWISSPEARL
FibreCem Holding AG
Environmental Product Declaration FibreCem Holding AG – Swisspearl

1 General information

<table>
<thead>
<tr>
<th>Programme holder</th>
<th>Holder of the Declaration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eternit (Schweiz) AG, Niederurnen (Switzerland)</td>
<td>FibreCem Holding AG</td>
</tr>
<tr>
<td>IBU - Institut Bauen und Umwelt e.V. Rheinufer 108 D-53639 Königswinter</td>
<td>CH-8867 Niederurnen</td>
</tr>
<tr>
<td>Declaration number</td>
<td>Declared product/unit</td>
</tr>
<tr>
<td>EPD-FCH-2013321-D</td>
<td>Large-format fibre-cement panels / tonne t</td>
</tr>
<tr>
<td>This Declaration is based on the Product Category Rules:</td>
<td>Area of applicability:</td>
</tr>
<tr>
<td>Requirements on the EPD for fibre cement / fibre concrete, 09-2011 (PCR tested and approved by the independent Committee of Experts (SVA))</td>
<td>The EPD refers to three types of large-format fibre-cement panels manufactured in the FibreCem Holding AG plants in Switzerland (Eternit Schweiz AG, Niederurnen and Payerne) and Austria (Eternit-Werke Ludwig Hatschek AG, Vöcklabruck). Approx. 90% of the large-format fibre-cement panels are produced proportionately in Switzerland and Austria. Three average products from two plants are declared. The EPD is therefore representative for large-format panels manufactured by FibreCem Holding AG.</td>
</tr>
<tr>
<td>Issue date</td>
<td>Verification</td>
</tr>
<tr>
<td>14.01.2013</td>
<td>The CEN EN 15804 standard serves as the core PCR.</td>
</tr>
<tr>
<td>Valid until</td>
<td>Verification of the EPD by an independent third party in accordance with ISO 14025</td>
</tr>
<tr>
<td>14.06.2018</td>
<td>internal external</td>
</tr>
</tbody>
</table>

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

Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the Expert Committee (SVA))

Patricia Wolf (Independent auditor appointed by the SVA)

2 Product

2.1 Product description
Large size, flat, fibre cement panels, air cured, based on grey or white cement. The panels are:
- grey panels with a semi-translucent or opaque coating
- colored panels (dyed throughout) with a semi-translucent or opaque coating
- white panels with a semi-translucent or opaque coating

2.2 Application
Fibre cement panels for wall and roof cladding on timber or metal sub framing. Installed as rear ventilated or so called rain screen application.

2.3 Technical data
- Thermal conductivity [W/mK]: 0.56 W/mK
- Density [g/cm³]: 16 - 19 g/cm³
- Bending tensile strength [N/mm²]: lengthwise 16.5 to 26 N/mm², crosswise 21.5 to 34.5 N/mm²
- Elastic modulus [N/mm²]: 12'000 to 15'000 N/mm²
- Coefficient of thermal expansion [mm/mmK]: 0.01 mm/mmK

Ageing resistance: resistant as per EN 12467

2.4 Merchandising
In accordance with EN 12467 - fibre cement flat panel product specification and test methods

2.5 Delivery
The large size fibre cement panels are delivered in various dimensions and in thicknesses ranging from 6 to 12 mm.
The untrimmed panel sizes are 3'070 x 1'250 and 2'530 x 1'250 mm. The usable (trimmed) sizes are 3'040 x 1'220 and 2'500 x 1'220 mm.
The panels are cut to individual dimensions and drilled.
Delivery is on special pallets with a max. weight of 1900 kg.

2.6 Base materials
The large size fibre -format panels made of fibre cement comprise the following base materials (base materials as mass percentages of the hardened product):
- Cement: 57 to 78%
- Cellulose: 1.2 to 5%
### 2.7 Production

Large size fibre cement panels are manufactured by the means of an automated winding up process. The raw materials are mixed with water to prepare a homogeneous mixture. The mixture is pumped into material boxes in which screen cylinders rotate and drain internally. The screen surface is covered in a thin film of fibre cement which is transferred onto a continuous conveyor belt (transport felt) from where it is conveyed onto the main cylinder which is gradually covered in an increasingly thicker layer of fibre cement. Once the required material thickness is achieved, the still moist and malleable fibre-cement layer is cut off and rolled off the cylinder. The fibre cement layer is subsequently punched on all edges to size and leftovers are returned to the production process preventing any waste from being incurred. The panel which has not yet set is stacked between sheet metal layers and pressed. The panels are then set aside for curing before stacked onto pallets and placed temporarily in a special store for further curing. The setting and curing lasts around 4 weeks. The panel front face is then coated with high quality pure acrylic applied twice in a pouring or spraying process prior to hot filming. The panel back side receives a single or double coating which is usually rolled on. A Quality Management system in accordance with EN ISO 9001:2008 is implemented and certified in the manufacturing plants.

### 2.8 Environment and health during manufacturing

All of the manufacturing plants adhere to the national environmental and health regulations. The required processes, monitoring and measurements are in place and implemented. Past measurements indicated that the limit values are significantly fallen short of in each case. A safety system in accordance with the EKAS Directive 6508 is in place in the manufacturing plant in Switzerland. Directive 2003/53/EC of the European Parliament and Council dated 18 June 2003 on the 26th amendment of Council Directive 76/769/EEC governing restrictions on the marketing and use of certain hazardous substances and preparations (nonylphenol, nonylphenol ethoxylate and cement) is taken into consideration and implemented in the manufacturing plants. The substances are all prepared and processed in closed rooms in order to keep noise emissions as low as possible. Raw materials are largely transported by railways in order to keep emissions as low as possible there, too. The process water is retained in a closed circuit. Excess water is treated and redirected into public waters under supervision of the regional waste water authorities. This minimises environmental pollution.
2.9 Product processing / installation

The panels are generally cut and drilled to the customer’s requirements in the plant or in the workshop of local fabricator. Cutting in the field might be needed to suit the actual building dimensions and details. This can be done on site using circular hand saws with guide rails and jig saws for curved and smaller cut outs, etc. Use power tools with dust extraction systems. Respiratory masks are to be used according to local safety regulations.

The panels are installed for facades and wall claddings according to the principle of rear ventilation or so called rain screen application. The panels are fastened by screws to timber battens and by rivets to metal sub frame profiles.

Refer to technical documentations of the individual companies in FibreCem Holding AG.

During transportation, storage and installation, all measures must be taken to prevent the risk of injury, material and consequential damage. All national, federal, state, local and other applicable safety regulations must always be complied with.

No further special measures need to be taken.

2.10 Packaging

The panels are packed onto reusable pallets for regional shipping or within Europe and shipped directly to the building site or to the distributor. These pallets are generally used several times.

Composition of packaging per 1000 kg of panels:
- Wood (reusable pallet) 1.5 kg
- Cardboard edge protection 0.5 kg
- PE foil 0.4 kg

Specific pallets are used for overseas transportation which are disposed of locally or re-used.

Composition of packaging per 1000 kg:
- Wood (Euro pallet) 106 kg
- PE foil 0.8 kg

2.11 Condition of use

When the cement and water mixture sets (hydration), cement stone (calcium silicate hydrate) is formed with embedded fibres and fillers as well as micro air voids.

Over the RSL, the surface of the cement stone reacts to the effects of CO₂ (carbon dioxide) from the air and moisture to form calcium carbonate (carbonation).

Owing to this material composition, there are no particular characteristics which need to be observed during the use phase.

2.12 Environment and health during use

When the products are used as designated, the current state of knowledge indicates that there are no risks involved for the environment or health.

2.13 Reference Service Life (RSL)

The utilisation phase is not evaluated in this Environmental Product Declaration.

2.14 Extraordinary effects

Fire

The large size fibre cement panels dispose of the following fire performance in accordance with DIN EN 13501-1:
- A2 – s1, d0

Fire class A2 non-combustible, with parts of combustible building materials

Smoke class s1 no/minor smoke development

d0 no dripping/falling

Water

The ingredients are firmly bound in the cement/fibre matrix after setting. Thanks to this form bond, no ingredients which could be hazardous to water are washed out in the event of extraordinary effects by water.

Mechanical destruction

The product displays brittle breakage behaviour under mechanical loads. Splinters and sharp edges can arise.

Resistance to mechanical influences in accordance with EN 12467 complies with classes A4 or A5.

2.15 Re-use phase

The large size panels can be removed non-destructively by releasing the screws or rivets. In undamaged form, the dismantled product can be re-used in accordance with the original purpose.

2.16 Disposal

When separated by type, the fibre cement products referred to are suitable for further use when crushed and used as additives in the manufacture of cement (material recycling).

Furthermore, the fibre-cement products referred to are suitable for further use as filler and bulk material in civil engineering, especially in road construction or for noise barriers (material recycling).

Where the recycling options indicated above are not practical, fibre cement product leftovers on the construction site as well as those incurred by demolition can be safely landfilled without pre-treatment in Class I landfills thanks to their largely mineral ingredients:

- in European countries and Switzerland in accordance with the European Waste Catalogue (EWD) and the disposal guide for waste types for VeVA codes in class 17 01 01.
- In Austria in accordance with the Austrian Landfill Ordinance 2008 (Federal Law Gazette No. BGBl. II no. 39/2008 Part II) under code number 31409.

2.17 Further information

Further information is available on the following web sites:

www.swisspearl.com
3 **LCA: Calculation rules**

### 3.1 Declared unit
The declared unit is 1 tonne (1000 kg).

The declared indicators for the Life Cycle Inventory Analysis and estimated impact were calculated as averages, weighted by production volumes, from the Life Cycle Assessment results of manufacturing in the plants in Switzerland and Austria.

### 3.2 System boundary
**Type of EPD: cradle to plant gate**

In accordance with EN 15804, the Life Cycle Assessment refers to the product stage (information modules A1 to A3). Other life cycle phases such as processing, use and disposal were not assessed. Accordingly, it comprises the raw material supply and raw material processing as well as the finishing processes concerning secondary materials serving as input (A1), transport to the manufacturer (A2) and manufacturing (A3). All of the processes supplying material and energy input in Modules A1 to A3 as well as the treatment of all waste and emissions into the air incurred by these processes are part of the system. A large percentage of waste is incurred by cutting the panels to size. Emissions of volatile organic compounds are caused during coating. Waste water is treated by in-company sewage systems.

### 3.3 Estimates and assumptions
Most of the input and output influences of the Life Cycle Inventory Analysis could be depicted using corresponding data from the "ecoinvent v2.2" database. There were no data records on "ecoinvent" for certain inputs such as polyethylene fibre, polyvinyl alcohol fibres or polyethylene wax (coating component). In some cases, they were modelled using data which is as similar as possible (proxy data). For PVA, data was used which was drawn up by ESU-services within the framework of a project by the Swiss Federal Office of Energy (BFE, Switzerland).

The data was recorded in accordance with the ecoinvent guidelines and was available in EcoSpold format. Where possible, specific regional data was used when selecting background data.

### 3.4 Cut-off criteria
No data was available on the infrastructure of the FibreCem Holding (buildings and machinery) when recording data on fibre-cement production.

The following details can be provided, however:

The production and storage halls as well as the administration buildings are several decades old. Thanks to unchanging production processes, most of the production equipment and machinery have also been in use for several years.

On the basis of an estimate, it can be assumed that the impact by the infrastructure per kilogramme of product as per the Product Category Rules is less than 5% of the total use of primary energy and accounts for less than 5% of the total mass of the product stage.

### 3.5 Background data
Data from "ecoinvent, version 2.2" was used for drawing up the Life Cycle Assessments.

### 3.6 Data quality
The data records were comprehensive and carried out directly at the various production locations using a standardised questionnaire. All data was examined for plausibility in collaboration with the manufacturers. Very good data quality can therefore be assumed. The background data used from ecoinvent has not however been thoroughly revised for some time.

### 3.7 Period under review
Data for the entire production in 2010 was recorded at the production facilities. Apart from large-format panels, medium-sized and small panels, profiled panels and roof slates are also manufactured in the various FibreCem Holding plants.

### 3.8 Allocation
Within Modules A1, A2 and A3, the inputs and outputs of data records which could not be directly allocated to a product were allocated via the production volume of individual products.

### 3.9 Comparability
As a general rule, a comparison or evaluation of EPD data is only possible when all of the data to be compared has been drawn up in accordance with EN 15804. The building context or product-specific characteristics also need to be taken into consideration.

4 **LCA: Scenarios and other technical information**

No further details.

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2 ecoinvent Centre, Swiss Centre for Life Cycle Inventories, ecoinvent v2.2, 2010, [www.ecoinvent.org](http://www.ecoinvent.org)
5 LCA: Results

The following tables depict the results of the indicators for the Life Cycle Assessment, use of resources and waste with reference to one tonne:

- pigmented panels, coated
- white cement panels, coated
- grey panels, coated

The data is representative for products manufactured by FibreCem Holding AG.

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

<table>
<thead>
<tr>
<th>Product stage</th>
<th>Construction process 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 supply</td>
<td>Transport</td>
<td>Manufacture</td>
<td>Transport</td>
<td>Deconstruction</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td>Construction-installation process</td>
<td>Use / Application</td>
<td>Operational energy use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintainance</td>
<td>Repairs</td>
<td>Operational water use</td>
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<td></td>
<td></td>
<td></td>
<td>Replacement</td>
<td>Waste treatment</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Landlining</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Re-use, recovery and recycling potential</td>
</tr>
<tr>
<td>A1</td>
<td>X</td>
<td>X</td>
<td>MND</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td></td>
<td>X</td>
<td>MND</td>
<td></td>
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<tr>
<td>A3</td>
<td></td>
<td>MND</td>
<td>MND</td>
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<tr>
<td>A4</td>
<td></td>
<td>MND</td>
<td>MND</td>
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<tr>
<td>A5</td>
<td></td>
<td>MND</td>
<td>MND</td>
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<tr>
<td>B1</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td></td>
<td>MND</td>
<td>MND</td>
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<tr>
<td>B3</td>
<td></td>
<td>MND</td>
<td>MND</td>
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<tr>
<td>B4</td>
<td></td>
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<tr>
<td>B5</td>
<td></td>
<td>MND</td>
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<tr>
<td>B6</td>
<td></td>
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<tr>
<td>B7</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
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<tr>
<td>C1</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
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<tr>
<td>C2</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
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<tr>
<td>C3</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
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<tr>
<td>C4</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
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<tr>
<td>D</td>
<td></td>
<td>MND</td>
<td>MND</td>
<td></td>
</tr>
</tbody>
</table>

LCA RESULTS – ENVIRONMENTAL IMPACT: 1 tonne large-format fibre-cement panels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Pigmented panels, coated</th>
<th>White cement panels, coated</th>
<th>Grey panels, coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Potential (GWP)</td>
<td>kg CO₂ equiv.</td>
<td>A1 - A3 1.15E+03</td>
<td>A1 - A3 1.12E+03</td>
<td>A1 - A3 1.06E+03</td>
</tr>
<tr>
<td>Acidification Potential of soil and water (AP)</td>
<td>kg SO₂ equiv.</td>
<td>A1 - A3 2.53E+00</td>
<td>A1 - A3 2.43E+00</td>
<td>A1 - A3 2.23E+00</td>
</tr>
</tbody>
</table>

LCA RESULTS – USE OF RESOURCES: 1 tonne large-format fibre-cement panels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Pigmented panels, coated</th>
<th>White cement panels, coated</th>
<th>Grey panels, coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable primary energy as energy carrier (PERE)</td>
<td>[MJ]</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
</tr>
<tr>
<td>Renewable primary energy as material utilisation (PERM)</td>
<td>[MJ]</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
</tr>
<tr>
<td>Total use of renewable primary energy sources (PERT)</td>
<td>[MJ]</td>
<td>A1 - A3 2.17E+03</td>
<td>A1 - A3 1.71E+03</td>
<td>A1 - A3 2.16E+03</td>
</tr>
<tr>
<td>Non-renewable primary energy as energy carrier (PERE)</td>
<td>[MJ]</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
</tr>
<tr>
<td>Non-renewable primary energy as material utilisation (PERM)</td>
<td>[MJ]</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
</tr>
<tr>
<td>Net use of fresh water (FW)</td>
<td>[m³]</td>
<td>A1 - A3 1.19E+01</td>
<td>A1 - A3 1.11E+01</td>
<td>A1 - A3 1.16E+01</td>
</tr>
</tbody>
</table>

LCA RESULTS – OUTPUT FLOWS AND WASTE CATEGORIES: 1 tonne large-format fibre-cement panels

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Pigmented panels, coated</th>
<th>White cement panels, coated</th>
<th>Grey panels, coated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components for re-use (CRU)</td>
<td>[kg]</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
</tr>
<tr>
<td>Materials for energy recovery (MER)</td>
<td>[kg]</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
<td>A1 - A3 -</td>
</tr>
</tbody>
</table>

3 The primary energy used as energy carriers and for material utilisation can not be differentiated using ecoinvent.
LCA: Interpretation

The following illustrations show a dominance analysis regarding the most important indicators. Regardless of the indicator the results for coated cement composite panel depend to a great extent on the contents of cement and synthetic fibers in the base material mix; as well as on the consumption of electrical power and natural gas for manufacturing. On the other hand do packaging material, water consumption and wastage only contribute with a few percentage points to the total results (Fig. 1 to 3).

Regarding integrally colored, pigmented panels the content of pigments in the base material mix (other ingredients) is decisive for the results. The proportion of the pigments in the total result is especially dominant regarding non renewable primary energy (PENRT) and the potential in reducing the stratospheric ozone layer (ODP).

![Dominance analysis of pigmented panels with coating](image)

The dominance analysis panels made from white cement is comparable with that of panels comprising grey basic materials, the difference being that the provision of white cement is associated with longer transport distances (see also Fig. 32, "Transport").
Fig. 2: Dominance analysis of white cement panels with coating

Fig. 3: Dominance analysis of grey cement panels with coating
7 Requisite evidence

7.1 Radioactivity
In accordance with ÖNORM S 5200:2009 (test "A"), the material can be classified as harmless as the limit assessment factor (ÖNORM S5200 / level “A”) of 1 was significantly fallen short of by the assessment factors 0.09 to 0.016 +/- 0.02.
Measurements were carried out on materials from each of the individual manufacturing plants.

Measureing agency / Report / Date:
Seibersdorf Laboratories, 2444 Seibersdorf, Austria / LA278-1/12, LA278-2/12, LA278-3/12, LA278-4/12 / 18.06.2012

7.2 Leaching
No reservations can be asserted against the structural use of the products referred to from a water-hygiene perspective.

An eluate measurement was carried out to determine the disposal class. The material falls short of all limit values for Class I landfill sites and complies with disposal code 10 13 11.

Measureing agency / Registration no. / Report / Date:
Pulp and Paper Institut, Bogisiceva ul.8, 1000 Ljubljana, Slovenia / Registration code 1253344 / Report no. 23.650 / 23.01.2012

7.3 VOC emissions
According to the directives of DIBt guide lines for the evaluation of building products for interior applications as per October 2010.

*The obligations from the guidelines 98/34/EG of the European parliament and the Council of 22. June1998 concerning an information procedure in the sector of standards and technical regulations (ABI. EG Nr. L 204, S. 37), latest amendments by the guide line 98/34/EG of the European parliament and the council of Juli 20th, 1998 (ABI. EG Nr. L 217, S. 18) have been complied with.
The SWISSPEARL panels are suitable for living rooms and other interior rooms as they fall below all threshold values.

Measureing agency / test report / date:
ALAB GmbH, DE-10559 Berlin / Prüfbericht Nr. A 613 01 002 IK / 13.03.2013

8 References

Institut Bauen und Umwelt e.V., Königswinter (pub.):
General principles for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2011-06

Product Category Rules for Building Products, Part A: Calculation rules for the LCA and requirements on the background report 2011-07

Product Category Rules for Building Products, Part B: Requirements on the EPD for fibre cement / fibre concrete
www.bau-umwelt.de


DIN EN 15804:2012-04, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

EN 12467:2012 Fibre-cement flat panels – Product specification and test methods


European Waste Catalogue (EWC)
Regulation dated 22 June 2005 on handling waste (VeVA)

Austrian Landfill Ordinance 2008 (Federal Law Gazette No. BGBl. II No. 39/2008 Part II)

Data:
