ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025 and EN 15804

Owner of the Declaration | Troldekt A/S
---|---
Program operator | The Norwegian EPD Foundation
Publisher | Institut Bauen und Umwelt e.V. (IBU)
Declaration number | NEPD00295E
Registration number | MR-NEF-EPD-TRO-20140003-EN
Issue date | 19.12.2014
Valid to | 19.12.2019

Troldekt acoustic panels
Wood wool-cement panels

Troldekt A/S

Registered under the scope of mutual recognition between Institut Bauen und Umwelt e.V. (IBU) and The Norwegian EPD Foundation

www.bau-umwelt.com
**General information**

**Product**
Troldtekt acoustic panels

**Owner of the declaration**
Troldtekt A/S
Contact person: Tina Kristensen
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The Norwegian EPD Foundation
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**Declaration number**
NEPD00295E

**Program holder Manufacturer**
Troldtekt A/S
Phone: +47 23 08 80 00
e-mail: post@epd-norge.no

**Declaration number**
NEPD00295E

**Place of production**
Troldhede, 6920 Videbæk, Denmark

**Management system**
CEN Standard EN 15804 serve as core PCR together with the NPCR 010: Building boards.

**Org. No:**
CVR: 45810011

**Issue date**
19.12.2014

**Valid to**
19.12.2019

**Comparability:**
EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

**Year of study**
2014

**Approved**

**Verification:**
Independent verification of data, other environmental information and EPD has been carried out in accordance with ISO14025, 8.1.3 and 8.1.4

Externally ☐
Internally ☐

Kari Sørnes, SINTEF
(Independent verifier approved by EPD Norway)

**Declared unit:**
1 ton of grey or white acoustic wood wool cement panels

**Functional unit:**
No functional unit has been declared

**The EPD has been worked out by:**
Maria R. Rasch
Kari Sørnes, SINTEF

**Key environmental indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>grey panels</th>
<th>white panels</th>
<th>Transport *****</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming</td>
<td>kg CO₂ -eqv</td>
<td>208</td>
<td>434</td>
<td>10</td>
</tr>
<tr>
<td>Energy use</td>
<td>MJ</td>
<td>7643</td>
<td>8707</td>
<td>140</td>
</tr>
<tr>
<td>Dangerous substances</td>
<td>*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Use of secondary materials</td>
<td>kg</td>
<td>222</td>
<td>32</td>
<td>-</td>
</tr>
</tbody>
</table>

* The product contains no substances from the REACH Candidate list or the Norwegian priority list

***** Transport from production site to central warehouse in Norway
**Product**

**Product description:**
Troltekt acoustic panels are intended for use on indoor ceilings and walls.

**Product specification**
Troltekt acoustic panels are made with either grey or white cement. The panels are cut in different sizes with varying thicknesses.

<table>
<thead>
<tr>
<th>Materials</th>
<th>kg</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>470</td>
<td>47.0</td>
</tr>
<tr>
<td>Cement</td>
<td>503</td>
<td>50.3</td>
</tr>
<tr>
<td>Water glass</td>
<td>13</td>
<td>1.3</td>
</tr>
<tr>
<td>Water based paint</td>
<td>14</td>
<td>1.4</td>
</tr>
</tbody>
</table>

**Technical data:**

| Thickness (mm):        | 25 / 35 / 50 |
| Width (mm):            | 600          |
| Length (mm):           | 600 / 1200 / 2000 / 2400 |
| Weight (kg/m^2):       | 9.7 / 12.0 / 15.0 |

Troltekt acoustic panels are CE-labelled in accordance with two European standards: EN 13168 for wood wool panels and EN 13964 for suspended ceilings.

**Market:**
Norway and Northern Europe

**Reference service life:**
The expected lifetime of the panels is 50 years

**LCA: Calculation rules**

**System boundary:**
The system boundary include the recovery and transport of raw materials to the production site and the production processes.

**Declared unit:**
1 ton of grey or white acoustic wood wool cement panels

**Data quality:**
Production data for Troltekt acoustic panels is based on a yearly average of 2013. For background data the GaBi 6.3 databases have been used and all data is <10 years old. Data for the production of cement is provided as EPDs from Aalborg Portland A/S, 2013, compliant with EN 15804.

**Allocation:**
The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house production is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

**Cut-off criteria:**
All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

**LCA: Scenarios and additional technical information**

**Additional technical information**
Troltekt acoustic wood wool cement panels all hold the Danish Indeklimamærket and the fulfils the M1 criteria of the Finish Emission Class for Building Materials, both concerning indoor environment. The panels have no emission of gasses, including TVOC, formaldehyde, ammonia, any carcinogenic compounds or particles in the use phase.

All wood used at Troltekt A/S holds the FSC® or PEFC® label which ensures sustainable forestry.
LCA: Results

The following information describes the scenarios of the modules in the EPD. The central warehouse in Norway is located in Oslo. The transport distance from the warehouse to the final place of use is estimated to be 50 km.

### System boundaries (X=included, MND=module not declared, MNR=module not relevant)

<table>
<thead>
<tr>
<th>Product stage</th>
<th>Construction installation stage</th>
<th>Use stage</th>
<th>End of life stage</th>
<th>Beyond the system boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Transport</td>
<td>Manufacturing</td>
<td>Transport</td>
<td>Construction installation stage</td>
</tr>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
</tr>
<tr>
<td>MND</td>
<td>MND</td>
<td>MND</td>
<td>MND</td>
<td>MND</td>
</tr>
</tbody>
</table>

### Environmental impact

#### Grey panels

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>kg CO₂-eqv</td>
<td>6,97E+01</td>
<td>1,09E+01</td>
<td>1,27E+02</td>
<td>2,08E+02</td>
<td>2,96E+02</td>
<td>1,09E+01</td>
<td>1,27E+02</td>
<td>4,34E+02</td>
</tr>
<tr>
<td>ODP</td>
<td>kg CFC11-eqv</td>
<td>9,35E-08</td>
<td>8,43E-11</td>
<td>7,72E-10</td>
<td>9,43E-08</td>
<td>1,84E-07</td>
<td>8,43E-11</td>
<td>7,72E-10</td>
<td>1,84E-07</td>
</tr>
<tr>
<td>AP</td>
<td>kg SO₂-eqv</td>
<td>8,87E-01</td>
<td>3,20E-02</td>
<td>2,77E-01</td>
<td>1,20E+00</td>
<td>2,00E+00</td>
<td>3,20E-02</td>
<td>2,77E-01</td>
<td>2,31E+00</td>
</tr>
<tr>
<td>EP</td>
<td>kg PO₄³⁻-eqv</td>
<td>1,33E-01</td>
<td>7,07E-03</td>
<td>2,46E-01</td>
<td>3,85E-01</td>
<td>2,25E-01</td>
<td>7,07E-03</td>
<td>2,46E-01</td>
<td>4,78E-01</td>
</tr>
<tr>
<td>POCP</td>
<td>kg C₃H₈-eqv</td>
<td>8,83E-02</td>
<td>-3,16E-03</td>
<td>4,78E-02</td>
<td>1,33E-01</td>
<td>1,56E-01</td>
<td>-3,16E-03</td>
<td>4,78E-02</td>
<td>2,01E-01</td>
</tr>
<tr>
<td>ADPM</td>
<td>kg Sb-eqv</td>
<td>4,47E-04</td>
<td>7,52E-07</td>
<td>3,95E-06</td>
<td>4,51E-04</td>
<td>9,16E-04</td>
<td>7,52E-07</td>
<td>3,95E-06</td>
<td>9,20E-04</td>
</tr>
<tr>
<td>ADPE</td>
<td>MJ</td>
<td>3,78E+03</td>
<td>2,73E+02</td>
<td>2,53E+02</td>
<td>4,30E+03</td>
<td>5,66E+03</td>
<td>2,73E+02</td>
<td>2,53E+02</td>
<td>6,18E+03</td>
</tr>
</tbody>
</table>

### Resource use

#### Grey panels

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RPEE</td>
<td>MJ</td>
<td>1,40E+03</td>
<td>1,30E+01</td>
<td>5,90E+02</td>
<td>2,01E+03</td>
<td>1,45E+03</td>
<td>1,30E+01</td>
<td>5,90E+02</td>
<td>2,06E+03</td>
</tr>
<tr>
<td>RPEM</td>
<td>MJ</td>
<td>6,54E+03</td>
<td>-</td>
<td>1,80E+02</td>
<td>6,72E+03</td>
<td>6,54E+03</td>
<td>-</td>
<td>1,80E+02</td>
<td>6,72E+03</td>
</tr>
<tr>
<td>TPE</td>
<td>MJ</td>
<td>7,95E+03</td>
<td>1,30E+01</td>
<td>7,70E+02</td>
<td>8,73E+03</td>
<td>8,00E+03</td>
<td>1,30E+01</td>
<td>7,70E+02</td>
<td>8,78E+03</td>
</tr>
<tr>
<td>NRPE</td>
<td>MJ</td>
<td>4,39E+03</td>
<td>2,74E+02</td>
<td>2,53E+02</td>
<td>4,92E+03</td>
<td>5,85E+03</td>
<td>2,74E+02</td>
<td>2,53E+02</td>
<td>6,38E+03</td>
</tr>
<tr>
<td>NRPM</td>
<td>MJ</td>
<td>-</td>
<td>-</td>
<td>1,28E+01</td>
<td>1,28E+01</td>
<td>-</td>
<td>-</td>
<td>1,28E+01</td>
<td>1,28E+01</td>
</tr>
<tr>
<td>TRPE</td>
<td>MJ</td>
<td>4,39E+03</td>
<td>2,74E+02</td>
<td>2,66E+02</td>
<td>4,93E+03</td>
<td>5,85E+03</td>
<td>2,74E+02</td>
<td>2,66E+02</td>
<td>6,39E+03</td>
</tr>
<tr>
<td>SM</td>
<td>kg</td>
<td>2,22E+02</td>
<td>-</td>
<td>-</td>
<td>2,22E+02</td>
<td>3,19E+01</td>
<td>-</td>
<td>-</td>
<td>3,19E+01</td>
</tr>
<tr>
<td>RSF</td>
<td>MJ</td>
<td>2,82E+02</td>
<td>-</td>
<td>-</td>
<td>2,82E+02</td>
<td>2,70E+02</td>
<td>-</td>
<td>-</td>
<td>2,70E+02</td>
</tr>
<tr>
<td>NRSF</td>
<td>MJ</td>
<td>4,32E+02</td>
<td>-</td>
<td>-</td>
<td>4,32E+02</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>W</td>
<td>m³</td>
<td>9,12E-01</td>
<td>2,29E-02</td>
<td>1,46E-01</td>
<td>1,08E+00</td>
<td>9,12E-01</td>
<td>2,29E-02</td>
<td>1,46E-01</td>
<td>1,08E+00</td>
</tr>
</tbody>
</table>

### Notes

- **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 photochemical oxidants; **ADPM** Abiotic depletion potential for non fossil resources; **ADPE** Abiotic depletion potential for fossil resources.

- **RPEE** Renewable primary energy resources used as energy carrier; **RPEM** Renewable primary energy resources used as raw materials; **TPE** Total use of renewable primary energy resources; **NRPE** Non renewable primary energy resources used as energy carrier; **NRPM** Non renewable primary energy resources used as materials; **TRPE** Total use of non renewable primary energy resources; **SM** Use of secondary materials; **RSF** Use of renewable secondary fuels; **NRSF** Use of non renewable secondary fuels; **W** Use of net fresh water.
End of life - Waste

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Grey panels</th>
<th>White panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW</td>
<td>kg</td>
<td>1,46E-02</td>
<td>1,47E-03</td>
</tr>
<tr>
<td>NHW</td>
<td>kg</td>
<td>2,20E+01</td>
<td>3,80E-02</td>
</tr>
<tr>
<td>RW</td>
<td>kg</td>
<td>4,81E-02</td>
<td>3,80E-04</td>
</tr>
</tbody>
</table>

HW: Hazardous waste disposed; NHW: Non-hazardous waste disposed; RW: Radioactive waste disposed

End of life - Output flow

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Grey panels</th>
<th>White panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>kg</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MR</td>
<td>kg</td>
<td>9,26E-01</td>
<td>-</td>
</tr>
<tr>
<td>MER</td>
<td>kg</td>
<td>5,52E-02</td>
<td>-</td>
</tr>
<tr>
<td>EEE</td>
<td>MJ</td>
<td>6,93E-01</td>
<td>-</td>
</tr>
<tr>
<td>ETE</td>
<td>MJ</td>
<td>2,45E-02</td>
<td>-</td>
</tr>
</tbody>
</table>

CR: Components for reuse; MR: Materials for recycling; MER: Materials for energy recovery; EEE: Exported electric energy; ETE: Exported thermal energy

Reading example: 9.0E-03 = 9.0*10^{-3} = 0.009

Additional Norwegian requirements

Electricity
Electricity used in the manufacturing processes has been accounted for using the process Danish grid mix at consumer (1-60 kV) and a Danish mix of electricity from wind power from GaBi v. 6.3

Greenhouse gas emissions: 0.132 kg CO2 - eqv/MJ Danish grid mix (1-60 kV)
Greenhouse gas emissions: 0.0023 kg CO2 - eqv/MJ Danish mix (wind power)

Dangerous substances
None of the following substances have been added to the product: Substances on the REACH Candidate list of substances of very high concern or substances on the Norwegian Priority list (of 18.12.2014) or substances that lead to the product being classified as hazardous waste. The chemical content of the product complies with regulatory levels as given in the Norwegian Product Regulations.

Transport
Transport from production site to central warehouse in Norway is: 302 km

Transportation to a central warehouse is done by truck and by ship from Denmark to Norway. The truck is based on a Euro 5, 20-26 t (17.3 t payload) and the ship is based on a container ship including consumption of heavy fuel oil.

Indoor environment
The product meets the requirements for low emissions (M1) according to EN15251: 2007 Appendix E.
Bibliography

ISO 14025:2006  
*Environmental labels and declarations - Type III environmental declarations - Principles and procedures*

ISO 14044:2006  
*Environmental management - Life cycle assessment - Requirements and guidelines*

EN 15804:2012  
*Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products*

ISO 21930:2007  
*Sustainability in building construction - Environmental declaration of building products*

Rasch M. (2014)  
LCA of Troldtekt wood wool-cement acoustic panels, Project Report, Danish Technological Institute, 2014

PCR 2014  
ANNEX 1: Self declaration from EPD owner

Specific German requirements

1 Transport from the place of manufacture to a central warehouse

Transport distance, and CO₂-eq./DU from transport of the product from factory gate to central warehouse in Frankfurt shall be given. The following table shall be included in the EPD:

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity utilisation (incl. return) %</th>
<th>Type of vehicle</th>
<th>Distance km</th>
<th>Fuel/Energy use</th>
<th>Unit</th>
<th>Value (l/t)</th>
<th>CO₂-eqv./DU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Truck</td>
<td>80 %</td>
<td>Euro 4 24,7 t payload</td>
<td>811</td>
<td>0,015</td>
<td>l/tkm</td>
<td>12,3</td>
<td>43,2 kg</td>
</tr>
<tr>
<td>Railway</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The trucks are loaded with 24,5 ton of Troldekt acoustic panels in Trolthedede, Denmark, which yields a capacity utilisation of 99 % using a Euro 4 >32 t gross weight / 24,7 payload capacity. The trucks contain cargo on the return trip as well. Here is assumed a capacity utilisation of 60 %.

Capacity utilisation is calculated according to the following equation¹:

\[
load = \frac{\text{distance}_{\text{trip}} \times \text{load}_{\text{trip}} + \text{distance}_{\text{return}} \times \text{load}_{\text{return}}}{\text{distance}_{\text{trip}} + \text{distance}_{\text{return}}}
\]

\[
load = \frac{811 \times 0.99 + 811 \times 0.60}{811 + 811} = 0.80 = 80\%
\]

¹ Documentation for Truck Transportation Processes, 2012. By The Fraunhofer Institute for Building Physics, University of Stuttgart, Chair for Building Physics, published at www.gabi-software.com