ENVIROMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration: Norsk Stål AS
Program operator: The Norwegian EPD Foundation
Publisher: The Norwegian EPD Foundation
Declaration number: NEPD-348-237-EN

Issue date: 09.09.2015
Valid to: 09.09.2020

Wire mesh reinforcement steel

Norsk Stål AS

www.epd-norge.no
General information

**Product:**
Wire mesh reinforcement bars made from prefabricated steel from European manufacturers.

**Program operator:**
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Phone: +47 23 08 80 00
e-mail: post@epd-norge.no

**Declaration number:**
NEPD-348-237-EN

**ECO Platform reference number:**
-

**This declaration is based on Product Category Rules:**
CEN Standard EN 15804 serves as core PCR
NPCR 013 Steel as Construction Material Rev 1 (08/2013)

**Statement of liability:**
The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

**Declared unit:**
-

**Declared unit with option (A1-A3 + A4):**
Per kg steel

**Functional unit:**
-

**Verification:**
The CEN Norm EN 15804 serves as the core PCR.
Independent verification of the declaration and data, according to ISO14025:2010
☐ internal  ☐ external

**Third party verifier:**

Helene Sedal, Rambøll Norge AS
(Independent verifier approved by EPD Norway)

**Owner of the declaration:**
Norsk Stål AS
Contact person: Erik Larsen
Phone: +47 91 64 14 96
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**Manufacturer:**
Norsk Stål AS
Postboks 1083, 4683 Søgne
Phone: +47 47 81 80 00
e-mail: erik.larsen@norskstaal.no

**Place of production:**
Norway

**Management system:**
NS-EN ISO 14001:2004
NS-EN 10080:2005
Startbank ID: 138341

**Organisation no:**
NO 959493715 MVA

**Issue date:**
09.09.2015

**Valid to:**
09.09.2020

**Year of study:**
2015

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

**The EPD has been worked out by:**
Annik Magerholm Fet  Michael Myrvold Jenssen

NTNU – Trondheim
Norwegian University of Science and Technology

**Approved**
Dagfinn Malnes
Managing Director of EPD-Norge
Product

Product description:
The product studied is pre-welded steel wire mesh, often called welded wire mesh, welded wire fabric, wire mesh reinforcement or mesh reinforcement (Norwegian: armeringsnett). Wire mesh is a common application of reinforcement steel, where prefabricated welded steel bars forms a reinforcing mesh that supports the concrete slab. Reinforcement bars (rebar, Norwegian: armeringsjern) are steel rods that are used as a tension device in concrete reinforcement. The bars may have protruding features and indentations to better bond with the concrete, commonly in the form of ribs. When embedded into concrete, the steel is able to alleviate the tension that is imposed on the concrete by distributing the tension evenly over a large area, and typical applications are in the construction of buildings and civil structures.

Technical information:
Steel products may contain many types of alloys, depending on the intended performance characteristic of the steel product. For reinforcement steel, a typical material composition is given in the table below.

Scrap content is reported to be 100% (7)(8)(9)

Product specification:

<table>
<thead>
<tr>
<th>Materials</th>
<th>kg</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe - Iron</td>
<td>0,98-0,99</td>
<td>98-99</td>
</tr>
<tr>
<td>C - Carbon</td>
<td>0,005-0,002</td>
<td>0,05-0,02</td>
</tr>
<tr>
<td>Si - Silicon</td>
<td>0,02</td>
<td>0,2</td>
</tr>
<tr>
<td>Mn - Manganese</td>
<td>0,03-0,07</td>
<td>0,3-0,7</td>
</tr>
</tbody>
</table>

Market:
Norway

Reference service life, product:
Not relevant.

A construction worker sprays concrete (“shotcrete”) over welded wire mesh reinforcement. Photo: Raimond Spekking (CC BY-SA 3.0.).
LCA: Calculation rules

Declared unit:
Per kg steel

System boundary:
Cradle to gate (A1-A3) including transport from manufacturer to customer (A4). System boundaries are shown in the flowchart.

Data quality:
General requirements and guidelines concerning use of generic and specific data and the quality of those are as described in EN 15804: 2012 +A1:2013, clause 6.3.6 and 6.3.7. The data is representative according to temporal, geographical and technological requirements.

Temporal:
Data for use in module A3 is supplied by the manufacturer and consists of the recorded amount of specific material and energy consumption for the product studied. Specific data has been collected for 2014. Generic data has been created or updated within the last 10 years.

Geographical:
The geographic region of the production sites included in the calculation is Norway (A3). Data for A1 represents European manufacturers (Norway included).

Production sites included are in Klepp, Søgne and Skien. Warehouse operations in Larvik and Strømmen are included in the study.

Technological:
Data represents technology in use.

Data for module A1 consists of specific data derived from suppliers for reinforcement steel [7][8][9]. All other data are acquired from, and calculated in GaBi 7 [10].

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.

Allocation:
The allocation is made in accordance with the provisions of EN 15804: 2012 + A1:2013. Incoming energy and water and waste production in-house is allocated equally among all products through mass allocation if applicable.
LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

The scenarios for transport distances and transportation modes from suppliers to manufacturer represent both recorded and calculated routes and distances from factory gates in Europe to Norway. Transport scenarios for waste handling and transport to sites/customers are based on assumptions and recorded averages respectively.

**Transport from suppliers to producer (A2)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity utilisation (incl. return) %</th>
<th>Type of vehicle</th>
<th>Distance km</th>
<th>Fuel/Energy consumption (l/t/km)</th>
<th>Value (l/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container vessel</td>
<td>48</td>
<td>27500 DWT</td>
<td>1154</td>
<td>0,005</td>
<td>5,30</td>
</tr>
<tr>
<td>River freight ship</td>
<td>65</td>
<td>Downstream barge</td>
<td>700</td>
<td>0,002</td>
<td>1,12</td>
</tr>
<tr>
<td>Truck</td>
<td>85</td>
<td>Euro 0-5mix, 27t payl.</td>
<td>175,3</td>
<td>0,044</td>
<td>7,72</td>
</tr>
</tbody>
</table>

Transport in A2 describes the transports of steel products for further manufacturing, expedition or storage at manufacturer.

**Waste transportation (A3)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity utilisation (incl. return) %</th>
<th>Type of vehicle</th>
<th>Distance km</th>
<th>Fuel/Energy consumption (l/t/km)</th>
<th>Value (l/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>85</td>
<td>Euro 6, 27t payl.</td>
<td>50</td>
<td>0,795</td>
<td>0,02</td>
</tr>
</tbody>
</table>

Transport in A3 describes shipping transportation of waste to waste collection points or waste disposal plants.

**Transport from production place to user (A4)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity utilisation (incl. return) %</th>
<th>Type of vehicle</th>
<th>Distance km</th>
<th>Fuel/Energy consumption (l/t/km)</th>
<th>Value (l/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>85</td>
<td>Euro 6, 27t payl.</td>
<td>64</td>
<td>0,016</td>
<td>1,02</td>
</tr>
</tbody>
</table>

Transport in A4 represents an average of actual distances recorded in 2014.
The results show that the most significant impacts come from the production of steel. The steel is shipped from European manufacturers to ports in Norway, giving a moderate impact in A2. Module A3 includes unloading and expediting of goods from a forklift, storage and office maintenance, and has a relatively low impact. Module A4 gives transport to customers/sites, with a low impact relative to module A1.

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

<table>
<thead>
<tr>
<th>Product stage</th>
<th>Assembly 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>Assembly</td>
</tr>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Environmental impact

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWP</td>
<td>kg CO₂-eqv</td>
<td>3,31E-01</td>
<td>5,05E-04</td>
</tr>
<tr>
<td>ODP</td>
<td>kg CFC11-eqv</td>
<td>6,87E-08</td>
<td>3,41E-15</td>
</tr>
<tr>
<td>POCP</td>
<td>kg C₂H₄-eqv</td>
<td>1,01E-03</td>
<td>2,21E-08</td>
</tr>
<tr>
<td>AP</td>
<td>kg SO₂-eqv</td>
<td>2,46E-04</td>
<td>6,12E-07</td>
</tr>
<tr>
<td>EP</td>
<td>kg PO₄³⁻-eqv</td>
<td>1,31E-04</td>
<td>1,44E-07</td>
</tr>
<tr>
<td>ADPM</td>
<td>kg Sb-eqv</td>
<td>1,42E-07</td>
<td>2,30E-11</td>
</tr>
<tr>
<td>ADPE</td>
<td>MJ</td>
<td>5,19E+00</td>
<td>6,85E-03</td>
</tr>
</tbody>
</table>

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

Resource use

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPEE</td>
<td>MJ</td>
<td>2,20E+00</td>
<td>3,87E-04</td>
</tr>
<tr>
<td>RPEM</td>
<td>MJ</td>
<td>6,46E-06</td>
<td>5,37E-16</td>
</tr>
<tr>
<td>TPE</td>
<td>MJ</td>
<td>2,20E+00</td>
<td>3,87E-04</td>
</tr>
<tr>
<td>NRPE</td>
<td>MJ</td>
<td>6,61E+00</td>
<td>6,88E-03</td>
</tr>
<tr>
<td>NRPM</td>
<td>MJ</td>
<td>4,06E-05</td>
<td>2,00E-15</td>
</tr>
<tr>
<td>TRPE</td>
<td>MJ</td>
<td>6,61E+00</td>
<td>6,88E-03</td>
</tr>
<tr>
<td>SM</td>
<td>kg</td>
<td>2,86E-04</td>
<td>INA</td>
</tr>
<tr>
<td>RSF</td>
<td>MJ</td>
<td>2,78E-05</td>
<td>INA</td>
</tr>
<tr>
<td>NRSF</td>
<td>MJ</td>
<td>2,58E-04</td>
<td>INA</td>
</tr>
<tr>
<td>W</td>
<td>m³</td>
<td>7,45E-02</td>
<td>3,72E-05</td>
</tr>
</tbody>
</table>

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.
INA = Indicator not assessed
### End of life - Waste

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>A1-A3</th>
<th>A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW</td>
<td>kg</td>
<td>2.91E-02</td>
<td>3.269E-09</td>
</tr>
<tr>
<td>NHW</td>
<td>kg</td>
<td>1.33E-02</td>
<td>INA</td>
</tr>
<tr>
<td>RW</td>
<td>kg</td>
<td>7.61E-04</td>
<td>1.432E-08</td>
</tr>
</tbody>
</table>

1 Hazardous and radioactive waste is calculated from deposited goods from background processes. Non-hazardous waste are specific recorded waste from the manufacturer.

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>A1-A3</th>
<th>A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>kg</td>
<td>INA</td>
<td>INA</td>
</tr>
<tr>
<td>MR</td>
<td>kg</td>
<td>3.57E-02</td>
<td>INA</td>
</tr>
<tr>
<td>MER</td>
<td>kg</td>
<td>1.10E-03</td>
<td>INA</td>
</tr>
<tr>
<td>EEE</td>
<td>MJ</td>
<td>INA</td>
<td>INA</td>
</tr>
<tr>
<td>ETE</td>
<td>MJ</td>
<td>INA</td>
<td>INA</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: 9,0 E-03 = 9.0*10^{-3} = 0.009

### Additional Norwegian requirements

**Greenhouse gas emission from the use of electricity in the manufacturing phase**
The electricity mix (NO) represents the average country or region specific electricity supply for final consumers, including electricity own consumption, transmission/distribution losses and electricity imports from neighboring countries.
Reference year: 2011

<table>
<thead>
<tr>
<th>Data source</th>
<th>Amount</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>GaBi 6.4.</td>
<td>0.0465</td>
<td>kg CO₂-eqv/kWh</td>
</tr>
</tbody>
</table>

**Dangerous substances**
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0.1% by weight.
- The product contain dangerous substances, more then 0.1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS no.</th>
<th>Amount</th>
</tr>
</thead>
</table>

**Indoor environment**
No tests have been carried out on the product concerning indoor climate - Not relevant

**Carbon footprint**
Carbon footprint has not been worked out for the product.