

# Environmental Product Declaration



In accordance with ISO 14025 and EN 15804 for:

**SS Piles**

**UAB Scandia Steel Baltic**

|                          |   |
|--------------------------|---|
| Programme:               | The International EPD® System<br><a href="http://www.environdec.com">www.environdec.com</a> |
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| Geographical scope:      | Europe  |



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## Company

Scandia Steel is a leading supplier of steel piling pipes. Our piles are supplied to the Scandinavian building industry and used by well-known construction companies.



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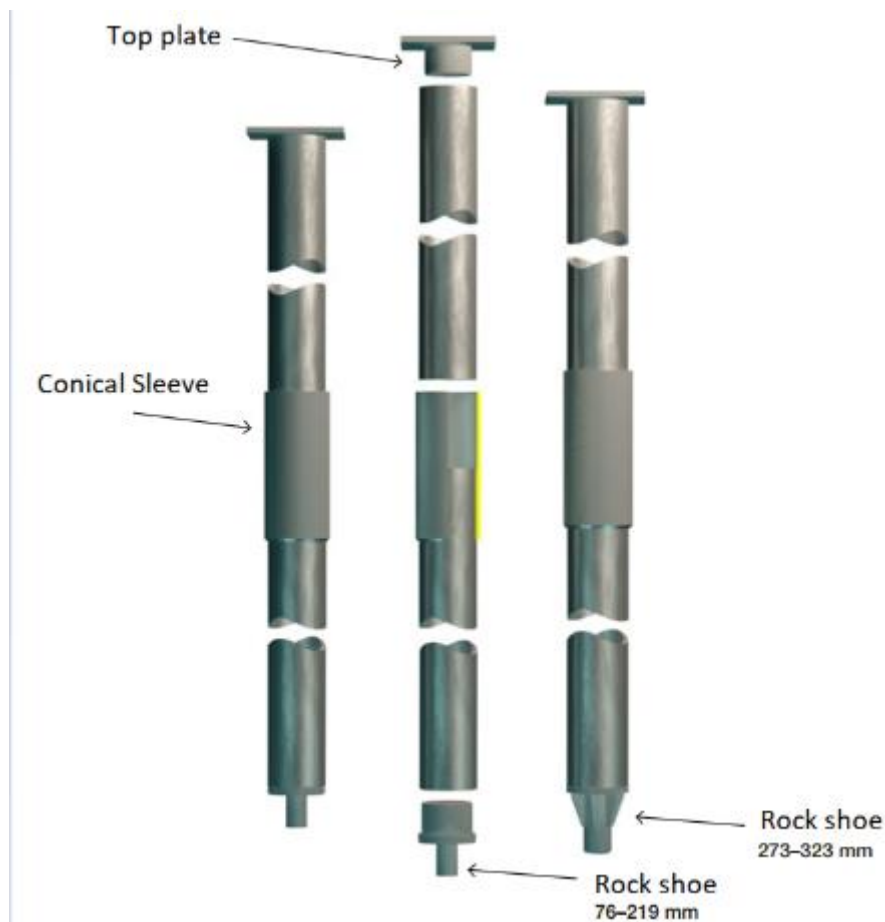
Homepage: [www.scandiasteel.se](http://www.scandiasteel.se)

## Product

SS Pile is a straight steel tube with a top plate, conical sleeve and rock shoe. A picture of the different components of the SS pile can be seen in the figure below.

The SS Piles consist of 100% steel. The steel grade used for the SS Piles is S460MH.

The SS Piles are either drilled or rammed into place, either with a driving shoe or a ring set. After ramming tubes are normally emptied and reinforced using steel and concrete. Typical applications are foundations for (houses) dwellings, offices and commercial buildings as well as refurbishing existing foundations and for infrastructure.



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## Product Life Cycle

This study goes from cradle-to-gate. That means that all processes needed for raw material extraction, transport to manufacturing and manufacturing is included in the study.

According to the PCR the life cycle should be divided into two different life cycle stages:

**Upstream processes** (from cradle-to-gate). Includes life cycle stage referred to as A1 Raw Material Supply. In this case extraction and processing of steel raw material.

### Raw material Steel pipe

The raw material for the SS Piles comes from three steelworks in Europe. One of these supplier that 2016 stood for 25% of the raw material supply is called Arvedi Tubi Acciaio S.p.A and the plant Arvedi Steel and are located in Cremona, in northern Italy. Specific data from this steelwork concerning processing technology and recycled content will be representative in the LCA model. The second producer, that stood for 25% of the supply 2016, is Stalprodukt SA and are located in Poland. The third producer, that stood for 50% of the supply 2016, is a Turkish steelwork plant that also uses EAF technique.

The steelworks produce the raw material for the SS Piles using Electric Arc Furnace (EAF). For the EAF a high amount of recycled steel scrap, >65%, can be used as input material. As an average 2014 came 65% of the raw material for the SS Piles produced from recycled steel scrap. (Battocletti, 2016)

At the steel work the tube piles are formed by cold rolling steel sheet raw material to a circular form and then welded together and cut to the preferred sizes. The raw material for the top plate is a long steel sheet that can be cut to the preferred size at the manufacturing site.

To manufacture the round form of the SS Piles hot rolling technique is used. To produce on tone of SS Piles 1091kg of steel is needed, the steel waste from the production process is reused at the plant.

### Raw material Conical Sleeve

The conical sleeve is used to attach steel pipes together, so one sleeve is made for connecting two steel pipes. With our FU of 6m only half the conical sleeve weight will be calculated with. The weight can be seen in Table 1.

The sleeve is made 30% in BMZ steelwork in Zhloblin Belarus and 70% in Monrovia, Czech Republic.

The steelwork BMZ produces the raw material for the conical sleeve using Electric Arc Furnace (EAF) technology. For the EAF a high amount of recycled steel scrap can be used as input material. In this case 93% of the raw material comes from recycled steel scrap. The specific site data for BMZ will be used to represent all the suppliers of raw material for the conical sleeve. (Melnikov, 2016)

To produce on tone of conical sleeves 1091kg of steel is needed, the steel waste from the production process is reused at the plant. (Melnikov, 2016)

The steel quality is S355J2.

### Raw material Top Plate

The top plate is attached at the upper end of the connected SS piles. The raw material to the top plate is made 10% in CMC, Poland and 90% in Monrovia, Czech Republic. The weight of the top plate can be seen in Table 1. The steel quality is S355J2 which is the same as for the steel pipes and the same data for representation will be used.

### Raw Material Rock Shoe

The rock shoe is welded on the lower end of the connected SS piles. Depending on the size the rock shoe has different design. The rock shoe is a hardened dub that is connected to the bottom end of the steel pipe in the smaller dimensions. In the bigger dimensions there is instead welded

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reinforcements in the end. The hardened dub is made in Köyliö, Finland with the steel quality according to E8815/445. Data to represent the rock shoe is generic data from ecoinvent 3.3

**Core processes** (from gate-to-gate). Includes life cycle stages referred to as A2 Transport and A3 Manufacturing.

All finishes raw material is transported to Kretinga Lithuania.

The finished steel pipes are transported 2029km from Arvedi 2029km, the distance from Stalprodukt is 617km and the distance from the Turkish steelwork is 2820km.

The finished conical sleeve is transported with lorry to Kretinga, Lithuania. From Zhloblin the distance is 770km and from Monrovia the distance is 1300km.

The finished raw material to the top plate is transported with lorry to Kretinga, Lithuania. From CMC in Poland the transport distance is 617km and from Monrovia the distance is 1300km.

The rock shoe is transported 877km from Köyliö, Finland.

In Kretinga, Lithuania the rock shoe is constructed by the raw material and welded on the end of the steel pipe. The energy demand when constructing and welding is depending on the dimension. The total energy demand for all manufacturing in Kretinga for the SS pile in kWh can be seen in the table below.

| Dimensions                          | Energy in kWh |
|-------------------------------------|---------------|
| <b>Outer diameter and thickness</b> |               |
| 88,9*6,3mm                          | 44,0          |
| 168,3*10mm                          | 36,5          |
| 323,9*12,5mm                        | 112           |

The energy in Kretinga comes to 90% from renewable sources as wind and solar, the other 10% comes from natural gas. Other consumables are 0,5l lubricating oil per ton processed. (Eriksson, CEO, Scandia Steel Förvaltning AB, 2017)

The manufacturing process uses 2l of coolant and 3kg waste per tone steel processed. 0,5kg waste is generated per processed ton. This waste is recycled by an external company that comes to the facility in Kretinga to fetch the waste.

The SS piles are offered in several different dimensions. Table 1 below show the weight for 1 declared unit of the finished product and its components in different dimensions. (Eriksson, CEO, Scandia Steel Förvaltning AB, 2017)

**Table 1, show common dimensions in mm of SS piles on the market and the weight in kg per declared unit.**

| Dimensions                   | Total weight in kg | Steel pipe | Top plate | Rock shoe | Conical Sleeve | Factor difference between dimension 88,9*6,3 | Meter per tone |
|------------------------------|--------------------|------------|-----------|-----------|----------------|--|----------------|
| Outer diameter and thickness |                    |            |           |           |                |  |                |
| 88,9*6,3mm                   | 85,8               | 76,8       | 2,90      | 2,60      | 3,50           | -  | 75             |
| 168,3*10mm                   | 287,8              | 234        | 12,1      | 19,1      | 22,6           | 3,4  | 23             |
| 323,9*12,5mm                 | 734,4              | 576        | 38,4      | 80,0      | 40,0           | 8,6  | 9              |

**Downstream processes.** Includes only the transport to construction site A4.

The end market is assumed to be Stockholm, Sweden. From Kretinga, Lithuania the finished product is transported with lorry 169km to Ventspils, Latvia. From Ventspils it is loaded on a cargo ship and transported 307km to Nynäshamn, Sweden. From Nynäshamn the lorry continues 58km to Stockholm.

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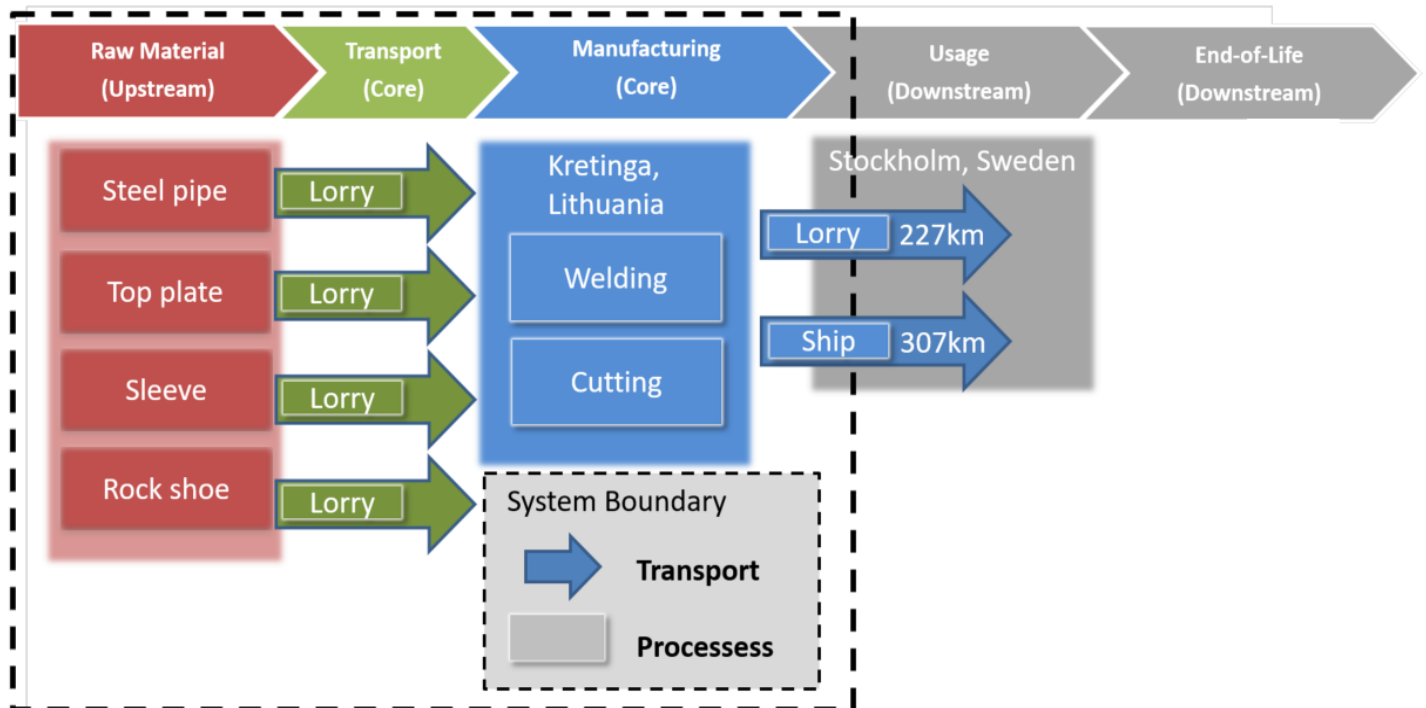
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The figure below shows an overview of the included and accounted modules and life cycle phases.

| Product stage |           |               | Construction process stage |                           | Use stage |             |        |             |               |                        |                       |                            | End of life stage |                  |          |                                    | Resource recovery stage |
|---------------|-----------|---------------|----------------------------|---------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-------------------|------------------|----------|------------------------------------|-------------------------|
| Raw materials | Transport | Manufacturing | Transport                  | Construction installation | 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                          | MND                       | MND       | MND         | MND    | MND         | MND           | MND                    | MND                   | MND                        | MND               | MND              | MND      | MND                                |                         |
|               |           |               |                            |                           |           |             |        |             |               |                        |                       |                            |                   |                  |          | MND                                |                         |

X = Module is accounted for  
MND = Module Not Declared

An overview of the life cycle for SS Piles from Scandia Steel and the included processes can be seen in the figure below.



After the completeness check all materials and processes are found to be included and represented in a full life cycle Cradle to Grave perspective.

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|                                     |  |
|-------------------------------------|--|
| <b>Declared Unit</b>                | The declared unit is 6m of finished product  |
| <b>Product group classification</b> | UN CPC 41244   |
| <b>Goal and Scope</b>               | <p>The result will be used to understand where the environmental burden for the products occurs during the life cycle and aims to lay a road map for development to decrease this burden. The intended use is also to optimize the choice of steel pipes and steel cores during a construction from an environmental perspective.</p> <p>The audience is in first hand construction companies and contractors but also producers of similar steel products.</p>  |
| <b>Manufacturing Site</b>           | UAB Scandia Steel Baltic<br>Vytauto 151<br>97133 Kretinga<br>Lithuania   |
| <b>Geographical Area</b>            | Europe   |
| <b>Compliant with</b>               | <p>This EPD follow the "Book-keeping" LCA approach which is defined as attributional LCA in the ISO 14040 standard.</p> <p>In accordance with ISO 14025 and EN 15804</p> <p>This EPD follow the PCR 2012:01 version 2.2 Construction products and construction services</p>  |
| <b>Cut-Off Rules</b>                | For this LCA study a 1 % cut off rule was applied.   |
| <b>Background Data</b>              | Every generic LCI data comes from ecoinvent 3.3  |
| <b>Reference year for data</b>      | For specific data 2016 is the reference year.<br>The background data from ecoinvent are from 2012-2016   |
| <b>Allocations</b>                  | Polluter Pays / Allocation by Classification<br>There are no co-products in the production and therefore no need for co-product allocation.  |
| <b>Impact Assessment methods</b>    | <p>Total use of renewable and non-renewable resources was calculated with Cumulative Energy Demand 1.09 method.</p> <p>Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100 year horizon.</p> <p>Emission of acidifying substances, Emission of substances to water contributing to oxygen depletion, Emission of gases that contribute to the creation of ground-level ozone, Abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method.</p> |
| <b>Based on LCA Report</b>          | Miljögiraff LCA Report 103 Scandia Steel   |
| <b>Software</b>                     | SimaPro 8.4  |

EPDs within the same product category but from different programmes may not be comparable.  
EPDs of construction products may not be comparable if they do not comply with EN 15804.

Product contain no substances in the REACH Candidate list. Product contain no substances in the Norwegian priority list.

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

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## Environmental performance

The tables below show the renewable and non-renewable resources, the quantities of waste generated, the amount of secondary material used and the consumption of net fresh water in the production of 1 declared unit i.e. 6m of finished product with the dimensions 88,9\*6,3mm. To get the result also for different dimension multiple the result with the factor stated in Table 1.

### Non-renewable resources

|  |           | UNIT | A1<br>UPSTREAM | A2, A3<br>CORE | A4,<br>DOWNSTREAM | TOTAL |
|--|-----------|------|----------------|----------------|-------------------|-------|
| <b>Non-Renewable primary resources: energy</b>       |           |      |                |                |                   |       |
| <b>Total</b>   |           | MJ   | 1338           | 291            | 70                | 1698  |
| <b>Energy</b>  | Hard Coal | MJ   | 614            | 12,1           | 4,2               | 630   |
|  | Petroleum | MJ   | 344            | 15,6           | 3,7               | 363   |
| <b>Non-Renewable primary resources: raw material</b> |           |      |                |                |                   |       |
| <b>Total</b>   |           | MJ   | 0              | 0              | 0                 | 0     |
| <b>Total use of non-renewable primary energy</b>     |           |      |                |                |                   |       |
|  |           | MJ   | 1338           | 291            | 70                | 1698  |

### Renewable resources

|  |  | UNIT | A1<br>UPSTREAM | A2, A3<br>CORE | A4,<br>DOWNSTREAM | TOTAL |
|--|--|------|----------------|----------------|-------------------|-------|
| <b>Renewable primary resources: energy</b>       |  |      |                |                |                   |       |
| <b>Total</b>                                     |  | MJ   | 114            | 4              | 1                 | 119   |
| <b>Renewable primary resources: raw material</b> |  |      |                |                |                   |       |
| <b>Total</b>                                     |  | MJ   | 0              | 0              | 0                 | 0     |
| <b>Total use of renewable primary energy</b>     |  |      |                |                |                   |       |
|  |  | MJ   | 114            | 4              | 1                 | 119   |

### Waste

|                                     | UNIT | A1<br>UPSTREAM | A2, A3<br>CORE | A4<br>DOWNSTREAM | TOTAL |
|-------------------------------------|------|----------------|----------------|------------------|-------|
| <b>Hazardous Waste disposed</b>     |      |                |                |                  |       |
| <b>Total</b>                        | kg   | 0,1            | 0,1            | 0,01             | 0,21  |
| <b>Non-Hazardous Waste disposed</b> |      |                |                |                  |       |
| <b>Total</b>                        | kg   | 0,75           | 0,01           | 0,01             | 0,77  |
| <b>Radioactive Waste disposed</b>   |      |                |                |                  |       |
|                                     | kg   | 0,02           | 0,01           | 0,001            | 0,031 |

### Secondary Material

|   | UNIT | A1<br>UPSTREAM | A2, A3<br>CORE | A4<br>DOWNSTREAM | TOTAL |
|---|------|----------------|----------------|------------------|-------|
| <b>Secondary material used: Scrap metal</b> |      |                |                |                  |       |
| <b>Total</b>                                | kg   | 62,5           | 0              | 0                | 62,5  |

### Use of net fresh water

|                        | UNIT           | A1<br>UPSTREAM | A2, A3<br>CORE | A4<br>DOWNSTREAM | TOTAL |
|------------------------|----------------|----------------|----------------|------------------|-------|
| <b>Net fresh Water</b> |                |                |                |                  |       |
| <b>Total</b>           | m <sup>3</sup> | 0,04           | 0,04           | 0,42             | 0,48  |



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## Potential Environmental Impact Cradle to Gate life cycle 6m of SS Piles

|  | UNIT        | TOTAL  | A1<br>UPSTREAM | A2, A3<br>CORE | A4<br>DOWNSTREAM |
|--|-------------|--------|----------------|----------------|------------------|
| Global warming potential                   | kg CO2-e    | 125,0  | 108,6          | 11,9           | 4,4              |
| Acidification potential                    | kg SO2-e    | 0,6    | 0,6            | 0,0            | 0,0              |
| Eutrophication potential                   | kg PO43-e   | 0,2    | 0,2            | 0,0            | 0,0              |
| Photochemical oxidant creation potential   | kg C2H4-e   | 0,1    | 0,1            | 0,0            | 0,0              |
| Ozone depletion,                           | kg CFC 11-e | 0,0    | 0,0            | 0,0            | 0,0              |
| depletion of abiotic resources (elements), | kg Sb-e     | 0,0    | 0,0            | 0,0            | 0,0              |
| depletion of abiotic resources (fossil),   | MJ          | 1576,9 | 1225,5         | 283,5          | 67,9             |





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## Programme-related information and verification

This EPD follow the PCR 2012:01 v. 2.2 Construction products and construction services.

Product Category Rules review was conducted by:  
The Technical Committee of the International EPD® System.  
Contact via [info@environdec.com](mailto:info@environdec.com)

Independent verification of the declaration and data, according to ISO 14025:2006:

EPD Process Certification (internal)  EPD Verification (external)

Third party verifier:  
Göran Brohammer, Extracon AB  
Approved by the International EPD System