

In accordance with ISO 14025 and EN 15804:2012+A2:2019

ERW Cold Formed Epoxy Coated Pipes

EAF Routed Steel

from

Borusan Mannesmann



PROGRAMME

The International EPD® System
www.environdec.com

PROGRAMME OPERATOR

EPD International AB

LOCAL OPERATOR

EPD Turkey

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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at: environdec.com

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PROGRAMME INFORMATION

Programme Information

Programme : The International EPD® System
Address : EPD International AB Box 21060 SE-100 31 Stockholm, Sweden
Website : www.environdec.com
E-mail : info@environdec.com

Information about verification and reference PCR:

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR)

PCR 2019:14 Construction products (EN 15804:A2) Version 1.1

PCR review was conducted by

The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members.
 Review chair: Claudia A. Peña, University of Concepción, Chile.
 The review panel may be contacted via the Secretariat www.environdec.com/contact.

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

EPD process verification EPD verification

Third party verifier

Sunil Kumar
 SimaPro partners for India & Sri Lanka, SIPL Pvt Ltd

Approved by

International EPD System Technical Commiee,
 supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

LCA Study & EDP Design Conducted by

Semtrio Sustainability Consulting
 BUDOTEK Teknopark, No 8/27
 Umraniye / Istanbul Turkey
www.semtrio.com



Borusan Mannesmann has the sole ownership, liability, and responsibility for the EPD.

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. For further information about comparability, see EN 15804 and ISO 14025.

COMPANY INFORMATION

Owner of the EPD

Borusan Mannesmann Boru Sanayi ve Ticaret A.Ş.

Ata Mh. Sanayi Cd. No: 54/68 16601

Gemlik/Bursa

Contact

Ahu OLGUN

aolgun@borusan.com

The first industrial enterprise of one of Turkey's foremost business conglomerates, the Borusan Group, Borusan Mannesmann marked its 60th anniversary in 2018. Having operated with a global vision since its inception, the company merged its operations with Europe's leading steel and technology firm Salzgitter Mannesmann GMBH in 1998.

Today, Borusan Mannesmann continues its operations as a global brand with 2,038 employees offering more than 4,000 product varieties. Its 7 facilities across 3 continents and high sales volume have placed it on the map as a leading manufacturer in Europe and the world in the steel pipe industry.

Borusan Mannesmann brings its experience, expertise, and passion worldwide with its state-of-the-art pipes addressing all areas ranging from automotive to construction, energy to machinery production. The company continued its investments with a global perspective in accordance with market dynamics and made its first overseas investment in 2001 when it bought the facility in Vobarno and founded Borusan Mannesmann Vobarno Tubi S.p.A. The company then established Borusan Mannesmann Pipe US Inc. in 2014 to manage its Houston Baytown factory investment in the United States. Borusan Mannesmann Pipe US Inc. achieved success soon thanks to its advanced technology and innovative products and won the "Best Pipe Manufacturer" award given by one of the most prestigious publications in the United States, American Metal Market, in 2015, 2017, and 2020.

Having entered among Turkey's pioneering overseas investors with these breakthroughs, Borusan Mannesman both seeks investment opportunities in different countries and aims to boost Turkey's competitiveness.

In addition to its contributions to our country with its exports to various countries in America, Europe, Africa, and Asia, it is also a driving force for the Turkish economy with the development assurance it gives for the coming years.

Having been ranked among Turkey's top 100 industrial enterprises for 50 years, Borusan Mannesmann goes beyond merely manufacturing pipes with its thousands of products, reliable service, quality, and the trails it has blazed in Turkey and the world, and builds Turkey's future. It delivers a sustainable society with its management policies as well as a developed country and a secure future with its large-scale investments.



Production Site

Gemlik

Ata Mah. Sanayi Cad. No: 54/68

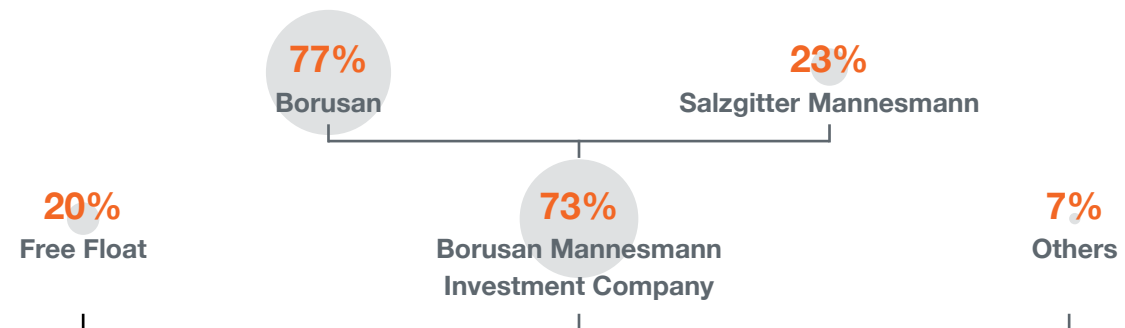
16601 Gemlik/Bursa



- ▣ Flagship of Borusan Group with more than 60 years of pipe manufacturing experience
- ▣ Workforce of 1,800 people
- ▣ 20 years of Contract Management competency
- ▣ Has its own port (Borusan Port) adjacent to the mill, which brings operational flexibility in terms of logistics inbound and outbound
- ▣ Sole 24.5 m single seam API/ISO/EN large diameter line pipe producer in Europe
- ▣ Operates with 7 mills; 5 in Turkey, 1 in Italy, 1 in USA

Corporate Structure

Borusan Group and Europe's leading steel and technology company; Salzgitter Mannesmann GmbH, merged their welded steel pipe investments in Turkey and named that partnership; "Borusan Mannesmann Boru Yatırım Holding" in 1998. The company has 73% shares of Borusan Mannesmann Boru San. ve Tic. A.Ş.



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PRODUCT INFORMATION

Product Name

ERW Cold Formed
Epoxy Coated Pipes

ERW Water Pipes

Production Standards & Material Qualities

- Production Norms
EN 10224, EN 10255, ISO 65, ASTM A 53, ASTM A 795, ASTM A 589, EN 10217-1
- Production Standard For Threading and Coupling (1/2"-6")
ISO 7/1, ANSI B.1.20.1, EN 10255
- Grooving (3/4"-12") according to Victaulic Standard.
- Medium Series Pipes can be used up to 25 bar operating pressure for water.

Production Standards & Material

- Visual and Dimensional Inspection
- Leak tightness testing: Hydrostatic Test, Eddy Current Test

Well Casing Pipes

Production Standards & Material Qualities

- ASTM A 589 Type I, II, III, IV
- Production Standard
- Reliable High Steel Quality
- From Grade A or Grade B Material
- Weldable
- Threadable

Tests & Certificates

- Visual and Dimensional Inspection
- Leak tightness testing: Hydrostatic Test, Eddy Current Test
- Destructive Tests: Flattening, Bending
- Mechanical Tests



- Chemical Analysis
- Metallographic Examination
- Others as required by the standards
- Mill Test Certificates
- Issued upon request according to
 - EN 10204 2.1; 2.2; 3.1; 3.2
- NDT Standards:
 - ET (EN ISO 10893-2), ET (ASTM E309)

Circular Hollow Section

Tests & Certificates

- Visual and Dimensional Inspection
- Mechanical Tests: Tensile Test Flattening Test, Flaring Test Expanding Test Impact Test
- Metallographic Examination
- Chemical Analysis
- Non Destructive Inspection: In-Line Ultrasonic (weld check) In-Line and offline Eddy Current (for round tubes)
- Mill Test Certificates - According to EN 10204 2.1; 2.2; 3.1; 3.2
- NDT Standards - ET (ISO 10893-2)
- Quality Certificates - EN 10219 - EN10210 CE marked

Finishing Operations

Plain End-Square cut or bevelled Black, self-colored/uncoated

Mill protective oil coating; for both round, square and rectangular tubes, black varnish for outside surface of round tubes.

Sizes

| ERW Water Pipes | Piling Tubes | Well Casing Pipes | Circular Hollow Section |
|---|---|---|---|
| Outside Diameter 21.3mm - 339.7mm | Outside Diameter 21.3mm - 339.7mm | Outside Diameter 33.4mm - 323.9mm | Outside Diameter 21.3mm - 339.7mm |
| Wall Thickness 1.9mm - 12.7mm | Wall Thickness 1.9mm - 12.7mm | Wall Thickness 1.9mm - 12.7mm | Wall Thickness 1.9mm - 12.7mm |
| Length 3.00m - 13.00m | Length 3.00m - 13.00m | Length 3.00m - 13.00m | Length 3.00m - 13.00m |

Technical Specifications

| Production Standards | Steel Grades |
|-----------------------------------|--|
| ERW Water Pipes | |
| TS EN 10255+A1 | S195T |
| TS EN 10217-1 | P195 TR1-TR2, P235 TR1-TR2, P265 TR1-TR2 |
| ASTM A53 - ASTM A795 | GrA, GrB |
| Well Casing Pipes | |
| ASTM A 589 Type I, II, III, IV | Grade A or Grade B |
| Circular Hollow Section | |
| EN 10305-3 | E 155 - E 700 |
| BS EN 10029 | GR 43 C |
| ASTM A 500 | GR A, GR B, GR C |
| EN 10219 (BS 6363), EN 10210-2 | S 235, S 275, S 355, S 460 MH, NH (J0H, JRH, J2H, K2H, GR 34/26, GR 43/36) |



LCA Information

Declared unit

1 tonne (1000kg) of fabricated steel product manufactured in Gemlik facility (TR).

Reference service life

Not applicable

Time representatives

The production data in this LCA study represents the period of 1st January 2021 and 30th September 2021.

Database(s) and LCA software used

Simpro v9.2 and Ecoinvent v3.7.1

Description of system boundaries

Cradle to gate (A1-3) with options, modules C1-C4, module D.

Data quality and data collection

According to EN 15804:2012+A2:2019 specific data was used for module A3 (Processes the manufacturer has influence over) and was gathered from Borusan Mannesmann Gemlik plant. Specific data includes actual product weights, amounts of raw materials used, product content, energy consumption, transport figures, water consumption and amounts of wastes. For A1 and A2 modules, according to EN 15804:2012+A2:2019, generic data was applied and was obtained from Ecoinvent v3.7.1

Allocation

Mass allocation has been applied for preconsumer recycled materials according to EN 15804:2012+A2:2019.

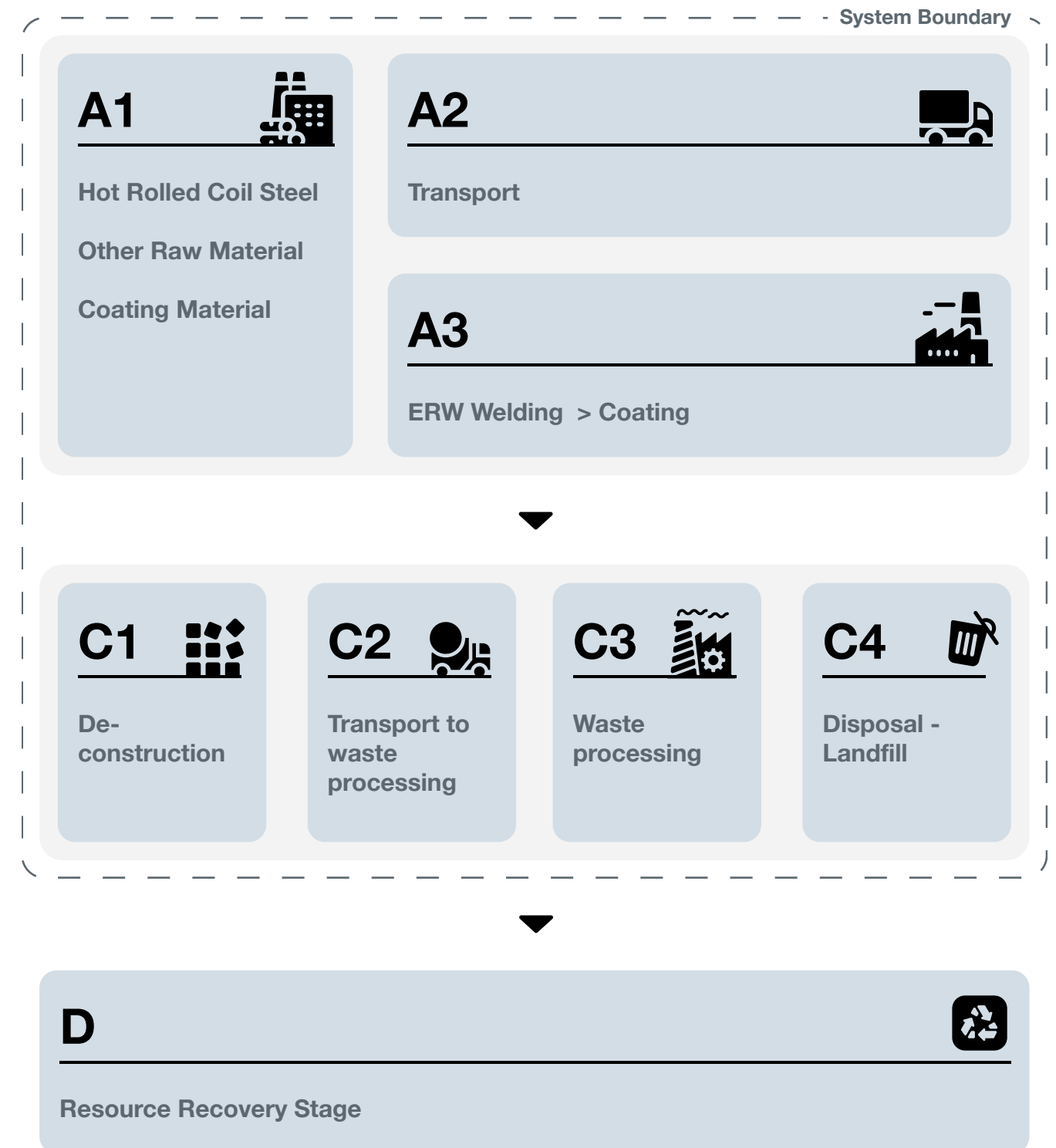
Cut-off rules

Life Cycle Inventory data for a minimum of 99% of total inflows to the three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass and environmental relevance was applied. Impacts caused by treatment operations have been calculated lower than 1% environmental relevance.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

| | Product Stage | | | Construction Process Stage | | Use Stage | | | | | | | End of Life Stage | | | | Resource Recovery Stage |
|--------------------|---------------------|-----------|---------------|-------------------------------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|-------------------|-----------|----------|------------------|--|
| | Raw Material Supply | Transport | Manufacturing | Transport from the gate to the site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational Energy Use | Operational Water Use | De-construction | Transport | Disposal | Waste Processing | Reuse - Recovery - Recycling Potential |
| Modules | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Modules Declared | X | X | X | ND | ND | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| Geography | GLO | GLO | TR | - | - | - | - | - | - | - | - | - | GLO | GLO | GLO | GLO | GLO |
| Specific data used | >99.5% | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation-products | Not Relevant | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation-sites | Not Relevant | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

System Diagram



Description of Raw Materials

A1 - Raw Materials Supply

This stage takes into account raw material extraction, processing and energy used in the production process.

A2 - Transport to the Manufacturer

This stages include transportation of the raw materials from supplier to factory gate. Transportation types are considered as seaway, road, etc.

A3 - Manufacturing

This stage includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered by this stage. Followed production processes are as;

- Tape slitting section
- Welding
- Coating

C1 - De-construction

The dismantling of steel pipe has a very low impact considering the impact throughout the life of the installation. It is assumed that, in C1 module, same electricity and diesel is consumed as during the construction installation of steel pipe.

C2 - Transport to Waste Processing

An average distance of 100km has been assumed for the transport to recycling facility. Transport is calculated on the basis of a scenario with the parameters described in the table below.

Parameters C2 Module

Transport by road* Lorry >32 metric ton

Distance (km) 100

Database Ecoinvent v3.7.1

*Technology is euro 6

C3 - Waste Processing for Reuse, Recovery and/or Recycling

The material and energy expenses required for Module C3 are negligible. It is assumed that there is no sorting or processing required for steel pipes.

C4 - Final Disposal

100% of used product after the lifetime will be collected and recycled into the manufacturing system. It is assumed that 5% of the product is lost during de-construction and 95% is reached to recycling system.

D - Reuse, Recovery or Recycling Potential

Scrap inputs to the production stage are subtracted from scrap to be recycled at end of life in order to obtain the net scrap output from the product system. This remaining net scrap is then delivered to recycling process. Module D reports the environmental aspects of recycled scrap generated at the end of life minus that used at the production stage.

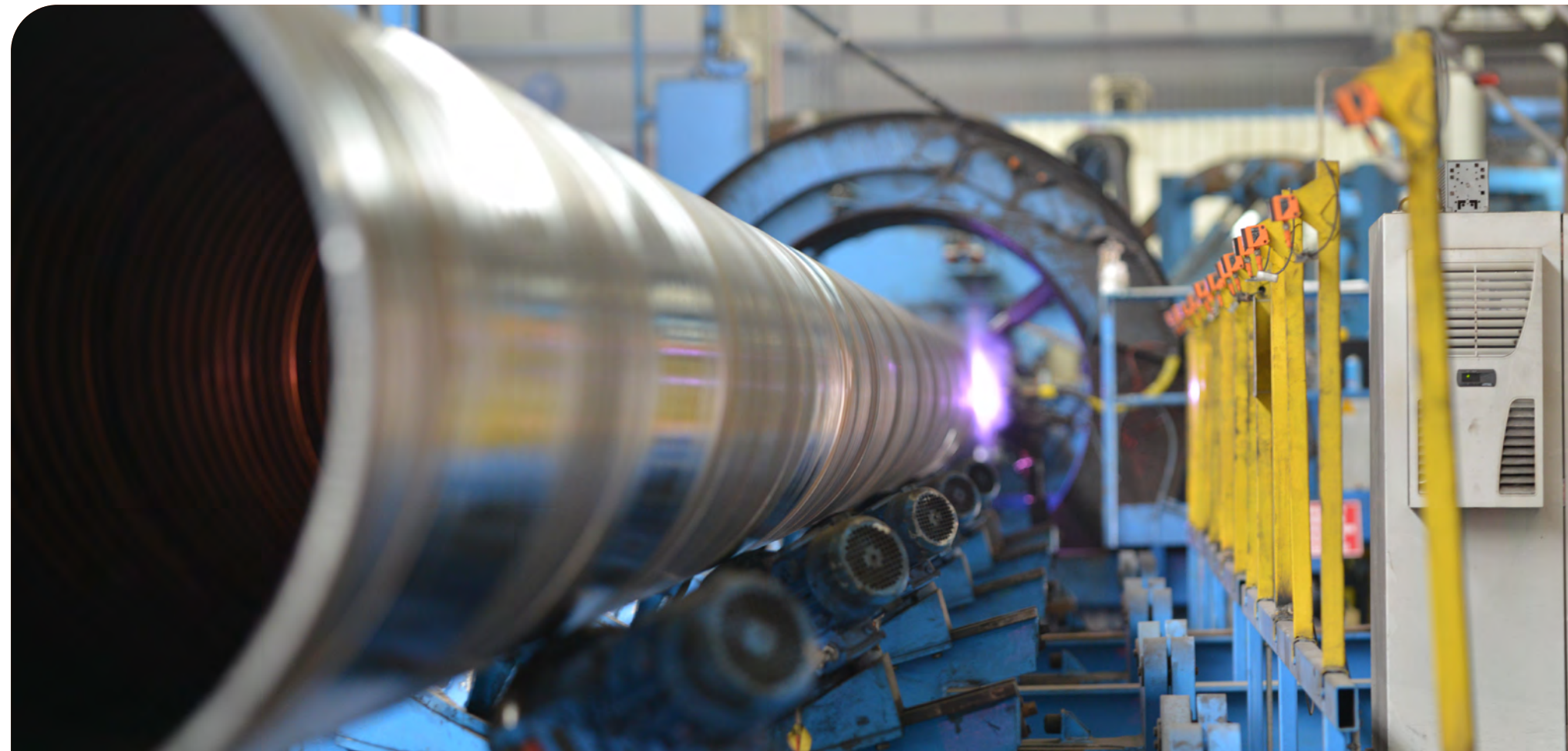
Information on Which Life Cycle Stages Are Not Considered

This EPD only covers the Cradle to Gate A1-3, C1-4 and D stages because other stages are very dependent on particular scenarios and are better developed for specific building or construction works.

Content Declaration

| Content declaration of 1000kg of ERW Steel Pipe | |
|---|--------------|
| Material | Share |
| Steel Coil | 99.0 - 99.9% |
| Renewable Material | 0% |
| Biogenic Carbon | 0% |
| Coating Materials | 0.1 - 1% |

*The product does not content "Candidate List of Substances of Very High Concern (SVHC)" compounds.



ENVIRONMENTAL PERFORMANCE

Potential Environmental Impact

Mandatory Indicators According to EN 15804

| Results for 1000kg of ERW Steel Pipe | | | | | | | |
|--------------------------------------|-------------|----------|----------|----------|----|----------|-----------|
| Indicator | Unit | A1:A3 | C1 | C2 | C3 | C4 | D |
| GWP-fossil | kg CO2 eq | 1079 | 1.28 | 8.67 | 0 | 0.262 | -22.6 |
| GWP-biogenic | kg CO2 eq | 12.6 | 0.031 | 0.019 | 0 | 8.13E-04 | -0.325 |
| GWP-luluc | kg CO2 eq | 0.995 | 1.65E-03 | 2.53E-03 | 0 | 7.12E-05 | -0.044 |
| GWP-total | kg CO2 eq | 1092 | 1.31 | 8.70 | 0 | 0.263 | -23.0 |
| ODP | kg CFC 11eq | 7.44E-05 | 7.22E-08 | 2.13E-06 | 0 | 1.08E-07 | -1.22E-06 |
| AP | mol H+ eq | 4.63 | 6.19E-03 | 0.027 | 0 | 2.48E-03 | -0.166 |
| EP-Freshwater | kg PO43- eq | 0.554 | 7.86E-04 | 3.03E-03 | 0 | 3.32E-04 | -0.016 |
| EP- Aquatic Freshwater | kg P eq | 0.063 | 9.32E-05 | 6.50E-05 | 0 | 2.76E-06 | -1.42E-03 |
| EP-Marine | kg N eq | 0.961 | 1.28E-03 | 6.11E-03 | 0 | 8.60E-04 | -0.033 |
| EP-Terrestrial | kg N eq | 10.7 | 0.012 | 0.068 | 0 | 9.47E-03 | -0.376 |
| POCP | kg NMVOC eq | 4.71 | 4.50E-03 | 0.027 | 0 | 2.75E-03 | -0.124 |
| ADP-minerals & metals* | kg Sb eq | 4.24E-03 | 9.24E-06 | 2.12E-05 | 0 | 5.87E-07 | -1.04E-04 |
| ADP-fossil* | MJ | 15249 | 18.9 | 141 | 0 | 7.35 | -312 |
| WDP | m3 | 551 | 0.995 | 0.466 | 0 | 0.330 | -5.41 |

Acronyms

GWP-fossil = Global Warming Potential fossil fuels; **GWP-biogenic** = Global Warming Potential biogenic; **GWP-luluc** = Global Warming Potential land use and land use change; **ODP** = Depletion potential of the stratospheric ozone layer; **AP** = Acidification potential, Accumulated Exceedance; **EP-freshwater** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-marine** = Eutrophication potential, fraction of nutrients reaching marine end compartment; **EP-terrestrial** = Eutrophication potential, Accumulated Exceedance; **POCP** = Formation potential of tropospheric ozone; **ADP-minerals&metals** = Abiotic depletion potential for non-fossil resources; **ADP-fossil** = Abiotic depletion for fossil resources potential; **WDP** = Water (user) deprivation potential, deprivation-weighted water consumption

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.



Potential Environmental Impact

Additional Mandatory and Voluntary Indicators

| Results for 1000kg of ERW Steel Pipe | | | | | | | |
|--------------------------------------|---------------|----------|----------|----------|----|----------|-----------|
| Indicator | Unit | A1:A3 | C1 | C2 | C3 | C4 | D |
| GWP-GHG¹ | kg CO2 eq | 1040 | 1.23 | 8.59 | 0 | 0.258 | -21.8 |
| Results for 1000kg of ERW Steel Pipe | | | | | | | |
| PM | [disease inc] | 9.23E-05 | 3.89E-07 | 7.57E-07 | 0 | 4.84E-08 | -1.32E-05 |
| IRP | [kBq U235 eq] | 62.6 | 0.110 | 0.620 | 0 | 0.030 | -1.54 |
| ET-freshwater | [CTUe] | 21721 | 30.8 | 108 | 0 | 4.62 | -805 |
| HT-cancer | [CTUh] | 2.15E-05 | 3.57E-08 | 3.31E-09 | 0 | 1.38E-10 | -1.27E-06 |
| HT-non-cancer | [CTUh] | 3.13E-04 | 3.17E-08 | 1.12E-07 | 0 | 2.88E-09 | -3.19E-07 |
| SQP | [pt] | 4505 | 4.80 | 162 | 0 | 15.4 | -123 |

Acronyms

GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; **IRP** = Ionizing radiation, human health; **ET-freshwater** = Eco-toxicity (freshwater); **HT-cancer** = Human toxicity, cancer effects; **HT-non-cancer** = Human toxicity, non-cancer effects; **SQP** = Potential soil quality index (SQP)

¹ The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Use of Resources

| Results for 1000kg of ERW Steel Pipe | | | | | | | |
|--------------------------------------|-------------|-------|-------|-------|----|-------|-------|
| Indicator | Unit | A1:A3 | C1 | C2 | C3 | C4 | D |
| PERE | kg CO2 eq | 1187 | 2.22 | 1.72 | 0 | 0.059 | -60.3 |
| PERM | kg CO2 eq | 0 | 0 | 0 | 0 | 0 | 0 |
| PERT | kg CO2 eq | 1187 | 2.22 | 1.72 | 0 | 0.059 | -60.3 |
| PENRE | kg CO2 eq | 16181 | 20.0 | 150 | 0 | 7.81 | -330 |
| PENRM | kg CFC 11eq | 0 | 0 | 0 | 0 | 0 | 0 |
| PENRT | mol H+ eq | 16181 | 20.0 | 150 | 0 | 7.81 | -330 |
| SM | kg N eq | 1047 | 0 | 0 | 0 | 0 | 0 |
| RSF | kg N eq | 0 | 0 | 0 | 0 | 0 | 0 |
| NRSF | kg NMVOC eq | 0 | 0 | 0 | 0 | 0 | 0 |
| FW | kg Sb eq | 92.1 | 0.170 | 0.129 | 0 | 0.012 | -1.50 |

Acronyms

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water



Waste Production

| Results for 1000kg of ERW Steel Pipe | | | | | | | |
|--------------------------------------|------|----------|----|----|----|----|---|
| Indicator | Unit | A1:A3 | C1 | C2 | C3 | C4 | D |
| Hazardous waste disposed | kg | 3.30E-03 | 0 | 0 | 0 | 0 | 0 |
| Non-hazardous waste disposed | kg | 0.274 | 0 | 0 | 0 | 0 | 0 |
| Radioactive waste disposed | kg | 0 | 0 | 0 | 0 | 0 | 0 |

Output Flows

| Results for 1000kg of ERW Steel Pipe | | | | | | | |
|--------------------------------------|------|-------|----|----|----|-----|---|
| Indicator | Unit | A1:A3 | C1 | C2 | C3 | C4 | D |
| Component for re-use | kg | 0 | 0 | 0 | 0 | 0 | 0 |
| Materials for recycling | kg | 72.4 | 0 | 0 | 0 | 950 | 0 |
| Materials for energy recycling | kg | 7.06 | 0 | 0 | 0 | 0 | 0 |
| Exported energy, electricity | MJ | 0 | 0 | 0 | 0 | 0 | 0 |
| Radioactive waste disposed | MJ | 0 | 0 | 0 | 0 | 0 | 0 |

REFERENCES

ISO 14020:2000

Environmental labels and declarations -- General principles

ISO 14040:2006

Environmental management -- Life cycle assessment -- Principles and framework

ISO 14044:2006

Environmental management -- Life cycle assessment -- Requirements and guidelines

ISO 14025:2006

Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures

EN 15804:2012+A2:2019

Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction product

The International EPD® System

www.environdec.com

The International EPD® System The General Programme Instructions v3.01

The International EPD® System PCR 2029:14 Construction products v1.1 (EN 15804:A2)

Ecoinvent 3.7.1

www.ecoinvent.org

SimaPro LCA Software

www.simapro.com

Borusan Mannesmann

borusanmannesmann.com

CONTACT

Third party verifier

Sunil Kumar

SimaPro partners for India & Sri Lanka

+91-9911921666

SIPL Pvt Ltd

www.sipl-sustainability.com

Owner of Declaration

Borusan Mannesmann Boru Sanayi ve Ticaret A.Ş.

Ata Mh. Sanayi Cd. No: 54/68 16601

Gemlik/Bursa

www.borusanmannesmann.com

LCA Study & EDP Design Conducted By

Semtrio Sustainability Consulting

BUDOTEK Teknopark, No 8/27

Umraniye/Istanbul Turkey

www.semtrio.com



borusanmannesmann.com

Borusan Mannesmann Boru Sanayi ve Ticaret A.Ş.
Ata Mh. Sanayi Cd. No: 54/68 16601, Gemlik/Bursa

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