Environmental Product Declaration Type III ITB No. 234/2021

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SAWH, SAWL and HFW steel pipes

and anti-corrosion 3LPE / 3LPP insulation, internal cement and epoxy coatings

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Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804:2012+A1 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804:2012+A1 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A4, C1-C4 and D modules in accordance with EN 15804:2012+A1
(Cradle to Gate with options)

The year of preparing the EPD: 2021

Service Life: depending on application type, up to 50 years for insulated pipes

PCR: ITB-PCR A (PCR based on EN 15804+A1)

Declared unit: 1 ton (1 Mg) of steel pipe

Reasons for performing LCA: B2B

Representativeness: Polish production, year 2020

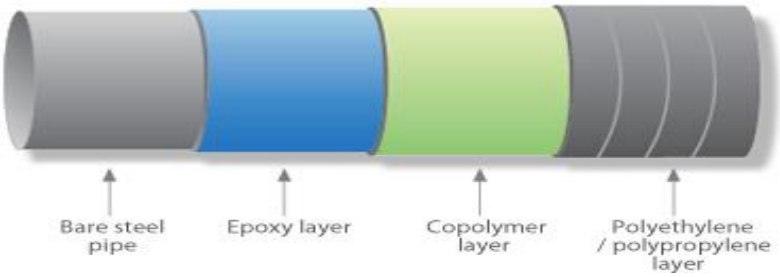
PRODUCTS DESCRIPTION

Helically submerged arc-welded pipes (SAWH) are manufactured by “FERRUM” S.A. in Katowice Poland. Products can be successfully used to produce steel fittings including tees, reducers, elbows and bends. Fittings are made by either cold or hot bending process depending on the strength parameters of steel grade as well as the diameter and wall thickness. Length of pipe is from 6 m to 36 m.

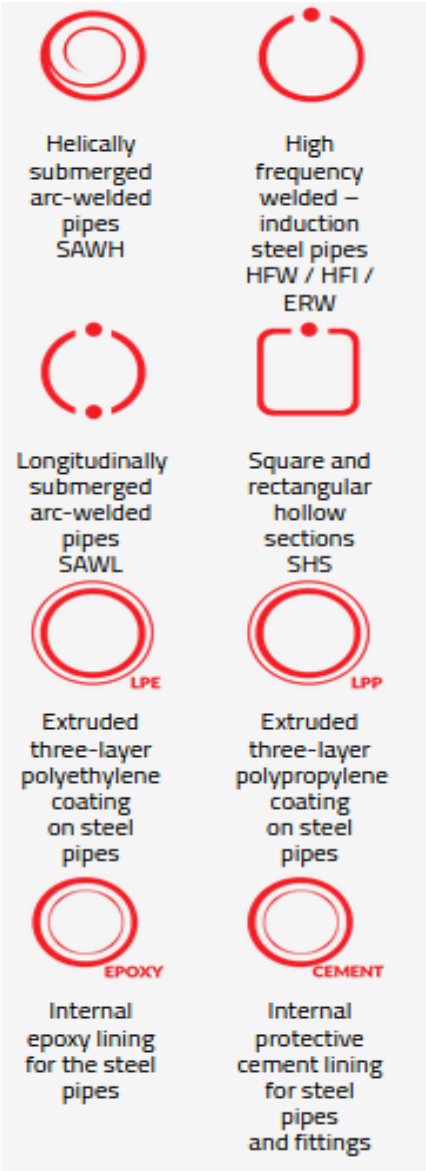
High frequency welded – induction steel pipes HFW / HFI / ERW are manufactured in diameter range from 114.3 mm to 406.4 mm, in production lengths from 6 m to 18 m. Pipes are supplied with plain or bevelled ends, after hydrostatic test and automatic non-destructive ultrasonic or eddy current tests. During production process the heat treatment of seam weld is performed to eliminate stresses generated in the seam as well as to guarantee both homogenous steel structure and higher strength properties. Depending on the required mechanical and technological properties or application, the pipes are produced from the following steel grades: unalloyed and low-alloyed, killed, quality, special. Upon the customer’s needs pipes are supplied as: bare – without protection coating, or with external three-layer polyethylene (PE) or polypropylene (PP) anticorrosion coatings and with internal either cement or epoxy lining. Against agreement pipes may be supplied with other anticorrosion protection e.g. galvanized pipes. High frequency welded (HFW) pipes manufactured by “FERRUM” S.A. can be used to produce steel fittings including tees, reducers, elbows and bends. Fittings are made by either cold or hot bending process depending on the strength parameters of steel grade as well as the diameter and wall thickness. In 1999 the most modern production line of high frequency welded (HFW) steel pipes and structural hollow sections was commenced into operation. The line was designed by the German enterprise SMS Meer and has an annual production capacity of 120 000 Mg for the specified production mix.

Longitudinally submerged arc-welded pipes (SAWL) are manufactured in diameter range from 559 mm to 2032 mm, with either plain or bevelled ends. Pipes in diameter from 559 mm to 914 mm are manufactured with one longitudinal weld seam and from diameter 1016 mm to 1620 mm with two weld seams, and above with three longitudinal weld seams. Line pipes in diameter from 559 mm to 1219 mm are hydrostaically tested. The welds of pipes in diameters from 559 mm to 1422 mm are subject to non-destructive tests. Such tests are continuously performed by X-ray. Upon technical agreement, pipes may be delivered with different diameters and wall thicknesses that are specified in the table, in outside diameters from 559 mm to 2032 mm, in production lengths from 5.2 m to 10,0 m m.

"FERRUM" S.A. produces the anticorrosive, extruded, three-layer, polyethylene/polyethylene coating for steel pipes. The coating technology allows to obtain the anticorrosive three-layer polyethylene/polyethylene coating, which consist of: epoxy layer, copolymer layer (bonding agent), polyethylene/polypropylene layer. The coating is applied on steel pipes of diameters from 159 mm to 1420 mm and length from 6 m to 18 m. Properties of applied coatings comply with the following standards: EN ISO 21809, DIN 30670, DIN 30678, NFA 49-710, EN-PN 10285. The anticorrosive coating consists of the following layers: epoxy layer of minimum thickness of 60 µm, copolymer layer of minimum thickness of 250 µm, polyethylene layer of minimum thickness between 1,8 mm and 3,7 mm or polypropylene layer of minimum thickness between 1,8 mm and 2,5 mm. "FERRUM" S.A. manufactures coated steel pipes in diameter from 159 mm to 1420 mm and length from 6 m to 18 m.



The coating application process consists of the following operations: the external surface blast cleaning acc. to ISO 8501-1, the electrostatic spraying of epoxy powder onto a heated pipe, wrapping a pipe with extruded copolymer, wrapping a pipe with polyethylene/polyethylene in continuous way, cooling the coating and dressing the pipe ends. An extruded polyethylene coating has higher mechanical properties in comparison with cold applied polyethylene tape coating. Anticor rosive coatings made of three-layer PE/PP are characterized by: high mechanical strength, high adherence of the coating to the pipe, guaranteed long-lasting anticorrosive protection of underground pipelines for minimum 50 years, 100% protection of weld zone of coated longitudinally and spirally welded pipes, suitability for bending of coated steel without damaging the insulation layer. "FERRUM" S.A. offers also epoxy lining manufactured in accordance with PN-EN 10301 and API RP 5L2 standards on pipes in diameters from 219,1 up to 1220 and lengths from 6 to 18 meters. Epoxy lining is applied within thickness range from 38 µm depending on the project specification. Application of epoxy lining allows to reduce transmission system operating costs by pipe surface roughness reduction, which provide more fluent flow of the medium, reduces medium friction and increases pipeline capacity. Pipes with epoxy lining are protected against corrosion during storage and operating time what increases transmission system lifetime. The technological process of internal cement lining assures anti- corrosion protection and stability of hydraulic parameters of pipe- lines for water and sewages and allows manufacturing products that meet all the requirements demanded by customers and inter- national standards. Steel pipes and fittings with cement lining are used for raw and potable water supply pipelines as well as for sewage system for both municipal and industrial effluents. Technical data: cement mortar lining for steel pipes of diameters is from 159 mm to 2032 mm, length from 6 m to 18 m, according to the conditions specified into the following standards: DIN 2614, DIN 2880, PN-EN 10298.



Technical data are avilable at manufacturer [web-site www.ferrum.com.pl](http://www.ferrum.com.pl).

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 Mg of SAWH, SAWL and HFW steel pipes. EPD also include environmental information of coating options including: anti-corrosion 3LPE / 3LPP insulation, cement and epoxy linings. The environmental characteristics have been prepared for 4 groups of pipe products having a different production process and 3 possible product coatings (3LPE/3LPP, epoxy and cement based);

Group no.	Data in
SAWH	see Table 2
SAWL	see Table 3
HFW (HFI)	see Table 4
Profiles SHS	see Table 5
Coatings 3LPE/3LPP, Linings EPOXY, Cement	see Table 6

System boundary

The life cycle analysis of the declared product covers “Product Stage” A1-A4 modlues, “End of Life stage” C1, C2, C3, C4 modules and loads&gains beyond system in D module (Cradle to Gate with options) in accordance with EN 15804 and ITB PCR A.

Allocation

The allocation rules used for this EPD are based on general ITB PCR A. Production of steel pipes are the line process in ‘FERRUM” S.A. located in Katowice. Allocation was done on product mass basis where the specific technology input and output data were hard to separate (e.g. heat). The impacts from raw materials extraction and processing are allocated in A1 module of the EPD (including input materials, and energy consumption, transportation, emissions and wastes resulting from the production of steel). 100% of impacts from line production were inventoried and allocated to steel pipes production. Municipal waste and waste water of whole factory were allocated to module A3. Energy supply was inventoried for whole production process. Emissions in the factory are calculated and were allocated to module A3. Energy supply (gas and electricity)was inventoried for whole factory and 100% was allocated to the product assessed. Emissions in the factory are assessed using national KOBIZE emission factors for energy carriers were allocated to module A3.

System limits

99.9% of input materials and 100% energy consumption (electricity, gas,) was inventoried in factory and were included in calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation, utilized thermal energy, and electric power consumption, direct production waste, and available emission measurements. Tires consumption for transport was not taken into account. Ancillary items ,precomponents with a percentage share of less than 0.1% were not included in the calculations. It is assumed that the total sum of omitted processes does not exceed 1% of all impact categories. In accordance with EN 15804 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

A1 and A2 Modules: Raw materials supply and transport

Process starts with sourced raw materials. Raw material supply includes raw material extraction and pre-treatment processes. The steel (99% mass based input material) used in the manufactory plant are produced in the mixed technologies in several steel mills in Europe (Poland, Czech, Latvia, Germany). The cement and sand used for linings are produced in Poland. Input steel product partly come from suppliers providing environmental data on a production. Transport is relevant for delivery of raw materials and other auxiliary materials to the plant and the transport of materials within the plant. Data on transport of the different input

products to the manufacturing plants were inventoried in detail and modelled by assessor. For calculation purposes European fuel averages are applied in module A2.

A3: Production

Manufacturing starts with steel hot rolled coils used to pipe forming. Formed pipe continue with internal and external welding. Later the pipes are cut to the specific lengths. The finished products are then quality inspected and accepted before delivery. SAWH, SAWL, HFW - "black" pipes are not enclosed directly, they are not the final product. These pipes are e.g. pre-insulated, coated with 3 layer polyethylene / polypropylene, cement lined or coated, as well as externally and internally painted. The coating application process consists of the following operations: the surface blast cleaning acc. to ISO 8501-1, the electrostatic spraying of epoxy powder onto a heated pipe, wrapping a pipe with extruded copolymer, wrapping a pipe with polyethylene/polypropylene in continuous way, cooling the coating and dressing the pipe ends.

A4: Transport to construction site

Transport of final product to construction site is taken as the weight average values for transport to customers. The following transport scenario to the place of use was assumed based on the manufacturer's declaration: large vehicle, 75% capacity over an average distance of 800 km. For calculation purposes European fuel averages are applied in module A4.

End of life scenarios (C and D modules)

The end-of-life scenario for all products has been generalized. The pipes are disassembled (C1 module) by lift, crane and power tools. It is assumed that the recovered steel will be prepared (C3) for further steel production process (net scrap approach used). It is assumed that at the end of life the transport distance from the product deconstruction place to waste processing (C2) is 50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km.

The reuse, recovery and recycling potential for a new product system is considered beyond the system boundaries (module D) based on World Steel recommendations and national practice (see references). On average, 43% scrap steel is used in the A1 steel production. Net scrap is an amount of steel recycled at end-of-life minus scrap input from previous product life cycles.

Table 1. End of life scenarios for steel pipe products

Products	Material recovery	Recycling	Landfilling
Steel pipes	100%	99%	1%

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2020 – 31.12.2020 (1 year). The life cycle assessments were done for Poland as reference area.

Data quality - production

The values determined to calculate A3 originate from verified Progress LCI inventory data. A1 values were prepared considering several specific and generic EPDs for the European made steel products. Allocation for steel production impacts is done in accordance with LCI *data for Steel products Report* compiled by Brian Hughes and William Hare (World Steel Association). The background data for the secondary inputs come from the Ecoinvent v.3.7/8 data base.

Assumptions and estimates

All production processes (A3) inputs and outputs were assigned to different types of products on specific process data as it was impossible mass based allocation was done. For steel suppliers without specific environmental information, generic data was used.

Calculation rules

LCA was done in accordance with ITB PCR a document. Characterization factors are CML ver. 4.2 based. ITB-LCA algorithms were used for impact calculations. A1 was calculated based on data from the database and specific EPD for steel, A3 and A2 are calculated based on the LCI questionnaire provided by the

manufacturer. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100 year horizon. 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

Data bases

The background data for the processes come from the following databases: Ecoinvent v.3.7, specific EPD for a steel producers, cement CEM I (SPC average national, energy KOBIZE and Tauron (Polish electricity mix and combustion factors for fuels). Specific (LCI) data quality analysis was a part of the audit. The time related quality of the data used is valid (5 years).

Additional information

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in Coated Spiral Welded Steel Pipes, either above the threshold for registration with the European Chemicals Agency or above 0.1 %

The electricity mix represents the average Polish specific electricity supply for final consumers, including electricity own consumption, transmission/distribution losses and electricity imports from neighbouring countries. Reference year is 2020 and carbon impact of electricity mix is 0.25 kg CO_2/MJ.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to the unit DU– 1 ton of the steel pipe produced by Ferrum S.A. in Poland. The following life cycle modules are included in the declaration (table 2).

Table 2. System boundaries (life stage modules included) in a product environmental assessment

Environmental assessment information (MA – Module assessed, MNA – Module not assessed, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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**
MA	**MA**	**MA**	**MA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MNA**	**MA**	**MA**	**MA**	**MA**	**MA**

Table 3. Environmental product characteristic – helically welded steel pipes SAWH

Environmental impacts: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2	1.58E+03	1.64E+01	6.59E+01	8.31E+01	1.99E+01	5.19E+00	4.38E+00	5.29E-02	-6.81E+02
Depletion potential of the stratospheric ozone layer	kg CFC 11	6.82E-06	0.00E+00	7.24E-06	0.00E+00	5.89E-06	0.00E+00	1.06E-08	1.90E-08	-2.93E-06
Acidification potential of soil and water	kg SO_2	3.28E+00	1.26E-01	2.04E-01	6.38E-01	1.54E+05	3.99E-02	1.59E-02	4.59E-04	-1.41E+00
Formation potential of tropospheric ozone	kg Ethene	5.74E-01	8.48E-03	2.09E-01	4.29E-02	1.64E-02	2.68E-03	1.12E-03	3.68E-05	-2.47E-01
Eutrophication potential	kg $(PO_4)^{3-}$	4.20E-01	2.23E-02	8.31E-03	1.13E-01	3.58E-02	7.06E-03	1.97E-03	8.43E-05	-1.80E-01
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	5.51E-01	0.00E+00	6.27E-01	0.00E+00	2.25E-01	0.00E+00	2.03E-06	7.72E-04	-2.37E-01
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	1.45E+04	2.24E+02	7.47E+02	1.13E+03	4.99E+02	7.09E+01	4.90E+01	0.00E+00	-6.22E+03
Environmental aspects: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.19E+03	2.24E+00	3.08E+01	1.13E+01	2.75E+00	7.09E-01	2.29E+01	3.53E-02	-5.10E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.05E+04	2.35E+02	6.56E+02	1.19E+03	5.04E+02	7.44E+01	7.38E+01	1.70E+00	-4.50E+03
Use of secondary material	kg	4.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.85E+02
Use of renewable secondary fuels	MJ	1.15E+00	1.18E+01	0.00E+00	5.96E+01	0.00E+00	3.72E+00	1.62E-22	0.00E+00	-4.94E-01
Use of non-renewable secondary fuels	MJ	2.08E+00	0.00E+00	3.64E-03	0.00E+00	0.00E+00	0.00E+00	1.90E-21	0.00E+00	-8.94E-01
Net use of fresh water	m^3	6.89E+01	2.40E-03	3.10E-01	1.21E-02	1.70E-01	7.59E-04	3.14E-02	0.00E+00	-2.96E+01
Other environmental information describing waste categories: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.12E+00	8.63E-03	2.25E-01	4.37E-02	2.12E-04	2.73E-03	9.42E-07	1.09E-06	-9.12E-01
Non-hazardous waste disposed	kg	3.01E+01	1.02E+01	4.99E+00	5.18E+01	1.05E+00	3.24E+00	6.01E+01	1.00E+01	-1.30E+01
Radioactive waste disposed	kg	2.70E-01	0.00E+00	0.00E+00	0.00E+00	3.30E-03	0.00E+00	9.47E-03	1.07E-05	-1.16E-01
Components for re-use	kg	1.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	0.00E+00	-5.07E-04
Materials for recycling	kg	2.64E+01	0.00E+00	7.40E+01	0.00E+00	0.00E+00	0.00E+00	1.83E+02	0.00E+00	-1.14E+01
Materials for energy recover	kg	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 4. Environmental product characteristic – steel pipes welded along SAWL

Environmental impacts: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2	1.58E+03	1.64E+01	5.56E+01	8.31E+01	1.99E+01	5.19E+00	4.38E+00	5.29E-02	-6.81E+02
Depletion potential of the stratospheric ozone layer	kg CFC 11	6.82E-06	0.00E+00	7.09E-06	0.00E+00	5.89E-06	0.00E+00	1.06E-08	1.90E-08	-2.93E-06
Acidification potential of soil and water	kg SO_2	3.28E+00	1.26E-01	1.71E-01	6.38E-01	1.54E+05	3.99E-02	1.59E-02	4.59E-04	-1.41E+00
Formation potential of tropospheric ozone	kg Ethene	5.74E-01	8.48E-03	1.68E-01	4.29E-02	1.64E-02	2.68E-03	1.12E-03	3.68E-05	-2.47E-01
Eutrophication potential	kg $(PO_4)^{3-}$	4.20E-01	2.23E-02	7.35E-03	1.13E-01	3.58E-02	7.06E-03	1.97E-03	8.43E-05	-1.80E-01
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	5.51E-01	0.00E+00	5.25E-01	0.00E+00	2.25E-01	0.00E+00	2.03E-06	7.72E-04	-2.37E-01
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	1.45E+04	2.24E+02	6.45E+02	1.13E+03	4.99E+02	7.09E+01	4.90E+01	0.00E+00	-6.22E+03
Environmental aspects: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.19E+03	2.24E+00	2.46E+01	1.13E+01	2.75E+00	7.09E-01	2.29E+01	3.53E-02	-5.10E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.05E+04	2.35E+02	5.25E+02	1.19E+03	5.04E+02	7.44E+01	7.38E+01	1.70E+00	-4.50E+03
Use of secondary material	kg	4.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.85E+02
Use of renewable secondary fuels	MJ	1.15E+00	1.18E+01	0.00E+00	5.96E+01	0.00E+00	3.72E+00	1.62E-22	0.00E+00	-4.94E-01
Use of non-renewable secondary fuels	MJ	2.08E+00	0.00E+00	3.64E-03	0.00E+00	0.00E+00	0.00E+00	1.90E-21	0.00E+00	-8.94E-01
Net use of fresh water	m^3	6.89E+01	2.40E-03	3.08E-01	1.21E-02	1.70E-01	7.59E-04	3.14E-02	0.00E+00	-2.96E+01
Other environmental information describing waste categories: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.12E+00	8.63E-03	2.17E-01	4.37E-02	2.12E-04	2.73E-03	9.42E-07	1.09E-06	-9.12E-01
Non-hazardous waste disposed	kg	3.01E+01	1.02E+01	4.19E+00	5.18E+01	1.05E+00	3.24E+00	6.01E+01	1.00E+01	-1.30E+01
Radioactive waste disposed	kg	2.70E-01	0.00E+00	0.00E+00	0.00E+00	3.30E-03	0.00E+00	9.47E-03	1.07E-05	-1.16E-01
Components for re-use	kg	1.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	0.00E+00	-5.07E-04
Materials for recycling	kg	2.64E+01	0.00E+00	7.40E+01	0.00E+00	0.00E+00	0.00E+00	1.83E+02	0.00E+00	-1.14E+01
Materials for energy recover	kg	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 5. Environmental product characteristic – HFW (HFI) high frequency welded steel pipes

Environmental impacts: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2	1.58E+03	1.64E+01	1.48E+02	8.31E+01	1.99E+01	5.19E+00	4.38E+00	5.29E-02	-6.81E+02
Depletion potential of the stratospheric ozone layer	kg CFC 11	6.82E-06	0.00E+00	8.47E-06	0.00E+00	5.89E-06	0.00E+00	1.06E-08	1.90E-08	-2.93E-06
Acidification potential of soil and water	kg SO_2	3.28E+00	1.26E-01	4.67E-01	6.38E-01	1.54E+05	3.99E-02	1.59E-02	4.59E-04	-1.41E+00
Formation potential of tropospheric ozone	kg Ethene	5.74E-01	8.48E-03	5.37E-01	4.29E-02	1.64E-02	2.68E-03	1.12E-03	3.68E-05	-2.47E-01
Eutrophication potential	kg $(PO_4)^{3-}$	4.20E-01	2.23E-02	1.60E-02	1.13E-01	3.58E-02	7.06E-03	1.97E-03	8.43E-05	-1.80E-01
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	5.51E-01	0.00E+00	1.45E+00	0.00E+00	2.25E-01	0.00E+00	2.03E-06	7.72E-04	-2.37E-01
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	1.45E+04	2.24E+02	1.57E+03	1.13E+03	4.99E+02	7.09E+01	4.90E+01	0.00E+00	-6.22E+03
Environmental aspects: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.19E+03	2.24E+00	8.00E+01	1.13E+01	2.75E+00	7.09E-01	2.29E+01	3.53E-02	-5.10E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.05E+04	2.35E+02	1.71E+03	1.19E+03	5.04E+02	7.44E+01	7.38E+01	1.70E+00	-4.50E+03
Use of secondary material	kg	4.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.85E+02
Use of renewable secondary fuels	MJ	1.15E+00	1.18E+01	0.00E+00	5.96E+01	0.00E+00	3.72E+00	1.62E-22	0.00E+00	-4.94E-01
Use of non-renewable secondary fuels	MJ	2.08E+00	0.00E+00	3.64E-03	0.00E+00	0.00E+00	0.00E+00	1.90E-21	0.00E+00	-8.94E-01
Net use of fresh water	m^3	6.89E+01	2.40E-03	3.27E-01	1.21E-02	1.70E-01	7.59E-04	3.14E-02	0.00E+00	-2.96E+01
Other environmental information describing waste categories: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.12E+00	8.63E-03	2.89E-01	4.37E-02	2.12E-04	2.73E-03	9.42E-07	1.09E-06	-9.12E-01
Non-hazardous waste disposed	kg	3.01E+01	1.02E+01	1.14E+01	5.18E+01	1.05E+00	3.24E+00	6.01E+01	1.00E+01	-1.30E+01
Radioactive waste disposed	kg	2.70E-01	0.00E+00	0.00E+00	0.00E+00	3.30E-03	0.00E+00	9.47E-03	1.07E-05	-1.16E-01
Components for re-use	kg	1.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	0.00E+00	-5.07E-04
Materials for recycling	kg	2.64E+01	0.00E+00	7.40E+01	0.00E+00	0.00E+00	0.00E+00	1.83E+02	0.00E+00	-1.14E+01
Materials for energy recover	kg	0.00E+00	0.00E+00	1.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6. Environmental product characteristic – steel profiles SHS

Environmental impacts: (DU) 1 Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2	1.58E+03	1.64E+01	1.03E+02	8.31E+01	1.99E+01	5.19E+00	4.38E+00	5.29E-02	-6.81E+02
Depletion potential of the stratospheric ozone layer	kg CFC 11	6.82E-06	0.00E+00	1.54E-06	0.00E+00	5.89E-06	0.00E+00	1.06E-08	1.90E-08	-2.93E-06
Acidification potential of soil and water	kg SO_2	3.28E+00	1.26E-01	3.28E-01	6.38E-01	1.54E+05	3.99E-02	1.59E-02	4.59E-04	-1.41E+00
Formation potential of tropospheric ozone	kg Ethene	5.74E-01	8.48E-03	4.10E-01	4.29E-02	1.64E-02	2.68E-03	1.12E-03	3.68E-05	-2.47E-01
Eutrophication potential	kg $(PO_4)^{3-}$	4.20E-01	2.23E-02	9.59E-03	1.13E-01	3.58E-02	7.06E-03	1.97E-03	8.43E-05	-1.80E-01
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	5.51E-01	0.00E+00	1.03E+00	0.00E+00	2.25E-01	0.00E+00	2.03E-06	7.72E-04	-2.37E-01
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	1.45E+04	2.24E+02	1.03E+03	1.13E+03	4.99E+02	7.09E+01	4.90E+01	0.00E+00	-6.22E+03
Environmental aspects: (DU) 1Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.19E+03	2.24E+00	6.15E+01	1.13E+01	2.75E+00	7.09E-01	2.29E+01	3.53E-02	-5.10E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.05E+04	2.35E+02	1.31E+03	1.19E+03	5.04E+02	7.44E+01	7.38E+01	1.70E+00	-4.50E+03
Use of secondary material	kg	4.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.85E+02
Use of renewable secondary fuels	MJ	1.15E+00	1.18E+01	0.00E+00	5.96E+01	0.00E+00	3.72E+00	1.62E-22	0.00E+00	-4.94E-01
Use of non-renewable secondary fuels	MJ	2.08E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-21	0.00E+00	-8.94E-01
Net use of fresh water	m^3	6.89E+01	2.40E-03	2.05E-02	1.21E-02	1.70E-01	7.59E-04	3.14E-02	0.00E+00	-2.96E+01
Other environmental information describing waste categories: (DU) 1Mg										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.12E+00	8.63E-03	7.97E-02	4.37E-02	2.12E-04	2.73E-03	9.42E-07	1.09E-06	-9.12E-01
Non-hazardous waste disposed	kg	3.01E+01	1.02E+01	7.97E+00	5.18E+01	1.05E+00	3.24E+00	6.01E+01	1.00E+01	-1.30E+01
Radioactive waste disposed	kg	2.70E-01	0.00E+00	0.00E+00	0.00E+00	3.30E-03	0.00E+00	9.47E-03	1.07E-05	-1.16E-01
Components for re-use	kg	1.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E+02	0.00E+00	-5.07E-04
Materials for recycling	kg	2.64E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E+02	0.00E+00	-1.14E+01
Materials for energy recover	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 7. Environmental product characteristic – steel pipe coatings "per 1 Mg of steel pipe"

Environmental impacts: A1-A3				
Indicator	Unit	**3LPE/3LPP**	**Epoxy**	**Cement**
Global warming potential	kg eq CO_2	1.64E+01	2.45E+00	1.58E+01
Depletion potential of the stratospheric ozone layer	kg CFC 11	9.65E-07	1.95E-07	6.70E-07
Acidification potential of soil and water	kg SO2	4.28E+01	6.00E-03	1.86E-02
Formation potential of tropospheric ozone	kg Ethene	8.24E+00	1.32E-03	1.56E-02
Eutrophication potential	kg $(PO_4)^{3-}$	2.88E+00	3.00E-03	1.96E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb	2.83E-01	2.82E-02	5.39E-02
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	3.90E+02	5.47E+01	6.92E+01
Environmental aspects: A1-A3				
Indicator	Unit	**3LPE/3LPP**	**Epoxy**	**Cement**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	6.04E+00	1.33E+00	3.38E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.29E+02	5.74E+01	7.71E+01
Use of secondary material	kg	0.00E+00	0.00E+00	1.23E+00
Use of renewable secondary fuels	MJ	1.08E-02	0.00E+00	1.48E+01
Use of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	2.14E+01
Net use of fresh water	m^3	1.32E-01	1.50E-02	1.45E-01
Other environmental information describing waste categories: A1-A3				
Indicator	Unit	**3LPE/3LPP**	**Epoxy**	**Cement**
Hazardous waste disposed	kg	9.31E-02	1.56E-05	1.96E-02
Non-hazardous waste disposed	kg	2.16E-01	1.56E-01	3.52E-01
Radioactive waste disposed	kg	0.00E+00	3.36E-05	1.58E-06
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	1.21E-08
Materials for energy recover	kg	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	0.00E+00	0.00E+00	0.00E+00

RESULTS INTERPRETATION

The environmental impact of is mainly dependent on the energy-intensive production of steel on which the manufacturer has a limited influence. The global warming potential expressed in carbon dioxide ranges from 1.65-1.75 tons of CO_2 / ton of products.

VERIFICATION

The process of verification of this EPD was in accordance with ISO 14025 and ISO 21930. After verification. this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years. if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804:2012+A1 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) [x] external [ ] internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA. LCI audit and input data verification: Ph.D. Eng. Michał Piasecki. m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska. j.tomaszewska@itb.pl

The EPD owner 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.

Normative references

- EN 15804:2012+A1 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- TB PCR A General Product Category Rules for Construction Products
- PED 2014/68/UE Directive
- PN-EN ISO 3183 Przemysł naftowy i gazowniczy -- Rury stalowe do rurociągowych systemów transportowych
- PN-EN 10219-1/2 Rury stalowe ze stali konstrukcyjnych niestopowych i drobnoziarnistych
- API Spec 5L Seamless & welded pipe
- PN-EN 10217-1 Rury stalowe ze szwem do zastosowań ciśnieniowych -- Warunki techniczne dostawy -- Część 1: Rury ze stali niestopowych zgrzewane elektrycznie i spawane łukiem krytym z określonymi własnościami w temperaturze pokojowej
- PN-EN 10217-3 Rury stalowe ze szwem do zastosowań ciśnieniowych -- Warunki techniczne dostawy -- Część 3: Rury ze stali stopowych drobnoziarnistych zgrzewane elektrycznie i spawane łukiem krytym z określonymi własnościami w temperaturze pokojowej, podwyższonej i obniżonej
- PN-EN 10217-5 Rury stalowe ze szwem do zastosowań ciśnieniowych -- Warunki techniczne dostawy -- Część 1: Rury ze stali niestopowych zgrzewane elektrycznie i spawane łukiem krytym z określonymi własnościami w temperaturze pokojowej
- PN-EN 10224 Rury i złączki ze stali niestopowej do transportu wody i innych płynów wodnych -- Warunki techniczne dostawy
- LCI DATA FOR STEEL PRODUCTS at https://www.worldsteel.org/en/dam/jcr:04f8a180-1406-4f5c-93ca-70f1ba7de5d4/LCI%2520study_2018%2520data%2520release.pdf
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines

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Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE № 234/2021

of TYPE III ENVIRONMENTAL DECLARATION

Products:

SAWH/SAWL/HFW steel pipes

Manufacturer:

Ferrum S.A.

ul. Porcelanowa 11, 40-246 Katowice, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

PN-EN 15804

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

This certificate, issued for the first time on 29th June 2021 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, June 2021