Steel reinforcement products for concrete

Environmental Product Declaration in accordance with ISO 14025 and EN 15804

celsa steelservice

EPD®

Company	**CELSA STEEL SERVICE AB**
Website:	www.celsa-steelservice.se
Certification No.:	S-P-00305
Validity:	2020-07-04
LCA coverage:	cradle-to-gate
Geographical coverage:	Sweden
Climate change:	370 kg CO_2 eq/tonne

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370 kg CO_2 eq/tonne

THE COMPANY

Celsa Nordic is a producer of steel reinforcement products in the Nordic countries and part of the private company CELSA GROUP since 2007. The Celsa Nordic steel mill is situated in Mo i Rana, Norway, and products are distributed through the company's downstream reinforcing services (Celsa Steel Service) in Norway, Sweden, Denmark, and Finland. In Sweden, Celsa Steel Service has its roots in early 1900s in Halmstad Stålverk.

Celsa Steel Service manufactures and sells reinforcing products and services to the Swedish concrete construction industry. The production sites in Halmstad, Västerås, and Vännäs are situated close by the most active and populated construction areas in Sweden, minimizing transportation distances.

Celsa Steel Service has the expertise to provide advice and assistance for the reinforcement of concrete and offers products and services that serve to reduce workplace execution times through efficient planning and adequate logistic solutions. Celsa Steel Service is one of the largest manufacturer of concrete reinforcing products in Sweden.

Our ambition and aim is to increase productivity and safety by using a larger extent of prefabricated reinforcement solutions instead of cutting and bending reinforcement on site. Prefabrication and special welded elements are possible to manufacture in cooperation with the client and with the help of 3D-drawings and analysis.

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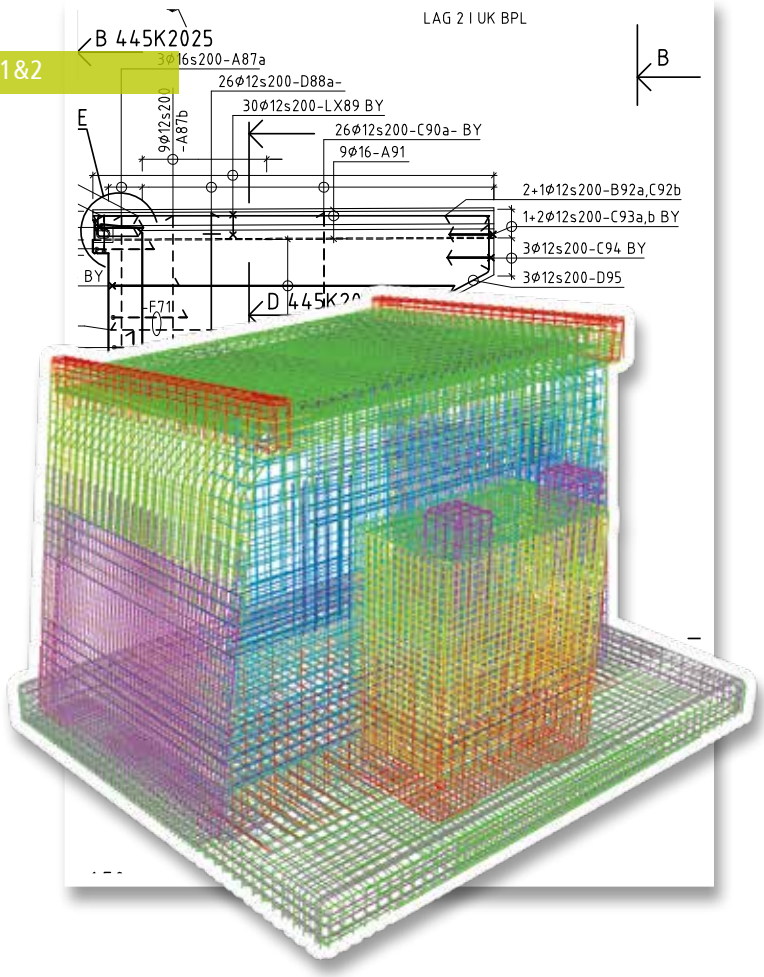

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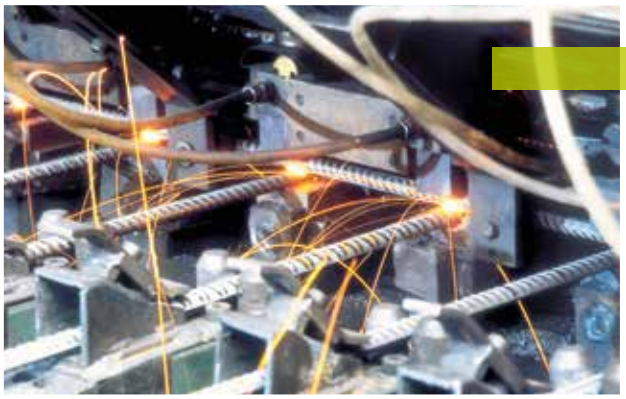

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BUSINESS AREAS

Celsa Steel Service is the provider of reinforcement solutions for all types of concrete constructions in the Nordics

Customer value through whole chain

Engineering		Fabrication	Logistics
Accurate Specifications	Finding Solutions	Unlimited Possibilities	Customized Deliveries
1.	2.	3.	4.

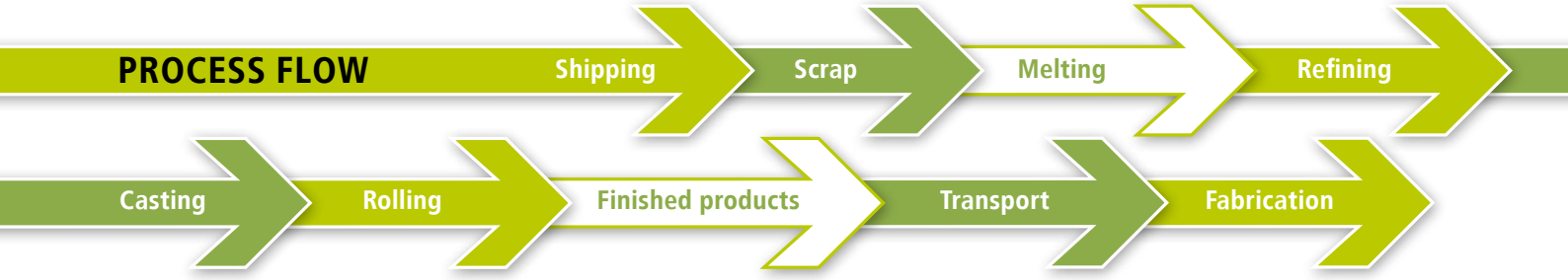
ABOUT THE EPD

This EPD is based on a Life Cycle Assessment (LCA) and provides information that can be used in order to put into perspective different steel sourcing. For Celsa Steel Service the EPD is a document that, together with the environmental report from Celsa Armeringsstål, shows a company investing in technology and technical solutions that affects the total environmental impact of its products.

METHODOLOGY

The environmental impact of Celsa Steel Service products have been calculated according to the rules of the EPD (Environmental Product Declaration) International program. EN 15804:2012 and PCR 2012:01 Construction products and Construction services is the basis for the calculation of the life cycle assessment (LCA) from cradle to gate.

The environmental impacts from the production sites and from the transports of materials and commodities to these sites are 10% or less of the total impacts from the product stage of the reinforcement products. The variance between products from different production sites is thus within ± 10%.



INPUT DATA

Site specific data on use of fuels and commodities provided by Celsa Armeringsstål AS have been used for the steel production in Norway. Site specific data from Celsa Steel Service is used for the core processes. Site specific data are from 2013. Electricity production data according to country averages[1] have been used for electricity consumed. Specific data from the suppliers has been collected wherever possible. Otherwise generic data has been collected from commercial databases GaBi professional database (PE International) and Ecoinvent. By the selection of data the geographical location of each supplier has been considered to the extent possible.

Besides the main product is also by-products generates. These by-product are treated as usable flows, but not attributed to any environmental impact when calculating the impact of steel reinforcement. This is a conservative allocation approach for the products in this EPD.

[1] For the steel works the national production mix in Norway is applied. Norwegian Production Mix 0,024 kg CO2eq/kWh

DECLARED UNIT

Reinforcement steel is normally sold in weight and therefore the declared unit is set to 1 tonne reinforcement steel.

RAW MATERIAL

The EPD considers reinforcement steel made out of hot rolled products, transformed into straight ribbed bars, cut and bend, mesh, and combinations of these (special welded products).

The production of low-alloyed steel from scrap and additional alloying metals is done in an electric arc furnace (EAF). Scrap is transported from Norway (approx. 80%) and imports (approx. 20-25%) from Sweden, Finland and Denmark to the steel works in Mo i Rana, Norway. After hot rolling the products are transported with vessels as coils or straight bars to the production sites in Sweden where they are worked up to reinforcement products.

Output flows

Parameter	Unit
Components for re-use	Kg
Materials for recycling	Kg
Materials for energy recovery	Kg
Exported energy	MJ per energy carrier

Indicators not assessed

Product stage			Assembly stage		Use stage							End of Life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Repair	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potentiall
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

*For A4, transport distance of 500 km. diesel truck-trailer, Euro 5,5% bio- CO_2, payload 27 tonnes, and capacity utilization 70%.

SYSTEM BOUNDARIES

The Environmental Product Declaration (EPD) shows the environmental performance of the product from its life cycle phases from cradle to gate. Life cycle phases are divided in upstream processes (A1), transportation to national productions sites (A2), and core processes (A3).

Upstream processes includes steelmaking processes and core processes includes processing activities from coils and straight bars to project specific reinforcement steel.

The raw material is transported to the productions sites from steelworks as coils and straightened bars by boat to the port in Halmstad and Västerås and by truck to Vännäs. All sites deliver all products but production of SpinMaster and mesh is done in Halmstad and Bamtec® in Västerås.

The use phase and end of life were not considered according to EN 15804:2012 and PCR 2012:01 but transport to final destination was calculated (A4), with a transportation distance of 500 km.

Registrations in other Environmental Assessment Systems

Byggvarubedömningen, BASTA, Sunda Hus

Material Characteristics

Product diameter range from 4 mm to 40 mm
- Yield stress, Re ≥ 500 MPa
- Rm/Re ≥ 1,15
- Elongation Agt ≥ 7.5%
- Density 7700 kg/m^3

Product content weight %

Iron	98–99
Carbon	0,05–0,2
Manganese	0,3–0,7
Silicon	0,2

INCLUDED PRODUCTS

Products range from cut and bend, mesh (Halmstad), BAMTEC® (Västerås), SpinMaster (Halmstad), to an extensive production of prefabricated reinforcement elements (special welded products).

Product identification

Steel reinforcement products for concrete

Material Standards

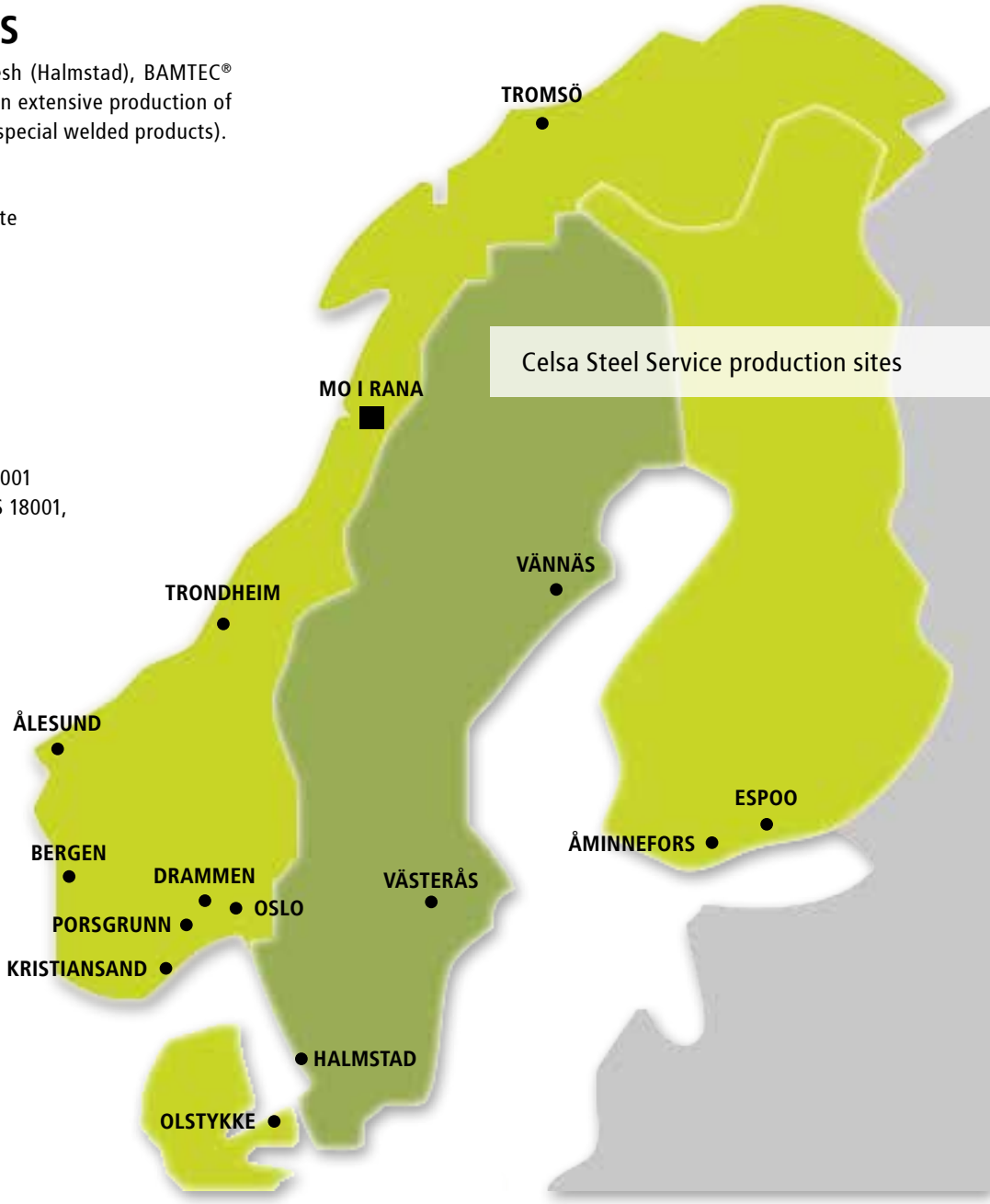
SS 212540:2011 and EN 10080:2005

Product Certificates

SBS A3/001, A3/016 and A3/017

Other Certifications

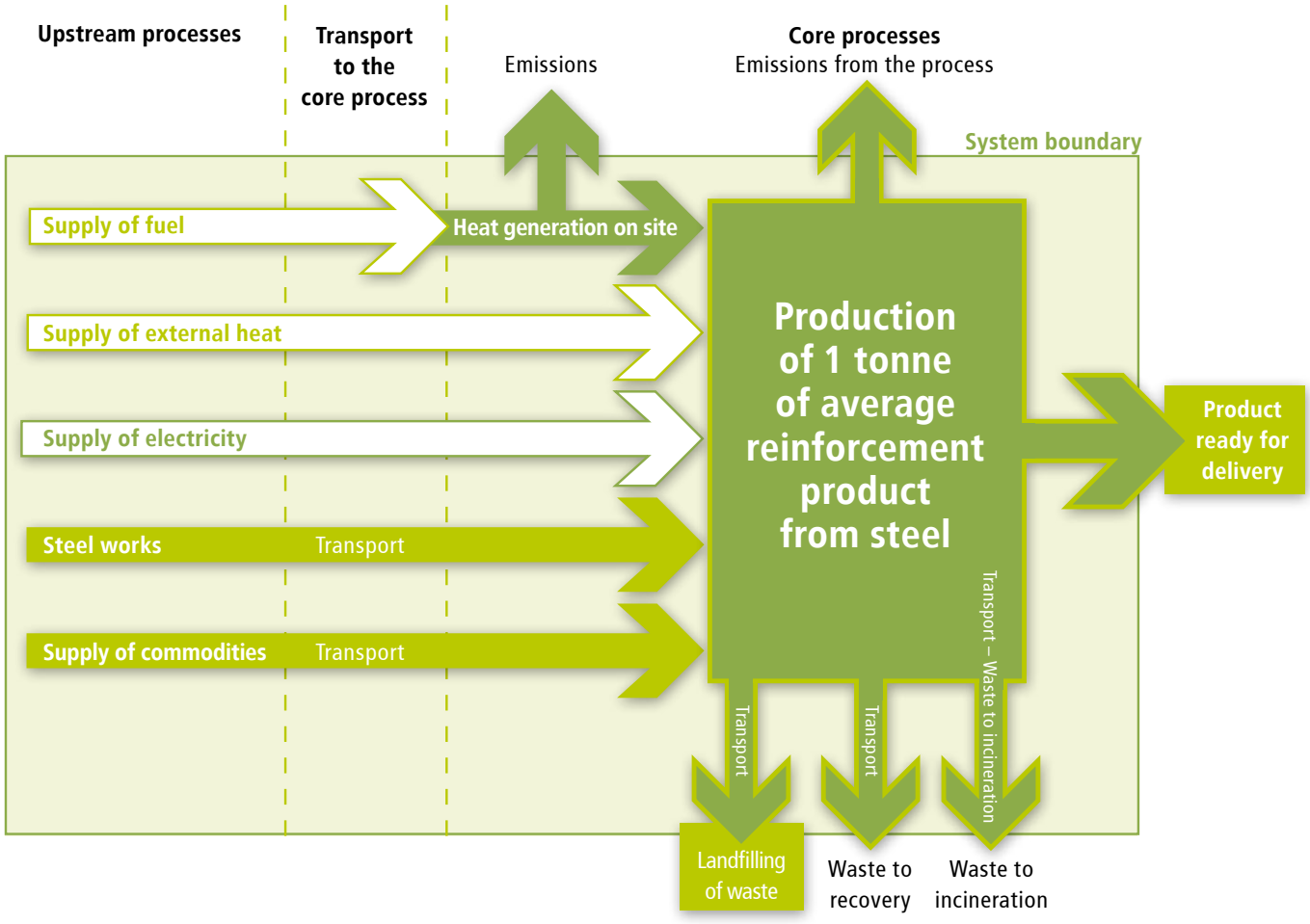
Celsa Steel Service AB; ISO 9001, ISO 14001
Supplier Celsa Armeringsstål AS; OSHAS 18001, ISO 14001, EMAS



Scrap is transported to Mo i Rana by vessels and the final products are delivered to Celsa Steel Service by the returning vessels.

ENVIRONMENTAL PERFORMANCE-RELATED INFORMATION

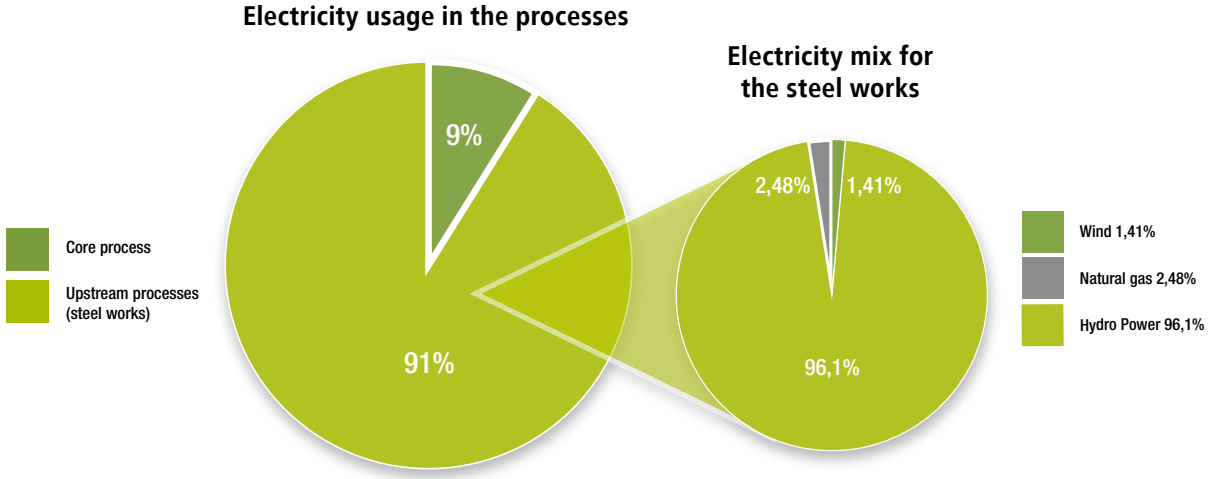
For the purpose of the EPD the production chain is subdivided as shown in the figure



ENVIRONMENTAL PERFORMANCE DECLARATION

Declared unit; 1 tonne of average reinforcement product in Sweden	Unit/tonne	A1 Upstream processes	A2 Transports to the core process	A3 Core process	A4 Transport to the construct site*	A1–3 Total
Impact category result						
Climate change	kg CO_2 eq.	330	37	1.6	28	370
Acidification	kg SO_2 eq.	0.5	0.28	$9.3 \cdot 10^{-4}$	0.086	0.78
Eutrophication	kg PO_4^{3-}eq.	0.11	0.066	$2.3 \cdot 10^{-4}$	0.022	0.17
Stratospheric ozone depletion	kg CFC-11 eq.	$2.85 \cdot 10^{-6}$	$1.7 \cdot 10^{-10}$	$2.6 \cdot 10^{-12}$	$1.9 \cdot 10^{-10}$	2.9E-06
Ground level photochemical ozone[1)]	kg C_2H_4 eq.	0.043	0.019	$3.8 \cdot 10^{-5}$	-0.026[2)]	0.063
Depletion of abiotic resources (elements)	kg Sb eq.	$1.36 \cdot 10^{-4}$	$1.2 \cdot 10^{-6}$	$1.3 \cdot 10^{-8}$	$1.3 \cdot 10^{-6}$	1.4E-04
Depletion of abiotic resources (fossil)	MJ net calorific value	1542	503	1.2	384	2046
Site specific impact category result						
Inventory result, energy resource consumption						
Electricity use by the core process	MJ			239		
Electricity use by the steel process	MJ	2403				

*Transportation distance 500 km
[1)] I ncluding impact from NO_x
[2)] Reported emissions of nitrogen monoxide with negative POCP from trucks.



The supplier Celsa Armeringsstål is the largest steel recycling company in Norway

USE OF RESOURCES

The result on resource handling covering the production stage (cradle-to-gate), i.e. from resource extraction to the manufactured product ready to be delivered from the factory, is given below.

Declared unit; 1 tonne of average reinforcement product in Sweden	Unit/tonne	A1 Upstream processes	A2 Transports to the core process	A3 Core process	A4 Transport to the construct site	A1–3 Total
Resource use						
Use of renewable primary energy excluding renewable primary energy	MJ, net calorific value	3605	7.1	0.070	22	3612
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	3.1				3.1
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	3608	7.1	0.070	22	3615
Use of non-renewable primary energy excluding non- renewable primary energy resources used as raw materials	MJ, net calorific value	1830	504	1.3	387	2335
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	69[1)]				69[1)]
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ, net calorific value	1899	504	1.3	387	2404
Use of secondary material	kg	1122				1122
Use of renewable secondary fuels	MJ, net calorific value	23	0.0033	$6.7 \cdot 10^{-4}$	0.0031	23
Use of non-renewable secondary fuels	MJ, net calorific value	1029	0.035	0.0021	0.032	1029
Use of net fresh water	m^3	40	0.0035	$4.3 \cdot 10^{-4}$	0.0036	40

[1)] Includes the energy of combustion of 0,2 % w/w of carbon in the steel (32,7 MJ/kg C(graphite)).

OTHER INDICATORS

Declared unit; 1 tonne of average reinforcement product in Sweden	Unit/tonne	A1 Upstream processes	A2 Transports to the core process	A3 Core process	A4 Transport to the construct site	A1–3 Total
By-products (no allocation)						
Slags	kg	141				141
Zinc-containing dust	kg	15				15
Steel scrap	kg			11.2		11.2
Mill scales	kg	15.4		0.91		16
Waste disposal						
Hazardous waste disposed	kg	0.11	$6.1 \cdot 10^{-5}$	0.014	$1.8 \cdot 10^{-4}$	0.12
Non-hazardous waste disposed	kg	230	1.5	3.0	2.0	235
Radioactive waste disposed	kg	0.11	$7.1 \cdot 10^{-4}$	$1.6 \cdot 10^{-5}$	$8.1 \cdot 10^{-4}$	0.11

CATEGORIES OF IMPACT

Acidification

a phenomenon whereby atmospheric precipitations have a lower-than-normal pH value, which can cause damage to forests and crops, and to aquatic ecosystems and manufactured items. It is due to emissions of SO_2, NO_x and NH_3, which are therefore included in the Acidification Potential (AP) indicator, expressed as SO_2-eq.

Ozone depletion

degradation of the stratospheric ozone layer, which blocks the ultra-violet component of sunlight, by means of highly reactive compounds originating from chlorofluorocarbons (CFCs) or chlorofluoromethanes (CFMs). The substance used as a reference for the ODP (Ozone-Depletion Poten-tial) is trichlorofluoromethane, or CFC-11.

Greenhouse effect

a phenomenon whereby infra-red rays emitted by the earth's surface following solar heating are absorbed by molecules present in the atmosphere and reemitted in the form of heat, causing global warming of the atmosphere. The indicator used here is the GWP (Global Warming Potential), which covers emissions of carbon dioxide, the main greenhouse gas, and other gases with a higher degree of infra-red absorption, such as methane (CH_4), nitrous gas (N_2O) and chlorofluoro-carbons (CFCs), which are expressed as a function of the degree of absorption of CO_2.

Eutrophication

the enrichment of watercourses with nutrients, which causes imbalances in aquatic ecosystems due to overdevelopment as the result of a lack of nutritional limitations. Eutrophication Potential (EP) mainly covers phosphorous and nitrogen salts, and is expressed as PO_4^{3-} eq.

Photochemical ozone creation

the production of compounds which, by the action of light, are able to promote an oxidation reaction that leads to the production of ozone in the troposphere. The POCP (Photochemical Ozone Creation Potential) indicator mainly concerns VOCs (Volatile Organic Compounds) and is expressed as equivalent weight of ethylene (C_2H_4).

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ENVIRONMENTAL MANAGEMENT

Celsa Steel Service AB is certified according to ISO 14001, and works for a sustainable development of the environment. This dedication motivates a quest to minimize material and energy use, but also to seek possibilities to increase the efficiency and reduce heavy work and unhealthy environments for people working with reinforcement. The company, as a part of CELSA Group™, has the safety as the first priority and the company has incorporated safety in all its daily activities.

For the products delivered by Celsa Steel Service, the upstream processes that include the scrap processing and the steel works is the dominating emitter. Apart from the upstream processes, the environmental burden is dependent on **transportation distances, efficient logistics,** the level of prefabrication with **minimum material use**, and **efficient installation at the construction site**. Construction sites have the potential to be more sustainable by limiting the number transports, handle materials more efficiently and safely, and implement routines to reduce wastes.

Material for the production of reinforcement steel comes from the group's steel and rolling mill in Mo i Rana, Norway. Celsa Nordic has during many years invested in new technology, not only to conform to, but to exceed environmental demands in Norwegian legislation. All these investments have together a major impact in the production of **more environmentally friendly reinforcement steels in all stages of the production**; i.e. the steel mill, the rolling mill, and transportation. (Celsa Armeringsstål AS, 2014)

Environmental benefits also come from the location of the mill in northern Norway. The use of hydropower reduces indirect emissions and the water used in the processes is naturally **sourced** from immediate surrounding water magazines **without any energy input for retrieving it**. The water is available in the processes but is also **generating electricity** in the industrial park before reaching sea level.

Celsa Nordic has been an environmental pioneer in Norway by:

- Producing its first environmental report according to NS-EN ISO 14001 already in 1996
- Becoming one of the first mills in Europe to get the **EMAS** mark in 2010.
- A 1**00% scrap based production**, being the largest steel recycling company in Norway.
- **Reducing mercury emissions** as well as **primary and secondary** dust emissions, recognized by the Norwegian Environment Agency (NEA, 2008).

GENERAL INFORMATION

EPD Programme
The International EPD® System.
For more information, www.environdec.com

Programme operator
EPD International AB,
Box 210 60 SE-100 31 Stockholm Sweden

PCR review conducted by
The Technical committee of the International EPD® System

Declaration number:
S-P-00305

Product category rules:
PCR 2012:01 version 2.0 2015-03-03

Central Product Classification
CPC 4126, drawn and folded products of iron or steel

Issue date:
2012-04-26

Version date:
2015-08-10

Valid to:
2020-07-04

Owner: Celsa Steel Service AB
Head office: Stationsgatan 55, Box 119
301 04 Halmstad, Sweden
www.celsa-steelservice.se

Declared unit
Per tonne of reinforcement products.

Geographical coverage:
Sweden

Scope
This declaration and its LCA are relevant to reinforcement products manufactured by hot and cold forming technique from reinforcement steel from Celsa Armeringsstål in Mo i Rana, Norway.

The LCA study includes product life cycle phases from cradle to gate and transport from gate to customer.

The environmental impacts from the production sites and from the transports of materials and commodities to these sites are 10 % or less of the total impacts from the product stage of the reinforcement products. The variance between products from different production sites is thus within ± 10 %. For transports tonnage-weighted average transport distances were calculated for ship routes and for truck routes by dividing the total annual transport work (sum of [annual tonnage] · [distance] for all sites) by the total annual tonnage of product.

Additional information
Product contain no substances in the REACH Candidate 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.

EPD of construction products may not be comparable if they do not comply with EN15804.

Verification
The CEN standard EN 15804 serves as the core PCR.
Verification of the EPD by an independent third party according to ISO 14025.

External verification by
Det Norske Veritas Certification AB,
Box 6046/Hemvärnsgatan 9,
S-17106 Solna, Sweden
Tel: +46 8 587 940 00
Martin Erlandsson

REFERENCES

Almemark, M. (2015) "LCA of Reinforcement Steel Products from Celsa Steel Service in Sweden, Norway, Denmark, and Finland", IVL-Report U 5330.

Ecoinvent 2.0, Database from the Swiss Centre for Life Cycle Inventories, Swiss Federal Laboratories for Materials Testing and Research (EMPA), Dübendorf, Switzerland, www.ecoinvent.ch

EDIP, "Environmental Design of Industrial Products", Technical University of Denmark.

CML (Institute of Environmental Sciences, Leiden University, The Netherlands) 2013, Database CML-IA, v. 4.2, April 2013, contact person van Oers, L., oers@cml.leidenuniv.nl, available at http://cml.leiden.edu/research/industrialecology/.

PE International (2014), LCA software GaBi 6.2, Thinkstep (former PE International GmbH), Life Cycle Engineering, Stuttgart, www.pe-international.com.

EN 15804:2012, "Sustainability of construction works - Environmental product declarations - Product category rules", European Committee for Standardization

ISO 14025, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

Product category rules according to ISO 14025 (2015-03-03). Product group classification: multiple un cpc codes construction products and construction services, 2012:01, version 2.0, 2015-03-03

Swerea/MEFOS AB (2010), Process Metallurgy Department, Luleå.

Uppenberg, S. et al (2001), "Miljöfaktabok för bränslen. Del 2. Bakgrundsinformation och teknisk bilaga", IVL report B 1334B-2.

NEA (2008), Norwegian Environment Agency, http://www.miljodirektoratet.no/no/Nyheter/Nyheter/Old-klif/2008/Juli_2008/Ny_teknologi_og_strengere_krav_til_Celsa_Armeringsstal_AS/

Celsa Armeringsstål AS (2014), "2013 Environmental Report", Celsa Armeringsstål AS, www.celsaarmeringsstal.com

Celsa produces steel with means of renewable energy by hydro power in Helgeland, Norway

Company **CELSA STEEL SERVICE AB**

Address Stationsgatan 55, Box 119,
302 50 Halmstad, Sweden

Phone: +35 15 40 00

Contact person EPD: Susanne Naevermo-Sand,
susanne.naevermosand@celsanordic.com

Commercial contact: Magnus Lundgren,
magnus.lundgren@celsa-steelservice.com

Website: www.celsa-steelservice.se

This environmental declaration is prepared by Mats Almemark, November 2015 IVL Swedish Environmental Research Institute – independent qualified environmental competence. www.ivl.se +46 8 598 563 00 – mats.almemark@ivl.se

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