



Expandable Rock Bolt

Environmental Product Declaration (EPD)

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

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UN CPC 412

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1. SSAB's vision – a stronger, lighter and more sustainable world

SSAB is a specialized global steel company driven by close relationships with our customers. SSAB develops and markets high performance steels that are either high strength or fit for purpose products designed for better performance and sustainability.

The company is a leading producer in the global market for Advanced High Strength Steels (AHSS) and Quenched & Tempered Steels (Q&T). We serve segments such as, automotive, mining and construction with strip, plate and tube products. SSAB's steels and services help to make end-products lighter and better engineered, thereby increasing their strength and lifespan.

SSAB has a cost-efficient and flexible production system. SSAB's production plants in Sweden, Finland and the US have an annual steel production capacity of approximately 8.8 million tonnes. In Sweden and Finland, an integrated blast furnace process is used, whereas in the US, electric arc furnaces are used in a scrap-based production process. SSAB has been at the forefront of sustainability in many ways. With confidence deriving from our traditions, we now strive to do even more. SSAB aims to be fossil free as a company by 2030.

SSAB's environmental management is based on the international environmental management systems standard,

ISO 14001. All production facilities within the scope of this Environmental Product Declaration have third-party ISO 14001 certification

1.1 SSAB IN THE CIRCULAR ECONOMY

The term circular economy usually is used to describe a transition from linear business models, in which products are manufactured from raw materials, used and then discarded, to circular business models, where products or parts are repaired, re-used, returned and recycled. A circular economy promotes zero waste in order to create a more sustainable world.

In addition, it supports innovative design to promote recycling, reducing the amount of virgin materials used, and encourages the re-use and recycling of all materials.

A circular economy can be applied by adopting a lifecycle approach and measuring the social, economic and environmental impact at each stage of a product's lifecycle, including end of life. To sum up, steel products promote the core objective of a circular economy because steel can be recycled indefinitely without weakening its properties.

2. Product

2.1 TECHNICAL INFORMATION AND APPLICATION

Expandable Rock Bolts (ERB) are used for rock reinforcement. The ERB is a full column anchored rock bolt that forms a mechanical interlock between the borehole wall and the bolt over the full bolt length. The ERB is inflated using high water pressure. When inflated it causes the bolt length to contract, which in turn tensions the face plate against the rock surface. The ERB is a rock reinforcement solution with no cement grout or other chemicals required to anchor the bolt.

The coatings are applied according to ISO 12944-6:2018 and tested according to ISO 4624:2016. ERB pipes are tested according to ISO 6892-1:2019 and ISO 10893-2:2011 as applicable. SSAB also have its own specific requirements for ERB manufacturing and testing.

ERBs are used in applications for underground mining and underground civil engineering work. ERBs are presumed to stay in the application; in the rock surrounding underground excavations or returned to the excavation as backfill material.

2.2 PRODUCT COMPOSITION

SSAB ERBs come in a variety of dimensions and load-carrying specifications. They are available in 12, 16 and 24 tonne load capacity. All ERBs can be supplied with a protective coating. This ERB 120 product is a typical example of an SSAB expandable rock bolt.

Table 1 shows the composition of the products studied.

SSAB steel raw material has a post consumer steel scrap input of 2.6% by weight. This means an uncoated rock bolt has the same content, since it consists only of steel, while a coated rock bolt has 2.5% input due to the coating.

2.3 COMPLIANCE WITH CHEMICAL LEGISLATION

SSAB actively tracks and anticipates future changes in environmental, safety and chemical legislation and complies with valid EU chemical regulations, such as the REACH Regulation 1907/2006. Communication and cooperation throughout the supply chain play an important role and SSAB requires full REACH compliance from its subcontractors. SSAB tracks the list of Substances of Very High Concern (SVHC) and other regulatory requirements to ensure products meet legal and customer requirements. In addition, SSAB observes and complies with the requests and recommendations of many customers to withdraw products containing hazardous substances in the customer sector.

SSAB's steel products contain no substances of very high concern (SVHC) as defined and listed in the European Chemicals Agency (ECHA) Candidate List of substances of very high concern for Authorisation, in levels above 0.01% by weight.

Steel contains very small amounts of impurities originating from natural raw materials and not added during the steel production process. The amount of impurities in the steels is minimal and, based on knowledge of the toxicity of these substances and their metallurgical bond in the steel matrix, does not pose a risk to the environment or human health.

TABLE 1: PRODUCTS STUDIED.

Products	Rock bolt (ERB 120) – 2.4m: Uncoated			Rock bolt (ERB 120) – 2.4m: Coated		
	Amount (kg)	Post-consumer material * (weight-%)	Renewable material (weight-%)	Amount (kg)	Post-consumer material (weight-%)	Renewable material (weight-%)
Hot-rolled pickled steel	4.77	2.6%	0	4.77	2.6%	0
Coating (Plascoat PPA 571ES)	-	-	-	0.12	0%	0
Total weight (kg/item)	4.77	2.6%	0	4.89	2.5%	0

3. Production

3.1 PRODUCTION SITES

Expandable Rock Bolts (ERB) are manufactured at SSAB's production site in Virsbo, Sweden.

ERBs are made using SSAB steel manufactured in Sweden or Finland. The steel is uniquely specified to achieve the required characteristics. The ERB manufacturing and assembly plant produces steel tubes that are bent into ERB profiles. These profiles are cut into the required lengths with upper bushing and inflation bushing welded at each end of the profile.

3.2 LABELING AND PACKAGING

Products are labeled so as to be easily and permanently identifiable and traceable. Labeling complies with EN 10204. Steel straps and wood props are used as packing material for ERBs.

This section of the declaration is for information purposes only. The packaging materials are not included in the LCA study.

3.3 SOURCING AND TRANSPORTATION

The general terms and conditions of all new or renewed raw material sourcing contracts require compliance with SSAB's Supplier Sustainability Policy. Ethical values, environmental concerns and energy efficiency are considered when choosing suppliers.

The company's own logistics unit is responsible for most of SSAB's transportation of raw material (steel) and products. Finished products are transported by sea, road or rail. SSAB's environmental objectives in respect of logistics are managed through a certified environmental management system. The aim is to increase the share of logistics contracts with partners who have signed up for energy efficiency agreements in the logistics and transport sector. SSAB's international partners have certified environmental management systems. Logistics aims to optimize transport and maximize payloads and to combine transport as efficiently as possible.



4. Waste processing

No hazardous waste is formed from end products and steel does not harm the environment. According to the European Waste Catalogue, the waste code for steel products manufactured by SSAB after their useful life is 17 04 05 (iron and steel). All packaging materials for steel products can be recycled.

5. Information about safe use

Steel poses no hazards to the environment in the forms supplied. Some grades of steel contain alloying elements such as manganese, chromium, niobium, vanadium, titanium, nickel, copper and silicon. None of these substances is released under normal or reasonably foreseeable conditions of use.

The use and handling of steel does not endanger people or the environment and there are no specific exposure limits in place for this reason. Neither have any first aid measures,

measures in the event of fire or unintentional emission, or measures as regards the handling and storage of steel been specified.

Expandable Rock Bolts are not classified as dangerous under the EU's chemical regulation (REACH) and so no Safety Data Sheet or hazardous packaging, marking or transport rules and regulations are required.

6. LCA information

- **Functional unit / declared unit:** One (1) rock bolt corresponding to 4.77 kg when uncoated and 4.89 kg when coated.
- **Reference service life:** Not applicable.
- **Production site:** SSAB EMEA AB - Virsbo, Sweden
- **Scope of declaration:** Under the PCR, it is mandatory to cover End of Life (module C) and Benefits and loads beyond the system boundary (module D). However, since the products remain in their application e.g.in the ground, they will never become waste. Therefore, the only relevant lifecycle stages are A1 – A4 as outlined below, which corresponds to cradle-to-gate including production of raw materials and electricity, transport of raw materials to the production site, manufacturing of rock bolts at the production site as well as transport to customer.
- **Allocation:** No allocations have been made, since not relevant.
- **Cut off:** Production of packaging materials is not covered by the LCA. The packaging material represents less than 0.3% of the total inflow by mass and is therefore well below the limits provided by the cut-off rules, stated in EN 15804, as well as the relevant PCR document for this EPD. No other cut offs have been made.

6.1 DATA

DATA APPLIED

SSAB Special Steels collects material composition and manufacturing data at both SSAB Special Steels and the company applying the coating directly from the production site in Virsbo and the coating supplier in Kvänum. Specific data has been used for the transport of raw materials. The transport to customer (A4) represents the largest market (SE to Montreal).

The data applied for the production of the hot-rolled pickled steel produced by SSAB Luleå and SSAB Borlänge is based on an EPD published in 2020. The SSAB steel EPD was published according to EN 15804+A1, which would have caused a problem since the rock bolt EPD is made according to EN 15804+A2 and the environmental indicators these two versions of EN 15804 are not fully compatible. However, since IVL made this SSAB steel EPD, it has been possible to use the Gabi model and not the EPD as such as input data.

Data from the Gabi database has been applied for the production of the coating, transportation, production of electricity as well as the production and combustion of fuels. The electricity mix applied in the calculations is 100% Swedish average mix.

The production of the PP-based coating has been estimated using PP data (PlasticsEurope 2014). The estimation is assessed to be fair since the coating corresponds to only 2% of the rock bolt by weight.

TABLE 2:

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 demolition	Transport	Waste processing	Disposal	Re-use-, 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

X=Module declared.

MND=Module not declared (such a declaration shall not be regarded as an indicator of a zero result).

DATA QUALITY AND REPRESENTATIVENESS

The data applied in the study has been classified based on the representativeness in relation to geographical, technical and chronological coverage.

- Raw material supply A1 (steel): Very good coverage for geography and technology. Good for chronological coverage.
- Raw material supply A1 (coating): Fair coverage for all aspects. Only applicable for coated bolts, coating represents 2 % of raw material use.
- Manufacturing A3: Very good coverage for all aspects.
- Transport A2, A4: Very good coverage for all aspects.

Site-specific data for manufacturing is provided by SSAB EMEA AB, Virsbo, Sweden and is based on 2020 and the production of the steel produced by SSAB in Luleå and Borlänge is based on the EPD published in 2020. Other background data applied is less than 10 years old. The data is assumed to be the most relevant according to current conditions and production practices.

ENERGY CONTENT

Since an uncoated rock bolt consists entirely of steel, declaration of the energy content is therefore not relevant. A coated rock bolt has a polymer content of 2 % due to the polypropylene-based paint and hence an energy content. This was not calculated since it corresponds to only 2 % and furthermore since the product remains in the ground (does not become waste), the energy content should not be of interest.

BIOGENIC CARBON CONTENT

There is no biogenic carbon in the products and no packaging materials are used for the products.

DATABASE AND LCA SOFTWARE USED

GaBi LCA software with a corresponding database 2021.2 was used.

MORE INFORMATION

The underlying LCA study has been performed by Lisa Hallberg at IVL Swedish Environmental Research Institute.

TABLE 3: GEOGRAPHICAL SCOPE, SHARE OF SPECIFIC DATA (IN GWP-GHG INDICATOR) AND DATA VARIATION

Module		Rock bolt, uncoated (ERB 120) – 2.4m		Rock bolt, coated (ERB 120) – 2.4m		Variation – products	Variation – sites
		Geography	Specific data used	Geography	Specific data used		
Raw material supply	A1	SE (1)	95 %	SE, EU (2)	92 %	Not relevant since no aggregation of products	Not relevant since only one core site
Transport	A2	SE (3)	0.3 %	SE, EU (4)	0.3 %		
Manufacturing	A3	SE (5)	1 %	SE (5)	2 %		
Transport	A4	SE to CA (6)	4 %	SE to CA (6)	4 %	into product groups	

(1) A1: 100 % of the raw material is steel with site-specific data from SSAB in Sweden, corresponding to 95 % of the total GWP. Data applied for electricity production (Swedish average) is based on generic data though.

(2) A1: 97.5 % of the raw material is steel with site-specific data from SSAB in Sweden, corresponding to 92 % of the total GWP. Data applied for the coating is based on a generic data set (EU average) and the data for electricity production (Swedish average) is also based on generic data.

(3) A2: All raw material transportation data is specific in terms of distances and transport modes. Relevant transports are within Sweden. Generic data is applied for the fuel use and emissions from the combustion of the fuel.

(4) A2: All raw material transportation data is specific in terms of distances and transport modes. Relevant transports are within Sweden except for the coating, which is transported between NL and SE. Generic data is applied for the fuel use and emissions from the combustion of the fuel.

(5) A3: Specific data is applied for the core module in terms of use of fuels in forklifts and production of some minor ancillaries, while generic data is applied for the fuel combustion and production of ancillaries. Nevertheless, 100 % of the data used has been considered as specific, which corresponds to 1 % of the total GWP for an uncoated rock bolt and to 2 % for a coated rock bolt.

(6) Transport to the customer is estimated based on the largest market (SE to Montreal).

7. Environmental performance

Table 4A – D shows the result of the Environmental Product Declaration.

TABLE 4A: POTENTIAL ENVIRONMENTAL IMPACT

Parameter	Unit	Rock bolt, uncoated (ERB 120) – 2.4m		Rock bolt, coated (ERB 120) – 2.4m	
		Total A1 – A3	A4	Total A1 – A3	A4
Global warming potential (GWP), excl biogenic carbon	kg CO ₂ eq	1,18E+01	5,23E-01	1,23E+01	5,36E-01
Climate Change - total	kg CO ₂ eq	1,20E+01	5,30E-01	1,25E+01	5,43E-01
Climate Change - fossil	kg CO ₂ eq	1,20E+01	5,29E-01	1,25E+01	5,42E-01
Climate Change - biogenic	kg CO ₂ eq	1,55E-02	5,75E-04	2,28E-02	5,90E-04
Climate Change - land use and land use change	kg CO ₂ eq	3,10E-03	3,56E-04	4,60E-03	3,65E-04
Ozone depletion	kg CFC-11 eq	1,47E-13	5,55E-17	2,40E-09	5,68E-17
Acidification	mole H+ eq	2,19E-02	1,86E-02	2,29E-02	1,91E-02
Eutrophication aquatic freshwater	kg P eq	9,54E-06	2,35E-07	1,81E-05	2,40E-07
Eutrophication aquatic marine	kg N eq	5,60E-03	4,74E-03	5,89E-03	4,86E-03
Eutrophication terrestrial	mole N eq	6,08E-02	5,20E-02	6,38E-02	5,33E-02
Photochemical ozone formation	kg NMVOC eq	1,76E-02	1,33E-02	1,86E-02	1,36E-02
Depletion of abiotic resources - minerals and metals	kg Sb eq	5,09E-07	1,78E-08	5,98E-07	1,83E-08
Depletion of abiotic resources - fossil fuels	MJ	1,36E+02	6,46E+00	1,55E+02	6,62E+00
Water use	m ³	3,37E+00	1,11E-03	3,44E+00	1,14E-03

TABLE 4B: USE OF RESOURCES

Parameter	Unit	Rock bolt, uncoated (ERB 120) – 2.4m		Rock bolt, coated (ERB 120) – 2.4m	
		Total A1 – A3	A4	Total A1 – A3	A4
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	1,13E+01	5,16E-02	1,93E+01	5,29E-02
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PERT)	MJ	1,13E+01	5,16E-02	1,93E+01	5,29E-02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (PENRE)	MJ	1,36E+02	6,47E+00	1,55E+02	6,63E+00
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT)	MJ	1,36E+02	6,47E+00	1,55E+02	6,63E+00
Use of secondary material (SM)	kg	1,24E-01	0,00E+00	1,27E-01	0,00E+00
Use of renewable secondary fuels (RSF)	MJ	4,02E-22	0,00E+00	4,02E-22	0,00E+00
Use of non renewable secondary fuels (NRSF)	MJ	4,72E-21	0,00E+00	4,72E-21	0,00E+00
Net use of fresh water (FW)	m ³	9,72E-02	6,89E-05	1,11E-01	7,06E-05

WASTE AND OUTPUT FLOWS

TABLE 4C: WASTE

Parameter	Unit	Rock bolt, uncoated (ERB 120) – 2.4m		Rock bolt, coated (ERB 120) – 2.4m	
		Total A1 – A3	A4	Total A1 – A3	A4
Hazardous waste disposed (HWD)	kg	1,60E-02	7,41E-11	1,59E-02	7,60E-11
Non-hazardous waste disposed (NHWD)	kg	4,12E-02	6,76E-04	5,48E-02	6,93E-04
Radioactive waste disposed (RWD)	kg	3,96E-03	7,25E-06	7,40E-03	7,43E-06

TABLE 4D: OUTPUT FLOWS

Parameter	Unit	Rock bolt, uncoated (ERB 120) – 2.4m		Rock bolt, coated (ERB 120) – 2.4m	
		Total A1 – A3	A4	Total A1 – A3	A4
Components for re-use (CRU)	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling (MFR)	kg	4,08E-01	0,00E+00	4,43E-01	0,00E+00
Material for energy recovery (MER)	kg	0,00E+00	0,00E+00	1,99E-02	0,00E+00
Exported electrical energy (EEE)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported thermal energy (EET)	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Remark: The two resource indicators PERM and PENRM provide a zero result since input data to the LCA-models (i.e. database data such as production of fuels, electricity, materials etc.) often does not distinguish between an energy carrier used as fuel and as material. Therefore, it is often not possible to present the results into these two categories (even though this is required).

In this specific EPD, where steel is the main raw material, resources used as raw material are not relevant. However, the painted rock bolt has a thin layer of polymer-based paint, so if the input data would have supported a division between non-renewable resources used as material and as energy, some small values would have appeared in the PENRM indicator. This is however not the case.

DISCLAIMERS

ILCD classification	Indicator	Disclaimer
ILCD Type 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD Type 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator must be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

8. Mandatory statements

The EPDs for construction products may not be comparable if they do not comply with EN 15804.

- EPDs within the same product category but from different programs or utilizing different PCRs may not be comparable.
- An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to continuous registration and publication at www.environdec.com.

9. Program-related information and verification

Program	The International EPD® System. EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. www.environdec.com
Product group classification	UN CPC 412
Reference year for data	2020
Geographical scope	Global
Product category rules (PCR)	PCR 2019:14 Construction Products. Version 1.11, 2021-02-05
PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: Claudia A. Peña. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:2006:	<input type="checkbox"/> EPD Process Certification (internal) <input checked="" type="checkbox"/> EPD Verification (external)
Third party verifier	Carl-Otto Nevén NEVÉN Miljökonsult
Accredited or approved by	The International EPD® System.

10. References

- CEN European Committee for Standardisation (2021). EN15804:2012+A2:2019/AC:2021 (CEN 2021), Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
- CML, Institute of Environmental Sciences Faculty of Science University of Leiden, Netherlands.
- EPD International (2019) PCR 2019:14 Construction products. Version 1.11, date 2021-02-05.
- Gabi LCA software. The Gabi LCA software and corresponding database are provided by sphaera in Leinfelden-Echterdingen, Germany.
- Gabi/sphaera database. The Gabi database 2021.2 was used.
- ISO (2006a). ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures.
- ISO (2006b). ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework.
- ISO (2006c). ISO 14044: 2006, Environmental management – Life cycle assessment – Requirements and guidelines.
- SSAB – SSAB Special Steels, the rock bolt manufacturer. The data has been provided by Roger Andersson.

11. Contact information

EPD owner	SSAB EMEA AB SE-737 61 Virsbo Sweden www.ssab.com Malin Lundmark
LCA author:	IVL Swedish Environmental Research Institute Valhallavägen 81 114 27 Stockholm Sweden www.ivl.se Lisa Hallberg
Program operator	EPD International AB info@environdec.com

SSAB is a Nordic and US-based steel company. SSAB offers value added products and services developed in close cooperation with its customers to create a stronger, lighter and more sustainable world. SSAB has employees in over 50 countries. SSAB has production facilities in Sweden, Finland and the US. SSAB is listed on the Nasdaq OMX Nordic Exchange in Stockholm and has a secondary listing on the Nasdaq OMX in Helsinki.