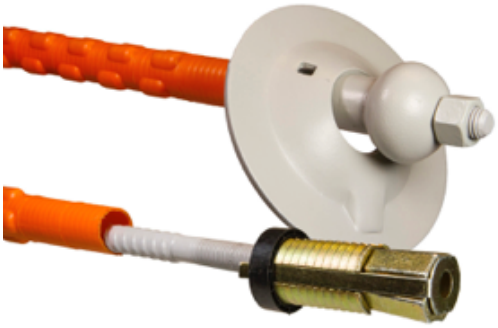
ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Zhejiang Pretec Metal Products Co.,Ltd *www.chinapretec.com* No.9 JinChang Road , Haining, Zhejiang province, China
Programme: Program operator: Publisher: Revision date: Registration number: Issue date: Valid to: Geographical scope:	The International EPD® System *www.environdec.com* EPD International AB, Box 210 60 SE-100 31 Stockholm Sweden The International EPD System September 22nd, 2018 S-P-01400 October 18th, 2018 October 12th, 2023 Global (transportation in A4 corresponding to customer in Norway)
Publisher: Registration number:	The Norwegian EPD Foundation NEPD-1667-666-EN

Pretec Combination Bolt
PRETEC NC-Bolt and Pc-Bolt



NC-Bolt

Pc-Bolt

CEN standard EN 15804 served as the core PCR	
PCR :	PCR 2012:01 Construction products and construction services, Version 2.2
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	□ EPD process certification ☒ EPD verification
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Accredited or approved by:	Accredia, certificate n.006H

Product

Manufacturer description:

Pretec manufactures the combination bolts in Zhejiang, China for distribution to Scandinavian markets (especially the Norwegian market). The products are used for rock support and fixation of water and frost protecting sheets. One of the specialty products is the combination bolt (NC-Bolt and Pc-Bolt), combining immediate and permanent support and offering extended durability.

Pretec is interested in demonstrating leadership in this industry through transparent communication of its products' environmental performance through an Environmental Product Declaration (EPD) in accordance with ISO 14025 and EN 15804. A LCA study was conducted, serving as the basis for this EPD report according to the PCR 2012:01 "Construction Products and Construction Services" from the Swedish International EPD System.

Target audiences of the study are customers and other parties with an interest in the environmental impacts of the Pretec combination bolt.

Product specifications:

The products that are to be analyzed in this study are two types of combination bolt: NC-Bolt M20x2.5 (rebar bolt) and Pc-Bolt 27/15 (tube bolt). The main manufacturing processes of the two products are the same. There is only minor difference during the assembling process.

A combination bolt is installed for immediate support of rock, anchored by an expansion shell, and to be fully grouted at a later stage, allowing it to be classified as permanent support. The advantage is that a single bolt is effective for immediate work protection at the face after torque tensioning, while later gaining additional corrosion protection by the grouting.

The products are approved by the Norwegian Public Roads Administration and Norwegian National Rail Administration as well for the use as combination bolt/rock support bolt in tunnels.

Components of the product NC-Bolt:

Deformed rebar	1 piece
Grouting head	1 piece
Plastic grout pipe	1 piece
Circular bearing	1 piece
Compact nut	1 piece
Expansion shell	1 piece

Technical Data of NC-Bolt:

Dimension	Material	Weight
NC-Bolt M20x2.5	HRB500E	2.47kg/m

Contents of the product NC-Bolt:

Material	
Steel	94.3%
Plastic (PP)	3.8%
Zinc	1.5%
Others	0.4%

Components of the product Pc-Bolt:

Deformed rebar	1 piece
Compact half ball	1 piece
Circular bearing	1 piece
Compact nut	1 piece
Expansion shell	1 piece

Technical Data Pc-Bolt:

Dimension	Material	Weight
Pc-Bolt 27/15	40Cr	2.51kg/m

Contents of the product Pc-Bolt:

Material	
Steel	98.0%
Zink	1.6%
Others	0.4%

LCA: Calculation rules

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)																	
Product Stage			Construction process stage		Use Stage							End of life stage					Resource recovery stage
Raw Material	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing	disposal		Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND		MND

Table1. System boundary of the life cycle assessment

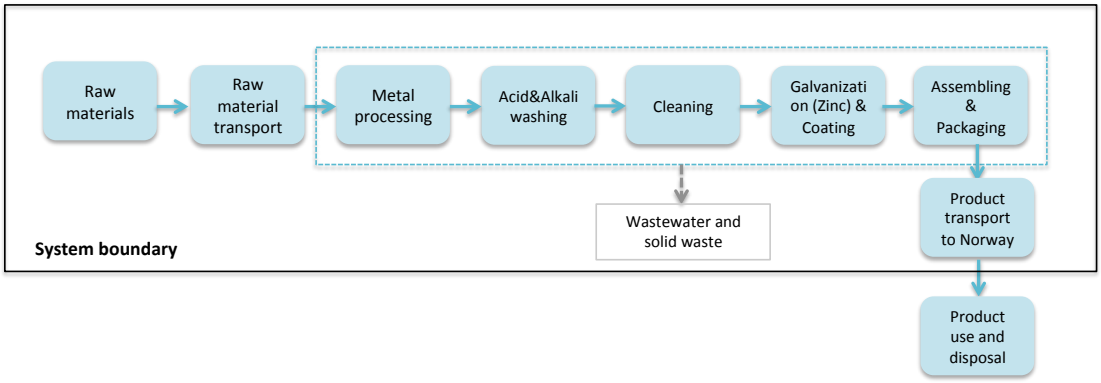

Figure1. Processes and flows within the considered system boundaries

Additional technical information			
Scenario title	Parameter	Units (expressed per declared unit)	Value
A4 Transport to Site	Vehicle type used for transport	Dry bulk cargo	N/A
	Vehicle load capacity	Dead weight tonnes	50,000
	Fuel type and consumption	Heavy fuel oil, g per tkm	2.5
	Distance to central warehouse or storage, if relevant	km	20,400
	Distance to construction site	km	-
	Capacity utilization (including empty returns)	%	unknown
	Bulk density of transported products	kg/m^3	unknown
	Volume capacity utilization factor (factor:=1or <1 or >=1 for compressed or nested packaged products)		unknown

Table2. Additional technical information for stage A4

Declared unit:

In accordance to the guiding PCR, the declared unit being evaluated is "***per kg***" of the combination bolt.

The manufacturer provided the LCI data for raw materials for each kg of the product. These materials are used exclusively for the production of combination bolts. However, considering the fact that the manufacturing process of the combination bolts is complicated and the production line manufactures various other products as well, it is not feasible for the manufacturer to collect all the consumption data for each process and exclusively for the two products. Therefore, LCI data for energy, water and auxiliary materials (except zinc ingots) provided by the manufacturer represent the consumption amount for the entire year and the whole production line. For this study, these consumption amounts were later allocated according to the percentage of the production volume (adopting a physical allocation approach). The production volume of combination bolts reaches 1,979,000 kg /year and accounts for 24.98% of the total yearly production volume of the whole production line, so the consumption of water, electricity and other auxiliary materials are calculated following a mass-ratio allocation approach, for example:
Consumption of water per unit of bolt = yearly total consumption amount of water x 24.98% /1,979,000kg

For the raw material usage, the manufacturer provided mass ratio per kg of bolt for each component, such as plastic grout pipe, the compact nut and so on. Given the fact that all the raw materials are used onsite without loss of mass, except for the rebar raw material, whose weight might be slightly reduced during processing process. So we used a special calculation formula to calculate the rebar's average weight ratio per kg of bolt product, which is: weight of deformed rebar per kg of bolt = 1 kg of bolt product – sum of the weight of the rest raw materials

For Pc Bolt:
weight of deformed rebar per kg of bolt = 1 kg of bolt product –weight of steel, grouting head, plastic group pipe, compact nut, expansion shell, zinc

For NC Bolt:
weight of deformed rebar per kg of bolt = 1 kg of bolt product –weight of steel, compact half ball, compact nut, expansion shell, zinc

System boundary:

This EPD is a "cradle-to-gate with options" EPD. The system boundary for this LCA report is from A1 to A4 (Table 1).

The PCR requires, at minimum, that the EPD reports environmental impacts of activities up to the factory "gate", with subsequent life cycle stages optionally reported. This is considered by the PCR to be the cradle-to-gate system boundary. According to the EN 15804 standard on the sustainability of construction works, cradle-to-gate activities can be grouped into three modules: raw material production, inbound transport, and manufacturing, which are categorized as A1, A2, and A3 respectively.

Additional scenario information (Table 2) and LCA results are also declared for module A4 in this study: Transport from production site to central warehouse in Oslo.

Data quality:

All specific data has been collected from and provided by Pretec, including information of raw material supply, auxiliary materials, energy consumption and emission of wastewater and solid waste. Except the estimated data such as oceanic transportation distance, and purchasing distances of some raw materials from trading companies, all other product related specific data are either monitored results (e.g. electricity, water, raw material consumption) or inventory records.
All data are representative of year 2017, and based on total production volume and input output flow, using weighted average approach to calculate unit LCI inventory results. The specific data are considered accurate, complete and representative of the product under assessment.

Ecoinvent 3.3 dataset was used as the generic data, with modification on some generic data such as steel production. The electricity supply was replaced with

Chinese electricity supply. Efforts have been paid during chosen of generic data to reflect the representativeness of generic data considering regional representativeness and technical&time relevance.

Cut-off rules:

Raw materials that account for less than 1% of the mass of the product are allowed not to be considered in the study, including the transportation of the associated materials.

The infrastructure for bolt manufacturing is not included in the LCA, including the metal working machine, zinc plating equipment and cleaning process line, packaging line and etc.. However, the wastewater treatment facilities (infrastructure) are simulated using a wastewater treatment facility from Ecoinvent database. Treatment of metal scraps including steel scraps, waste zinc ingot is not considered in the system boundary, following an allocation approach (see above: 3.6 allocation) of not including the burden as well as benefit of recycling of waste metals; other packaging waste accounts for less than 1% of the total weight, and so it is omitted from the system boundary.

Allocation:

Allocation of flow during production phase (A3): the energy and water consumption follows a mass allocation approach, namely the total energy and water consumption is allocated according to the ratio of weight of each final product series, since the input value follows a linear relationship to the mass of the product produced. In this case, the NC-Bolt product serial accounts for 15.69% of the total production volume in 2017, and the Pc-Bolt product serial accounts for 9.29%, hence the same ratio of energy and water consumption is allocated to these two product categories. And the same rule is applied to allocation of other input and output inventories, including raw materials, auxiliary materials, wastewater treatment and others.

Allocation of waste benefit during recycling process (stage C): for steel, zinc and some other recyclable materials, the benefit is not considered during the LCA, neither the burden of recycling treatment for the recyclable materials. The reason is that in this study, the LCA of the bolt product only considers A1 to A4.

LCA model:

SimaPro was used for the LCA modeling. The model includes the key (aggregated) LCI data regarding each A1-A4 stage.

LCA: Results

Although the products Pc-Bolt and NC-Bolt are manufactured by the same company with the same core processes, the differences between the environmental indicators of the two products are higher than ±10%. The results are presented separately for each product as follows.

LCA Results—— Process/stage Results (NC-Bolt)

Parameter	Unit	A1	A2	A3	A4	Total
ADPE	kg Sb-Eq.	2.46E-04	2.97E-07	1.10E-07	1.67E-07	2.46E-04
ADPF	MJ, net calorific value	4.17E+01	1.42E+00	1.53E+00	4.04E+00	4.87E+01
GWP	$kgCO_2$ Eq.	3.42E+00	9.06E-02	2.73E-01	2.75E-01	4.06E+00
ODP	kg CFC-11 Eq.	2.06E-07	1.62E-08	2.99E-09	4.52E-08	2.71E-07
AP	kg SO_2 Eq.	1.72E-02	4.62E-04	9.07E-04	5.09E-03	2.37E-02
EP	kg $(PO4)^{3-}$ Eq.	7.02E-03	1.08E-04	1.57E-04	5.54E-04	7.83E-03
POCP	kg ethene Eq.	1.80E-03	1.73E-05	4.00E-05	1.66E-04	2.02E-03

LCI Results——Resource Use for NC-Bolt				
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**
PERE	Renewable primary energy as energy carrier	[MJ, net calorific value]	3.16E+00	9.04E-02
PERM	Renewable primary energy resources as material utilization	[MJ, net calorific value]	0.00E+00	0.00E+00
PERT	Total use of renewable primary energy resources	[MJ, net calorific value]	3.16E+00	9.04E-02
PENRE	Non renewable primary energy as energy carrier	[MJ, net calorific value]	5.71E+01	3.78E+00
PENRM	Non renewable primary energy as material utilization	[MJ, net calorific value]	0.00E+00	0.00E+00
PENRT	Total use of non renewable primary energy resources	[MJ, net calorific value]	5.71E+01	3.78E+00
SM	Use of secondary material	[MJ, net calorific value]	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	[MJ, net calorific value]	0.00E+00	0.00E+00
NRSF	Use of non renewable secondary fuels	[MJ, net calorific value]	0.00E+00	0.00E+00
FW	Use of net fresh water	[m³]	5.24E+00	7.85E-02
LCI Results——Output Flows and Waste Categories for NC-Bolt				
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**
HWD	Hazardous waste disposed	[kg]	1.57E-02	0.00E+00
NHWD	Non hazardous waste disposed	[kg]	0.00E+00	0.00E+00
RWD	Radioactive waste disposed	[kg]	0.00E+00	0.00E+00
CRU	Components for re-use	[kg]	-	
MFR	Materials for recycling	[kg]	-	
MER	Materials for energy recovery	[kg]	-	

EEE	Exported energy	[MJ]	-	
EET	Exported thermal energy	[MJ]	-	

LCA Results—— Process/stage Results (Pc-Bolt)

Parameter	Unit	A1	A2	A3	A4	Total
ADPE	kg Sb-Eq.	2.43E-04	2.96E-07	1.10E-07	1.67E-07	2.43E-04
ADPF	MJ, net calorific value	3.92E+01	1.41E+00	1.53E+00	4.04E+00	4.62E+01
GWP	kgCO_2 Eq.	3.40E+00	9.02E-02	2.73E-01	2.75E-01	4.04E+00
ODP	kg CFC-11 Eq.	2.11E-07	1.61E-08	2.99E-09	4.52E-08	2.75E-07
AP	[kg SO_2 Eq.]	1.72E-02	4.60E-04	9.07E-04	5.09E-03	2.36E-02
EP	kg $(PO4)^{3-}$ Eq.	7.16E-03	1.07E-04	1.57E-04	5.54E-04	7.98E-03
POCP	kg ethene Eq.	1.85E-03	1.72E-05	4.00E-05	1.66E-04	2.08E-03

LCI Results——Resource Use for Pc-Bolt				
Parameter	Parameter	**Unit**	**A1-A3**	**A4**
PERE	Renewable primary energy as energy carrier	[MJ, net calorific value]	3.13E+00	9.04E-02
PERM	Renewable primary energy resources as material utilization	[MJ, net calorific value]	0.00E+00	0.00E+00
PERT	Total use of renewable primary energy resources	[MJ, net calorific value]	3.13E+00	9.04E-02
PENRE	Non renewable primary energy as energy carrier	[MJ, net calorific value]	5.36E+01	3.78E+00
PENRM	Non renewable primary energy as material utilization	[MJ, net calorific value]	0.00E+00	0.00E+00
PENRT	Total use of non renewable primary energy resources	[MJ, net calorific value]	5.36E+01	3.78E+00
SM	Use of secondary material	[MJ, net calorific value]	0.00E+00	0.00E+00
RSF	Use of renewable secondary fuels	[MJ, net calorific value]	0.00E+00	0.00E+00
NRSF	Use of non renewable secondary fuels	[MJ, net calorific value]	0.00E+00	0.00E+00
FW	Use of net fresh water	[m^3]	5.41E+00	7.85E-02
LCI Results——Output Flows and Waste Categories for Pc-Bolt				
Parameter	**Parameter**	**Unit**	**A1-A3**	**A4**
HWD	Hazardous waste disposed	[kg]	1.57E-02	0.00E+00
NHWD	Non hazardous waste disposed	[kg]	0.00E+00	0.00E+00
RWD	Radioactive waste disposed	[kg]	0.00E+00	0.00E+00
CRU	Components for re-use	[kg]	-	
MFR	Materials for recycling	[kg]	-	
MER	Materials for energy recovery	[kg]	-	
EEE	Exported energy	[MJ]	-	
EET	Exported thermal energy	[MJ]	-	

Additional Norwegian requirements

Dangerous substances

The materials used for combination bolts do not include substances listed in the document "Candidate List of SVHC" released by European Chemicals Agency or the Norwegian priority list.

Mandatory Statement

EPD of construction products may not be comparable if they do not comply with EN 15804.

EPDs within the same product category but from different programs may not be comparable.

Bibliography

ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012+A1:2013	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
PCR	PCR 2012:01 “Construction Products and Construction Services”
LCA Report	LCA Report for PRETEC NC-Bolt and Pc-Bolt

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Third Party Verifier	**SGS Italia S.p.A.** *https://www.sgsgroup.it/*
Programme Operator	**EPD International AB** info@environdec.com *https://www.environdec.com*

ANNEX 1

ANNEX 1: Self declaration from EPD owner

Specific Norwegian requirements

1 Applied electricity data set used in the manufacturing phase

The electricity mix for the electricity used in manufacturing (A3) is the electricity grid mix

<0.341 CO_2 eqv/MJ>

2 Content of dangerous substances

☒ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.

☐ The product contains substances that are less than 0.1% by weight given by the REACH Candidate or the Norwegian priority list.

☐ The product contains dangerous substances more than 0.1% by weight given in the REACH candidate list or the Norwegian Priority List, concentrations is given in the EPD:

Dangerous substances from the REACH candidate list or the Norwegian Priority List	CAS No.	Quantity (concentration, wt%/FU(DU)).
Substance 1		
Substance n		

3 Transport from the place of manufacture to a central warehouse

Transport distance, and CO_2-eqv./DU from transport of the product from factory gate to central warehouse in Oslo shall be given. The following table shall be included in the EPD:

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy use	Unit	Value (l/t)	Kg CO2-eqv./DU
Boat	unknown	Dry bulk cargo	20,400	Heavy fuel oil	g/tkm	2.5 g/tkm	2.75E-01
Truck							
Railway							
Rail							
Air							
Total							

4 Impact on the indoor environment

☐ Indoor air emission testing has been performed; specify test method and reference; M1, _____

☐ No test has being performed

☒ Not relevant; specify _____