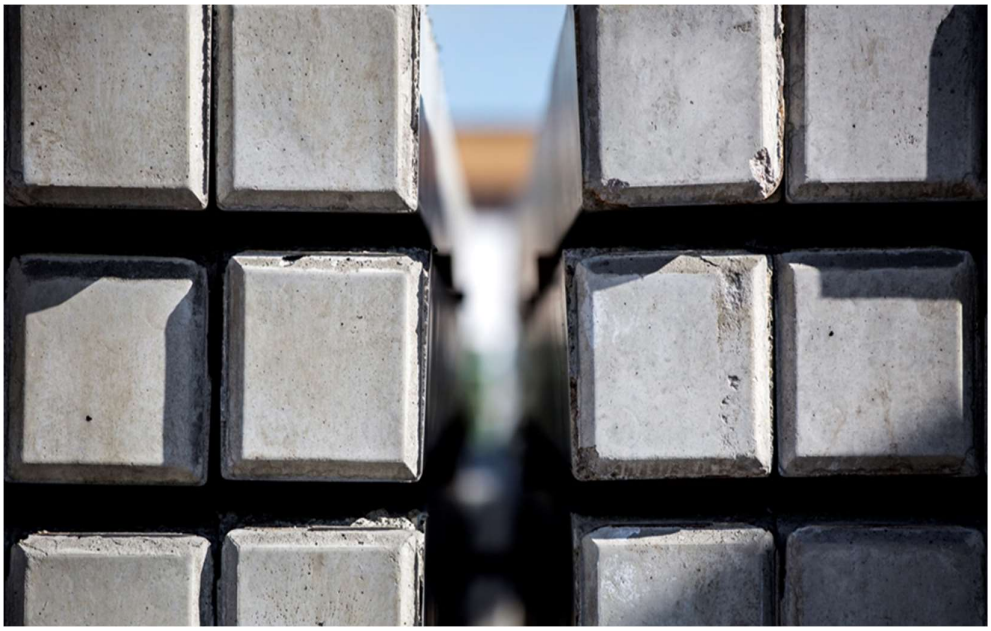
Environmental Product Declaration for Hercules Concrete Piles



According to EN 15804:2012+A1:2013, ISO 14025, ISO 14040 and ISO 14044
Program operator: The International EPD® System
Declaration owner: Hercules Grundläggning AB

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The Hercules plants currently manufacture precast concrete piles in three different sizes representing three main product groups: HP 235, HP 270 and HP 350. This EPD covers nine main design varieties of these concrete piles produced in the Ucklum and Västerås plants, both in Sweden. This EPD type is "cradle-to-gate" and includes life cycle stages from A1 to A3. Transport out to construction sites (A4) is not included in this EPD. The concrete piles are used in construction works in Sweden and Norway. Upon request, the concrete piles can be delivered to the affiliated company, Hercules Fundering in Denmark. The intended use of the EPD is for business-to-business communication.

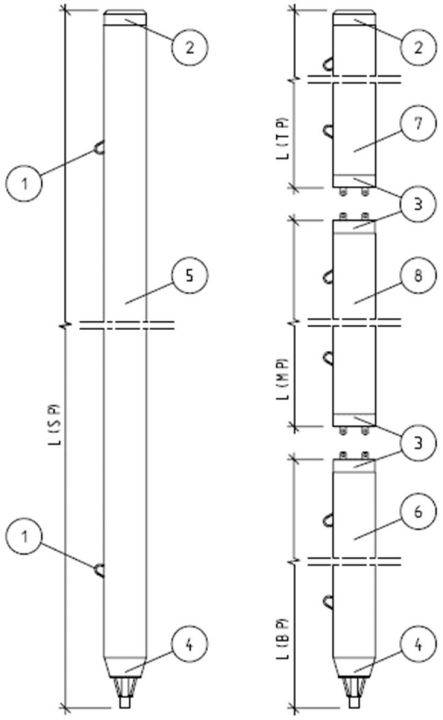
EPD INFORMATION

Declared unit:	1 metre of concrete pile
Service Life:	100 years
PCR:	PCR 2012:01. Construction products and construction services. Version 2.3, the International EPD System, Date 2018-11-15 Sub-PCR to PCR 2012:01 Concrete and concrete elements (EN 16757:2017), PCR 2012:01-SUB-PCR-G, the International EPD System, Date 2018-11-22
Program operator:	The International EPD® System, operated by EPD International AB

DESCRIPTION OF THE PRODUCT

The Hercules concrete piles are columnar elements in a foundation which have the function of transferring load from the superstructure through weak compressible strata or through water, onto stiffer or more compact and less compressible soils or onto rock. They may be required to carry uplift loads when used to support tall structures subjected to overturning forces from winds or waves. The concrete piles used in marine structures are subjected to lateral loads from waves and from the impact of berthing ships. Combinations of vertical and horizontal loads are carried where piles are used to support retaining walls, bridge piers and abutments, and machinery foundations.

A pile length is chosen for the initial driving which is judged to be suitable for the shallowest predicted penetration for the relevant region. Additional lengths are locked on if deeper penetration is necessary, or if a very deep penetration requiring multiples of the standard lengths is necessary, see figure 1. The precast concrete units are locked together by a pile joint to obtain the required bending and tensile resistance and a rock shoe incorporation may be used. This will not decrease the design load capacity. There is no limit to the length of such piles locked into a jointed pile.



1- Lifting loop; 2- Crack ring; 3- Pile joint, 4- Rock shoe; 5- Single Pile; 6- Bottom Pile; 7- Top Pile and 8-Middle Pile.

Figure 1. Design of the Hercules concrete piles.

The Hercules plants currently manufacture five pile types in three main sizes with standard lengths of between 3 and 12/14 m to suit the imposed loading and ground conditions, and their durability is satisfactory for most soil and immersion conditions in Scandinavia. To avoid excessive flexibility while handling and driving, the usual maximum lengths of square section piles, and the range of working loads applicable to each size are those shown in table 1.

There are some minor design differences between the five pile types depending on whether they are produced in the Ucklum or Västerås plants. The concrete piles declared are summarized in table 2. The most common concrete pile has a dimension of 235x235 mm. The geographical locations of the plants are shown in figure 2.

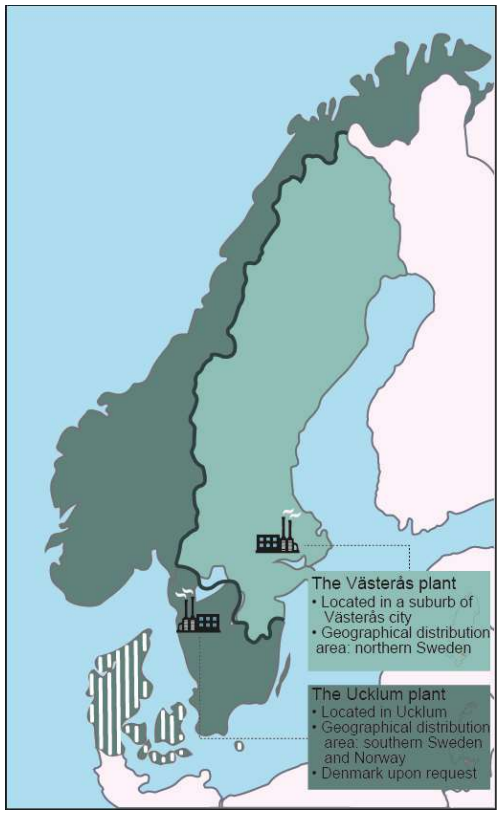


Figure 2. Map showing the geographical location of the Hercules concrete pile plants in Ucklum and Västerås, both in Sweden.

All Hercules concrete piles have been CE marked in accordance with the harmonized SS-EN 12794 standard, with Manufacturing and Execution Class I. According to the Construction Product Regulation, CPR, CE marking is mandatory for products covered by this harmonized Standard. The quality of the Hercules concrete piles is guaranteed by Nordcert through appropriate Product Quality Certification according to SS-EN 12794.

The cement used is in accordance with SS-EN 197-1:2011, with requirements in accordance with SS-EN 206:2013+A1:2016 and SS 137003:2015, EKS11 table D-1. If sulphate-resistant cement is used, the requirements of SS 134204:2014 are followed. Frost resistance is shown by testing according to SS 137244:2005. Air pore formers must be used in the concrete to meet the requirements of XF4.

The concrete in the Hercules concrete piles can, in principle, fulfil all existing exposure classes, see table 2 regarding applications and requirements. Hercules concrete piles have a cover of precast concrete between 25 and 45 mm thick. Concrete made with ordinary Portland composite cement (CEM II) is suitable for all normal exposure conditions but sulphate-resisting cement may be needed in aggressive ground conditions. The piles are normally manufactured in strength class C50/60. The maximum aggregate size in the concrete is 25 mm and all the ballast used is frost resistant.
The piles made in the Ucklum and Västerås casting plants, are based on a 16-hour cycle of casting and lifting from the casting beds. After the piles have been removed from the casting beds, they are stacked in order to harden and reach the required strength.

The Hercules concrete pile reinforcement consists of the longitudinal steel reinforcement that is welded or sewn into the transverse steel wire. This creates a reinforcing basket, which is placed in the casting beds together with a rock shoe and crack ring or pile joint at each end, depending on whether it is to be a single, lower, middle, top or bottom pile. All fitting elements (rock shoe, crack ring, pile joint and lifting loops) are made of structural steel. Reinforcement is necessary within the pile to help withstand both handling and driving stresses. Each segment is reinforced with four or eight steel rebars (between 12 and 16 mm in diameter) welded to a circumferential steel wire coil, see figure 3. Recesses are provided at each end of the segment and steel rebars connect each segment to form the joint. The quality of the longitudinal reinforcement is at least K500B according to SS 212540. The transverse wire is K400AB.

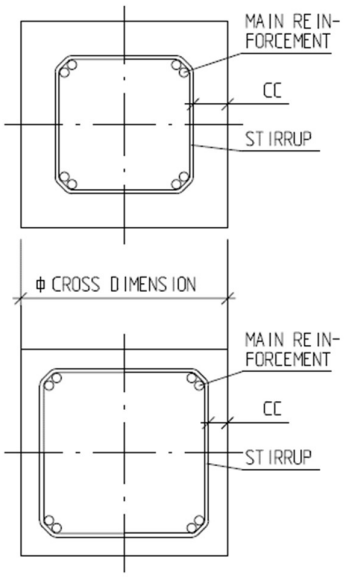


Figure 3: Cross sections of the Hercules concrete piles.

A content declaration is presented in table 3. The products contain no substances of very high concern (SVHC) according to REACH.

Table 1: Working loads and maximum lengths for the Hercules concrete piles of square section.

Product group (pile size, mm^2)	Pile type	Range of working loads (kN)	Maximum length (m)
235	HP 235-0412	550-1100	12
	HP 235-0416		14
270	HP 270-0812	750-1700	14
	HP 270-0816		
350	HP 350-0816	1000-2700	14

Table 2. Design varieties of the Hercules concrete pile types
(the dimensions refer to a length of 1 metre).

Pile type	Design varieties	Plant	Characteristics	Concrete cover (mm)	Weight (kg)	Dimensions (mm)
HP 235-0412	HP 235-0412U	Ucklum	4 rebars x 12 mm	25	128	235x235
	HP 235-0412V	Västerås			133	
HP 235-0416	HP 235-0416U	Ucklum	4 rebars x 16 mm	25	128	235x235
	HP 235-0416V	Västerås			133	
HP 270-0812	HP 270-0812U	Ucklum	8 rebars x 12 mm	25,45	178	270x270
	HP 270-0812V	Västerås			182	
HP 270-0816	HP 270-0816U	Ucklum	8 rebars x 16 mm	25,45	185	270x270
	HP 270-0816V	Västerås			189	
HP 350-0816	HP 350-0816U	Ucklum	8 rebars x 16 mm	45	303	350x350
	-	Västerås			-	

Table 3. Content declaration of the pile types declared (presented as a range because the content varies between the specific pile types).

Component	Trade name	Inherent substances	Weight (%)	CAS no	REACH no	REACH classification
Coarse and fine aggregate	-	Granite, porphyry	71	-	N/A	Not classified
Cement	Portland-composite cement CEM II/A-M (S-LL) 52.5 N	Portland Cement Clinker (80-85%)	13,6–14,4	65997-15-1	N/A	H315, H318, H335
		Blast furnace slag		65996-69-2	N/A	Not classified
		Limestone	2–3,4	-	N/A	Not classified
		Other (0–5%)	0–0,8	-	N/A	Not classified
Water (fresh)	-	Water	~~5,9~~	~~-~~	~~N/A~~	~~Not classified~~
Steel parts (reinforcement and fitting elements)			6	-	N/A	Not classified
Additives	CHRYSO®Fluid Premia 205	1,2-Benzisothiazol-3(2H)-one	<0,1	2634-33-5	613-088-00-6	GHS05, GHS07, GHS09, H302, H315, H318, H317, H400

1. Declared Unit

The EPD follows the Product Category Rules PCR 2012:01 for Construction products and construction services, version 2.3 (PCR 2012:01 2018) and Sub-PCR to PCR 2012:01 for Concrete and concrete elements (EN 16757:2017), PCR 2012:01-SUB-PCR-G (Sub-PCR 2018). According to the PCR 2012:01, the declared unit is 1 metre of pile. The declared products are the nine concrete pile types given in table 2.

2. System boundary

The EPD type is a "cradle-to-gate" EPD. The LCA model used to create the EPD includes the following life cycle stages (the modularity according to the EN 15804:2012+A1:2013 standard is given in brackets):

- Product stage
  - Raw material supply (A1)
  - Transport (A2)
  - Manufacturing (A3)

The system boundaries of the EPD follow the modular design defined by the EN 15804:2012+A1:2013 standard. Table 4 identifies the modules included in this study.

3. Estimates and assumptions

The specific data for the module A1-A3 is representative for the concrete pile manufacture at the actual production lines in the Hercules plants. Generic data is Swedish, German, European or global.

The primary data on material and energy use was collected by the management team in the Hercules plants in 2017 and is reported per 1 metre of concrete pile produced. Data are collected and calculated for the two producing units, in Ucklum and Västerås. The raw material content and transport data are specific for each plant. All the transport distances have been estimated based on data from the suppliers.

Table 4. Modules of the life cycle included in the EPD (X = declared module; MND = module not declared).

Upstream			Core		Downstream											Other environmental information
Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material supply	Transport	Manufacturing	Transport	Manufacturing	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

The manufacture of Hercules concrete piles leads to some co-products and waste, see table 5.

Table 5: Co-products and waste for recycling.

Waste	Co-product/ recycling	
	The Ucklum plant	The Västerås plant
Concrete	Concrete beams	Roadside barrier blocks
Gravel and crushed concrete	Recycling	Recycling
Steel wire package	Recycling	-

The co-products and waste to recycling make a very low contribution to the overall revenue (less than 5% of the input flow to the unit process) and they have therefore been disregarded in the calculation model in accordance with EN 15804:2012+A1:2013. All waste is sold to recycling.

4. Allocation

For all raw materials, allocation by mass and net calorific value has been applied. Two allocation rules are applied: 1) the raw material necessary for the manufacture is allocated by mass of the declared unit (i.e. by mass of 1 metre of pile); and 2) the energy (electricity) necessary for the manufacture (mixing the concrete; lifting of the finished piles from casting beds by travers; cutting, welding and stretching wires; and lifting piles to storage), is allocated in MJ by production of the declared unit (i.e. 1 metre of pile).

5. Cut-off criteria

In the assessment, all available data from the production process are considered, i.e. all raw materials and auxiliary materials used, and energy consumption using available LCI GaBi datasets. All raw materials and energy used in the manufacture of the concrete piles are included.

The following procedure is followed for the exclusion of inputs and outputs according to the EN 15804:2012+A1:2013 standard:

- In the case of insufficient input data or data gaps for a unit process, the cut-off criterion is 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input to that unit process.
- The maximum neglected input flows per declared module (A1- A3) is 5 % of energy usage and mass.

Cut-offs have been made for the package steel waste, the vegetable oil needed for the casting beds, plastic spacers, concrete waste for co-products and gravel and crushed stone waste for recycling.

6. Background data

For life cycle modelling, the software system for Life Cycle Engineering, GaBi, developed by thinkstep AG, has been applied. The GaBi 8 database contains consistent and documented datasets which are available in the online GaBi documentation. The method selected for the calculations is CML 2001-Apr 2013 (the database updated in 2019). Explanatory material is given in a background report to this EPD (see Reference list).

7. Data quality

Overall, the data quality can be described as good.

The model is based on site-specific data provided by Hercules Grundläggning AB for the year 2017. Background data are geographically representative of the production site location and are less than 5 years old.

EPDs of construction products may not be comparable if they do not comply with EN 15804:2012+A1:2013. Normally EPDs from different program operators within the same product category be comparable. A comparison of EPDs is possible only if all the data sets to be compared are created according to ISO 14025 and EN 15804:2012+A1:2013, and the building context, particularly the product-specific characteristics of performance, is taken into account.

In case of inclusion of several similar products and/or if more than one manufacturing site is accounted for, the International EPD System offers the possibility to report the environmental impact in the same declaration document (GPI, PCR 2012:01). Similar products with differences between the mandatory impact indicators higher than ±10% (concerning A1-A3) could be presented in the same declaration documents but using separate tables, and this has been done in this EPD.

The Hercules two plants currently manufacture precast concrete piles in three main sizes representing three main product groups: HP 235, HP 270 and HP 350. The results of the life cycle assessment of the declared unit of the products for each product group (HP 235, HP270 and HP350) over two production plants are presented as following:

- Product group HP 235, see table 6 (potential environmental impact), table 9 (resource use) and table 12 (output flows and waste categories)
- Product group HP 270, see table 7 (potential environmental impact), table 10 (resource use) and table 13 (output flows and waste categories)
- Product group HP 350, se table 8 (potential environmental impact), table 11 (resource use) and table 14 (output flows and waste categories).

The LCA results are aggregated for module A1-A3 as required by the PCR 2012:01. The results are presented per one metre of produced concrete pile, which is the declared unit. With respect to the EPD, the impact categories to be studied and documented are pre-defined in PCR 2012:01 for Construction products and construction services, version 2.3 (PCR 2012:01 2018) and Sub-PCR to PCR 2012:01 for Concrete and concrete elements (Sub-PCR 2018).

In this EPD the span between products within the same product groups is larger than 10% for some of the environmental indicators.

A sensitivity check of the cut-offs has been performed and the cut-offs do not influence the result.

Most of the impact in the “Global warming potential” category originates from the production of the cement and of the steel parts (in descending order). In the “Acidification potential” category, most of the impact originates from the production of the cement and the steel parts and from transport (in descending order). Most of the impact in the “Eutrophication potential” category also originates from the production of the cement and the steel parts and from transport (in descending order). Most of the impact in the “Photochemical ozone creation potential” category originates from the production of the steel parts and the cement (in descending order). Most of the impact in the “Ozone depletion potential” category originates from the production of the additive, the steel parts, energy and the cement (in descending order). In the “Depletion of abiotic resources (elements)” category, the impact originates mainly from the production of the cement. In the “Depletion of abiotic resources (fossil)” category, the impact is from the production of the steel parts and the cement.

In the “Total use of renewable primary energy (PERT)” category, most of the impact is from the production of cement. The concrete pile production does not have any impact in the “Total use of non-renewable primary energy (PENRT)” category.

Most of the radioactive waste originates from the electricity used in the manufacturing process and from the steel parts (in descending order). The hazardous waste disposed originates mainly from the production of the additive. The non-hazardous waste disposed originates mainly from the production of the aggregates and from the production of the cement (in descending order).

In general, the production of the HP 350-0816U concrete pile has the largest environmental impact in all categories, uses most resources and generates most waste, mainly because of the higher content of cement and steel parts in the HP 350-0816U pile than in the other concrete pile types.

Table 6: Results of the LCA – Potential environmental impact of 1 metre of HP 235 concrete pile type.

Potential environmental impact		Modules A1-A3			
Parameter	Unit	The Ucklum plant		The Västerås plant	
		HP 235-0412U	HP 235-0416U	HP 235-0412V	HP 235-0416V
Global warming potential (GWP100)	kg CO2 eq	24,7	24,7	24,0	24,0
Ozone depletion potential (ODP)	kg CFC 11 eq	4,19E-11	4,19E-11	2,88E-11	2,88E-11
Acidification potential of land and water (AP)	kg SO2 eq	0,053	0,053	0,062	0,052
Eutrophication potential (EP)	kg PO43- eq	0,007	0,007	0,006	0,006
Photochemical ozone creation potential (POCP)	kg C2H2 eq	0,005	0,005	0,006	0,006
Depletion of abiotic resources (elements) (ADPE)	kg Sb eq	3,20E-05	3,20E-05	3,11E-05	3,11E-05
Depletion of abiotic resources (fossil) (ADPF)	MJ, net calorific value	152	152	145	145

Table 7: Results of the LCA – Potential environmental impact of 1 metre of HP 270 concrete pile type.

Potential environmental impact		Modules A1-A3			
Parameter	Unit	The Ucklum plant		The Västerås plant	
		HP 270-0812U	HP 270-0816U	HP 270-0812V	HP 270-0816V
Global warming potential (GWP100)	kg CO2 eq	33,9	37,1	32,7	35,8
Ozone depletion potential (ODP)	kg CFC 11 eq	5,76E-11	5,77E-11	3,93E-11	3,94E-11
Acidification potential of land and water (AP)	kg SO2 eq	0,073	0,083	0,071	0,08
Eutrophication potential (EP)	kg PO43- eq	0,009	0,01	0,009	0,009
Photochemical ozone creation potential (POCP)	kg C2H2 eq	0,007	0,009	0,008	0,009
Depletion of abiotic resources (elements) (ADPE)	kg Sb eq	4,41E-05	4,47E-05	4,23E-05	4,28E-05
Depletion of abiotic resources (fossil) (ADPF)	MJ, net calorific value	211	248	200	238

Table 8: Results of the LCA – Potential environmental impact of 1 metre of HP 350 concrete pile type.

Potential environmental impact		Modules A1-A3
Parameter	Unit	The Ucklum plant
		HP 350-0816U
Global warming potential (GWP100)	kg CO2 eq	57,8
Ozone depletion potential (ODP)	kg CFC 11 eq	9,70E-10
Acidification potential of land and water (AP)	kg SO2 eq	0,125
Eutrophication potential (EP)	kg PO43- eq	0,016
Photochemical ozone creation potential (POCP)	kg C2H2 eq	0,013
Depletion of abiotic resources (elements) (ADPE)	kg Sb eq	7,43E-05
Depletion of abiotic resources (fossil) (ADPF)	MJ, net calorific value	363

Table 9: Results of the LCA - Resource use for 1 metre of HP 235 concrete pile type.

Use of resources		Modules A1-A3			
Parameter	Unit	The Ucklum plant		The Västerås plant	
		HP 235-0412U	HP 235-0416U	HP 235-0412V	HP 235-0416V
Use of renewable primary energy (PERE)	MJ, net calorific value	27,8	27,8	27,5	27,5
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ, net calorific value	27,8	27,8	27,5	27,5
Use of non-renewable primary energy (PENRE)	MJ, net calorific value	178	178	171	171
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	0	0	0	0
Total use of non-renewable primary energy resources (PENRT)	MJ, net calorific value	178	178	171	171
Use of secondary material (SM)	kg	0	0	0	0
Use of renewable secondary fuels (RSF)	MJ, net calorific value	0	0	0	0
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	0	0	0	0
Use of net fresh water (FW)	m3	0,055	0,055	0,058	0,058

Table 10: Results of the LCA - Resource use for 1 metre of HP 270 concrete pile type.

Use of resources		Modules A1-A3			
Parameter	Unit	The Ucklum plant		The Västerås plant	
		HP 270-0812U	HP 270-0816U	HP 270-0812V	HP 270-0816V
Use of renewable primary energy (PERE)	MJ, net calorific value	40,6	54,8	39,9	54,3
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources (PERT)	MJ, net calorific value	40,6	54,8	39,9	54,3
Use of non-renewable primary energy (PENRE)	MJ, net calorific value	249	301	238	290
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	0	0	0	0
Total use of non-renewable primary energy resources (PENRT)	MJ, net calorific value	249	301	238	290
Use of secondary material (SM)	kg	0	0	0	0
Use of renewable secondary fuels (RSF)	MJ, net calorific value	0	0	0	0
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	0	0	0	0
Use of net fresh water (FW)	m3	0,08	0,107	0,083	0,11

Table 11: Results of the LCA - Resource use for 1 metre of HP 350 concrete pile type.

Use of resources		Modules A1-A3
Parameter	Unit	The Ucklum plant
		HP 350-0816U
Use of renewable primary energy (PERE)	MJ, net calorific value	71,5
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	0
Total use of renewable primary energy resources (PERT)	MJ, net calorific value	71,5
Use of non-renewable primary energy (PENRE)	MJ, net calorific value	430
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	0
Total use of non-renewable primary energy resources (PENRT)	MJ, net calorific value	430
Use of secondary material (SM)	kg	0
Use of renewable secondary fuels (RSF)	MJ, net calorific value	0
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	0
Use of net fresh water (FW)	m3	0,141

Table 12: Results of the LCA - Output flows and waste categories for 1 metre of HP 235 concrete pile type.

Waste		Modules A1-A3			
Parameter	Unit	The Ucklum plant		The Västerås plant	
		HP 235-0412U	HP 235-0416U	HP 235-0412V	HP 235-0416V
Hazardous waste disposed (HWD)	kg	4,31E-04	4,31E-04	2,96E-04	2,96E-04
Non-hazardous waste disposed (NHWD)	kg	4,14	4,14	4,21	4,21
Radioactive waste disposed (RWD)	kg	0,010	0,010	0,010	0,010

Table 13: Results of the LCA - Output flows and waste categories for 1 metre of HP 270 concrete pile type.

Waste		Modules A1-A3			
Parameter	Unit	The Ucklum plant		The Västerås plant	
		HP 270-0812U	HP 270-0816U	HP 270-0812V	HP 270-0816V
Hazardous waste disposed (HWD)	kg	5,92E-04	5,92E-04	4,04E-04	4,04E-04
Non-hazardous waste disposed (NHWD)	kg	5,7	5,74	5,7	5,74
Radioactive waste disposed (RWD)	kg	0,015	0,021	0,015	0,021

Table 14: Results of the LCA - Output flows and waste categories for 1 metre of HP 350 concrete pile type.

Waste		Modules A1-A3
Parameter	Unit	The Ucklum plant
		HP 350-0816U
Hazardous waste disposed (HWD)	kg	9,96E-04
Non-hazardous waste disposed (NHWD)	kg	9,59
Radioactive waste disposed (RWD)	kg	0,027

ADDITIONAL ENVIRONMENTAL INFORMATION

This LCA study assumes that all the concrete and reinforcement are sent for recycling at the end of life. The products release no dangerous substances to indoor air, soil or water during their use stage. The products need no maintenance or service.

Hercules buys the electricity marked with “Good environmental choice” from Vattenfall AB, which means that Hercules buys 95% hydropower and 5% wind power.

VERIFICATION DETAILS

CEN standard EN 15804 served as the core PCR	
PCR:	Product Category Rules PCR 2012:01. Construction products and construction services. Version 2.3, the International EPD System, 2018-11-15
PCR review was conducted by:	PCR Committee: IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB Moderator: Martin Erlandsson, IVL Swedish Environmental Research Institute
Sub-PCR	Sub-PCR to PCR 2012:01 (v2.3 date 2018-11-22) Concrete and concrete elements (EN 16757:2017) PCR 2012:01-SUB-PCR-G, the International EPD System
Sub-PCR review was conducted by:	PCR Committee: WBCSD Cement Sustainability Initiative Moderator: International EPD® System
Independent verification of the declaration and data, according to ISO 14025:	□ EPD process certification (Internal) ☒ EPD verification (External)
Third party verifier:	Carl-Otto Nevén
Accredited or approved by:	The International EPD® System
The follow-up of data during the EPD validity involves third party verifier	□ No ☒ Yes

Alheid, P. Interview with Hercules geotechnical engineer.

Guidelines for concrete piles from Hercules Grundläggning. Betongpålar från Hercules Grundläggning – Anvisningar för projektering, design och kontroll, Hercules Grundläggning AB, 2018.

SS-EN 12794:2005/AC:2008 Precast concrete products - Foundation piles, 2007.

SS 137244:2005 Concrete testing - Hardened concrete - Scaling at freezing, 2005.

SS-EN 197–1:2011 Cement - Part 1: Composition, specifications and conformity criteria for common cements, 2011.

SS-EN 206:2013+A1:2016 Concrete - Specification, performance, production and conformity, 2016.

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ABOUT THE EPD

This environmental product declaration (EPD) describes, from a life cycle perspective, the total environmental impact of nine main design varieties of the Hercules concrete piles produced in the Ucklum and Västerås plants, both in Sweden.

The EPD has been drawn up in accordance with Product Category Rules PCR 2012:01 for Construction products and construction services, version 2.3 (PCR 2012:01 2018) and Sub-PCR to PCR 2012:01 for Concrete and concrete elements (EN 16757:2017), PCR 2012:01-SUB-PCR-G (Sub-PCR 2018). The program operator is the International EPD® System (see www.environdec.com for more information).

The aim of this EPD is to provide objective and reliable information on the environmental impact of the production of the Hercules concrete piles.

This EPD has been developed by Hercules Grundläggning AB. It has been certified by Carl-Otto Nevén and the certification is valid for five years (after which it can be revised and reissued). Hercules Grundläggning AB is the declaration owner.

As this EPD is based on data for the production of Hercules concrete piles in the plants owned by Hercules Grundläggning AB, the results may not be representative of concrete piles produced at the concrete pile plants of other companies.

ABOUT HERCULES GRUNDLÄG**G**NING AB

Hercules Grundläggning AB is a division of NCC Industry AB, which in turn is a business area within Nordic Construction Company, NCC AB.

Hercules Grundläggning AB is one of the leading deep foundation companies on the Nordic market. Using methods such as piling, support structures and foundation reinforcement, we help our customers to lay the foundation for future buildings and facilities. A competence that makes us unique is our engineering department that assists in design and optimizing of your project. We are also one of the largest manufacturers and suppliers of precast concrete piles on the Nordic Market. It is essential for Hercules to be able to fulfil certain market requirements.

Hercules Quality, Environmental and Health and Safety Management System has for a long time been certified according to SS-EN ISO 9001:2015, 14001:2015 and SIS-OHSAS 18001:2007.

The quality of the Hercules concrete piles is guaranteed by Nordcert through appropriate Product Quality Certification, SS-EN 12794, a document that specifies the maximum and minimum tolerances of the concrete piles with regards to the following criteria: bending resistance of the finished product; concrete resistance; resistance to freezing; product straightness.

For more information, visit www.hercules.se.

CONTACT

Göta Sörqvist
+46(0)70 306 18 42
gota.sorqvist@hercules.se

Larissa Strömberg
+46(0)70 667 73 21
larissa.stromberg@ncc.se

Address:
Hercules Grundläggning AB
Herrjärva torg 4
170 67 Solna
Sweden

For more information, visit www.hercules.se.