epd-norway
Global Program Operator

ENVIRONMENTAL PRODUCT DECLARATION

This EPD is in accordance with ISO 14025 and EN 15804.

Owner of the declaration:	Beer Sten AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-4059-3090-EN
Issue date:	19.12.2022
Valid to:	19.12.2027

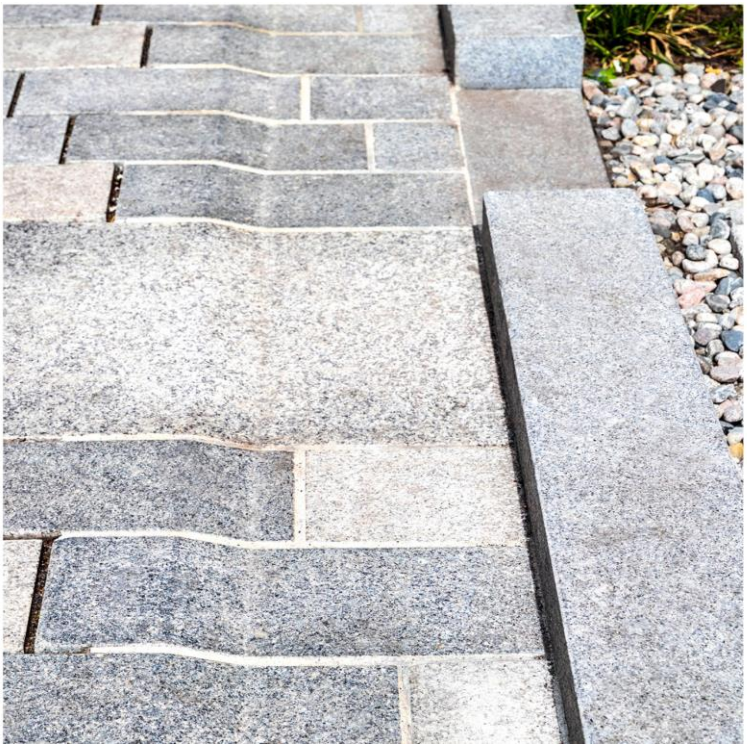
BeerEcoSten® Porto - The Star Selection

BeerEcoSten® Star White
BeerEcoSten® Star Blue
BeerEcoSten® Roriz

BEER STEN AS
Etabl ★ 1879
Et trygt valg

Beer Sten AS

www.epd-norge.no



General information

Product

BeerEcoSten® Star White
BeerEcoSten® Star Blue
BeerEcoSten® Roriz

Owner of the declaration

EPD owner	Beer Sten AS
Contact person:	Monica Midtun Sander
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Program holder

Næringslivets Stiftelse for Miljødeklarasjoner
Postboks 5250 Majorstuen, 0303 Oslo
Phone: +47 977 22 020
e-mail: post@epd-norge.no

Manufacturer

The average of three manufacturers were declared, here named as:
Portugal 1
Portugal 2
Portugal 3
Can be provided upon request.

Declaration number

NEPD-4059-3090-EN

Place of production:

Portugal

This declaration is based on Product Category Rules:

EN 15804:2012+A1:2013 v.1.0 (24.11.2013).
NPCR Part A v.1.0 for Construction products and services (07.04.2017).
NPCR 018 v.1.0 Part B for natural stone products, aggregates and fillers (20.05.2020).

Management system:

Statements:

The owner of the declaration shall be liable for the underlying information and evidence.
EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Organisation no:

952 440 330

Issue date

19.12.2022

Valid to

19.12.2027

Declared unit:

Year of study:

2021

Declared unit with option:

Comparability:

EPD of construction products may not be comparable if they do not comply with EN15804 and are seen in a building context. EPDs from other programmes than EPD-Norway may not be comparable.

Functional unit:

1 tonne of BeerEcoSten® installed in roads/pavements/parking lots/city squares/driveways/gardens/parks etc.

The EPD has been worked out by:

Simon A. Saxegård

NORSUS

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☑ external

Third party verifier:

Mie Vold - LCA.no AS
(Independent verifier approved by EPD Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
BeerEcoSten ® Porto is a product group of stone products with different colors of natural stone. The product group includes paving, wallstones, elements and curbs in an infinite variety of sizes. During installation it is only curb stones that requires adhesive concrete. A specific installation scenario (A5) is described for curb stones because these require additional B30 concrete.

Technical data:
Density of product: 2.6 t/m^3

Product specifications are tested in accordance to standards:
EN 1341:2012
EN 1342:2012
EN 1343:2012

Product specification

Declared stone types	Water absorption		Bending tensile strength		Compressive strength		Mineral composition
BeerEcoSten® Roriz	0,20	%	17,2	MPa	157	MPa	Feldspar, plagioclase, quartz, biotite, muscovite
BeerEcoSten® Star Blue	0,30	%	17,7	MPa	164	MPa	Microcline, plagioclase, quartz, mica
BeerEcoSten® Star White	0,30	%	14,6	MPa	170	MPa	Microcline, plagioclase, quartz, biotite, muscovite

Use and application:
- Elements and wallstones
- Curb stone
- Pavers
- Setts and cubes
- Steps

All products are licenced for road use according to strength and property parameters.

Market: Norway

Reference service life:
>60 years.

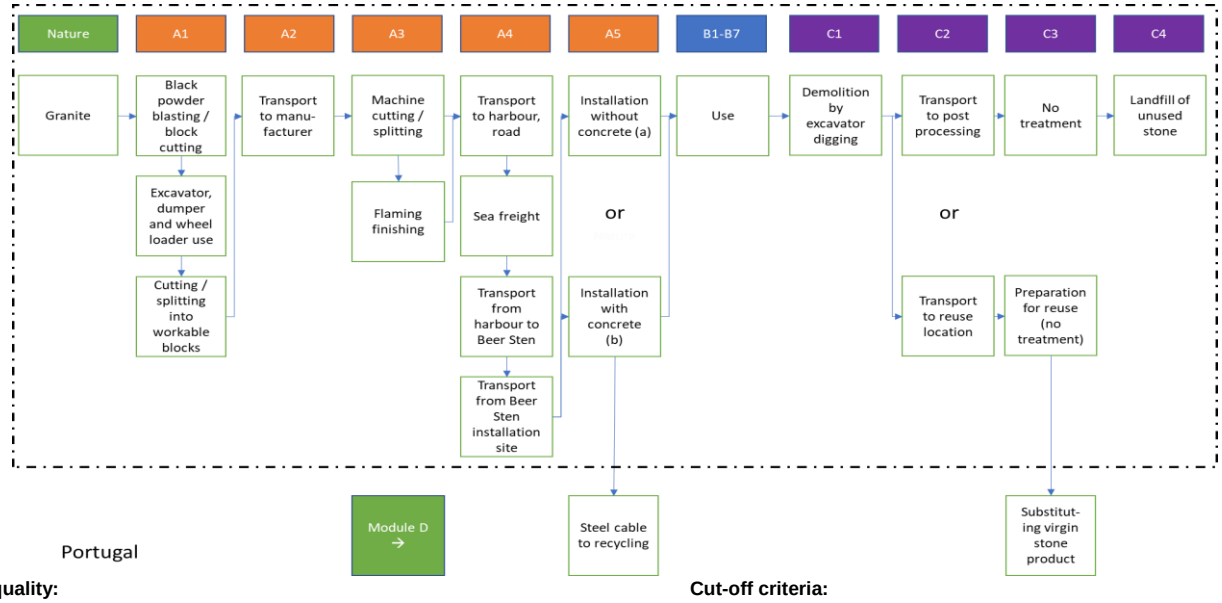
Average data:
This EPD declares natural stone products, from three types of materials, in various shapes, sizes and surfaces. The manufacturing data collected represent an average of all variations. A test was performed to investigate variations in the amount of saw dust from variations in saw blade thicknesses for cutting. It was found less than 10% variations in amounts of saw dust for the smallest stones cut (10x10x10) across the range of saw blade thicknesses. Similarly, flaming contributed with less than 10% variation for all stone sizes. Data were normalised per tonne stone product sold from manufacturer. Cut wastages, flaming, administrative consumables, and waste management are averaged accordingly.

LCA: Calculation rules

Functional unit
1 tonne of BeerEcoSten® Porto installed in roads/pavements/parking lots/city squares/driveways/gardens/parks etc.

System boundary:
The system boundary include the whole life cycle of BeerEcoSten ® Porto from Portugal installed, used, and handled after end-of-useful-life in Norway.

Figure 1: System boundary



Data quality:
Data quality: Good quality. Data based on information directly from manufacturer and Beer Sten AS. Transport based on information from distribution actors.
Database data based on Ecoinvent 3.8, where no data are more than 10 years old.
LCA software: SimaPro 9.4.0.2
Year of average data from manufacturer: 2019.

Cut-off criteria:
All major raw materials and all the essential energy flows are included. The production processes for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

Allocation:
The allocation is made in accordance with the provisions of ISO 14025 and the definitions in EN 15804+A1 and NPCR 018 Part B. The manufactured natural stones make up 100% of the revenue for two of the three factories in Portugal. For Portugal 2 the revenue of the co-product stone flour was 1.2%. Mass allocation was used between the three factories according to the weighted production: 16.2% Portugal 1, 80.5% Portugal 2, and 3.3% Portugal 3. The net allocation between the co-product stone flour (from Portugal 2) and the total amount of natural stones provided from Portugal will thus be far less than 1% and is accordingly negligible. However, we here chose to include an economic allocation for the Portugal 2 inventories with 98.8% of the activity to the declared functional unit as the data were readily available.

LCA: Scenarios and additional technical information

The following information describes the scenarios in the different modules of the EPD.

Transport from production place to assembly/user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption		Value (l/t)
Truck	55 %	>32 EURO 4	45	0,022106	l/tkm	1,0
Boat	60 %	10802 DWT container ship	1342	0,0040	l/tkm	5,4
Boat	60 %	13000 DWT container ship	1342	0,0054	l/tkm	7,3
Truck	55 %	>32 EURO 6 B7 fuel	90	0,022106	l/tkm	2,0

Stones are transported from the factories in Portugal to Lexioes harbour (45 km) before being shipped to Fredrikstad with a transhipment in Rotterdam. Sea vessel sizes have been adjusted according to information from EPD owner. Fuel consumption is based on Smith et al. (2014).

Assembly (A4) Intermediate storage

	Unit	Value
Beer Sten AS' sales and storage operation	t	1

Activities at Beer Sten AS are included as storage acitivity during the transport phase A4. Impacts associated with the storage are yearly activities and direct emissions divided by the annual sales of all natural stones.

Assembly (A5)

	Unit	Value
Excavator in operation	min/t	2

Assembly (A5b) Curbe stone installment with concrete

	Unit	Value
Excavator in operation	min/t	2
Concrete B30 (NEPD-2327-1071-NO)	m3/t	0,0007

Use phase (B1-B7)

No activity necessary to achieve the function of the declared unit. Natural stones are products which need no maintenance, washing or other activities to fullfill their intended use throughout their reference service life.

End of Life (C1, C3, C4)

Natural stone products can be reused. No national statistics on the life cycle scenario of natural stones are available, so a conservative approach was selected in accordance with NPCR 018. The end-of-life treatments typical for natural stone products are either direct reuse (80%), i.e., reuse as raw material to new stone produce, or reuse as raw material to gravel/sand production (10%) or as inert landfill (10%).

C1 Demolition

	Unit	Value
Excavator in operation	min/t	10

The demolition phase is assumed to be mainly performed by hand, but with aid of machinery, like an excavator, in the process.

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption		Value (l/t)
Truck	36 %	16-32t EURO 5	50	0,043287	l/tkm	2,2

C3 Waste treatment

	Unit	Value
Rock crushing, for landfill	t	0,1
Rock crushing, as recycling	t	0,1
Sorting for reuse (no activity)	t	0,8

C4

	Unit	Value
Inert waste, landfill	t	0,1

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Natural stone, reused at site or nearby	t	0,8
Crushed stone, recycled to road constructions etc.	t	0,1

Natural stone products can in most cases be reused directly for refurbishment or new installments. Beer Sten describes that about 10% will be landfilled/long time stored (>3 years) as inert gravel, leaving 90% to be reused either as natural stones (80%) or downcycled to gravel (10%). Crushing to gravel is included as the waste management process.

Additional technical information

The stones will maintain the same technical properties as described for the declared functional unit when reused or recycled.

LCA: Results

The results present the environmental and resource impacts, as well as delivered outputs, connected to the declared unit as described in EN 15804+A1

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Environmental impact

Parameter	Unit	A1-A3	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
GWP	kg CO2 -eqv	61,77	3,7E+01	2,2E+00	2,2E+00	0,0E+00	1,1E+01	8,2E+00	5,9E-03	6,7E-01	-9,6E+01
ODP	kg CFC11-eqv	8,3E-06	6,1E-06	3,9E-07	3,9E-07	0,0E+00	2,0E-06	1,5E-06	2,9E-10	2,1E-07	-1,6E-05
POCP	kg C2H4 -eqv	1,3E-02	1,6E-02	3,3E-04	5,3E-04	0,0E+00	1,7E-03	1,1E-03	1,9E-06	1,5E-04	-1,7E-02
AP	kg SO2 -eqv	4,6E-01	4,5E-01	7,6E-03	7,7E-03	0,0E+00	3,8E-02	2,6E-02	2,1E-05	4,9E-03	-6,6E-01
EP	kg PO43--eqv	1,1E-01	6,7E-02	1,7E-03	1,7E-03	0,0E+00	8,4E-03	5,8E-03	9,8E-06	1,1E-03	-1,8E-01
ADPM	kg Sb-eqv	3,2E-04	1,1E-04	2,5E-06	2,5E-06	0,0E+00	1,2E-05	2,9E-05	1,2E-07	9,8E-07	-3,6E-04
ADPE	MJ	831,38	5,3E+02	3,3E+01	3,3E+01	0,0E+00	1,6E+02	1,3E+02	5,6E-02	1,8E+01	-1,3E+03

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources

Resource use

Parameter	Unit	A1-A3	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
RPEE	MJ	120,50	1,4E+01	2,6E-01	2,6E-01	0,0E+00	1,3E+00	1,8E+00	5,6E-01	3,8E-01	-1,3E+03
RPEM	MJ	0,00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
TPE	MJ	120,50	1,4E+01	2,6E-01	2,6E-01	0,0E+00	1,3E+00	1,8E+00	5,6E-01	3,8E-01	-1,3E+03
NRPE	MJ	832,43	5,2E+02	3,2E+01	3,2E+01	0,0E+00	1,6E+02	1,3E+02	9,0E-02	1,7E+01	-2,6E+03
NRPM	MJ	0,00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
TRPE	MJ	832,43	5,2E+02	3,2E+01	3,2E+01	0,0E+00	1,6E+02	1,3E+02	9,0E-02	1,7E+01	-2,6E+03
SM	kg	0,0E+00	0,0E+00	0,0E+00	1,2E-02	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
RSF	kg	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	-1,2E-04
NRSF	kg	0,0E+00	0,0E+00	0,0E+00	4,3E-02	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
W	kg	8,3E+02	5,2E+02	3,2E+01	3,2E+01	0,0E+00	1,6E+02	1,3E+02	9,0E-02	1,7E+01	-2,6E+03

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste

Parameter	Unit	A1-A3	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
HW	kg	2,1E-03	8,7E-04	8,6E-05	8,6E-05	0,0E+00	4,3E-04	3,3E-04	2,5E-07	2,5E-05	-3,3E-03
NHW	kg	2,8E+01	2,9E+01	4,6E-01	4,6E-01	0,0E+00	2,3E+00	7,3E+00	8,2E-03	2,0E+02	-1,8E+01
RW	kg	4,1E-03	3,4E-03	2,1E-04	2,1E-04	0,0E+00	1,1E-03	8,5E-04	6,6E-07	1,2E-04	-2,8E-02

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life - Output flow

Parameter	Unit	A1-A3	A4	A5a	A5b	B1-B7	C1	C2	C3	C4	D
CR	kg	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	8,0E-01	0,0E+00	0,0E+00
MR	kg	7,0E-03	0,0E+00	1,4E-06	1,4E-06	0,0E+00	0,0E+00	0,0E+00	1,0E-01	0,0E+00	0,0E+00
MER	kg	2,2E-02	8,7E-01	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
EEE	MJ	1,7E-02	1,2E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00
ETE	MJ	3,6E-02	2,5E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00	0,0E+00

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Reading example: 9,0 E-03 = 9,0*10-3 = 0,009

Figure 1: Relative impact contribution across all life cycle stages A1-C4

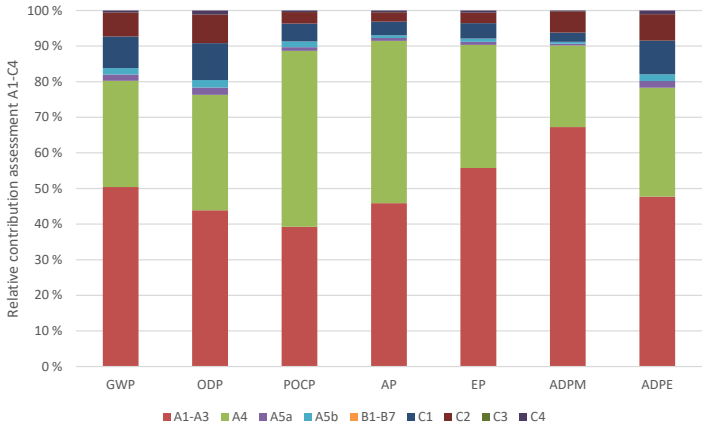
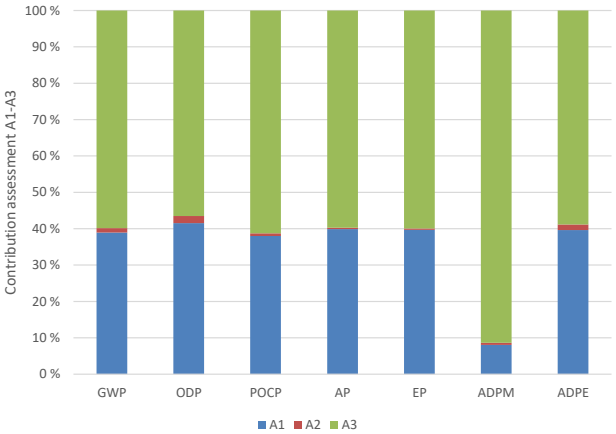


Figure 2: Relative impact contribution during the production phases A1-A3.



The relative contribution assessment shows that the product stages A1-A3 are the major source of impacts across impact categories. Thereafter follows A4 which contains both the distribution and regional storage and operations at Beer Sten AS.

Within the aggregated module A1-A3, A3 Manufacturing is the greatest contributor for all the assessed environmental impacts. A1 Raw material extraction is the second largest contributor, and for every category except ADPM it contributes about 40% of A1-A3 impacts. Transport to manufacturing is negligible.

Additional Norwegian requirements

Greenhous gas emission from the use of electricity in the manufacturing phase
National production mix from import, medium voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing prosess(A3).

Data source	Amount	Unit
Ecoinvent v3.8 Electricity, medium voltage {PT}| market for | Cut-off, U	394	g CO2-eqv/kWh

Dangerous substances

- [x] The product contains no substances given by the REACH Candidate list or the Norwegian priority list
- [ ] The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- [ ] The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- [ ] The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

Name	CAS no.	Amount

Indoor environment
The product meets the requirements for low emissions.
No tests have been carried out on the product concerning indoor climate because the usage is intended for outdoor applications and installation.

Carbon footprint
Calculations connected to climate change and global warming potential (GWP) includes greenhouse gas emissions from fossil sources and land use change connected to extraction of natural stones, but does not include calculations of biogenic emissions of CO_2.

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*
Ecoinvent v.3.8	Swiss Centre of Life Cycle Inventories. www.ecoinvent.ch
EN 1341:2012	*Slabs of natural stone for external paving - Requirements and test methods*
EN 1342:2012	*Cubes and setts of natural stone for external paving - Requirements and test methods*
EN 1343:2012	*Kerbs of natural stone for external paving - Requirements and test methods*
EN 15804:2012+A1:2013 v.1.0	*Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products (24.11.2013).*
ISO 21930:2007	*Sustainability in building construction - Environmental declaration of building products*
NEPD-2327-1071-NO	*NEPD-2327-1071-NO, 1002 B30 M60 22mm*
NPCR Part A v.1.0	*Part A for Construction products and services (07.04.2017).*
NPCR 018 v.1.0	Part B for Crushed Stones and Stone Products (20.05.2020)
Smith et al. 2014	*Third IMO GHG Study 2014; International Maritime Organization (IMO) London, UK, April 2015; Smith, T. W. P.; Jalkanen, J. P.; Anderson, B. A.; Corbett, J. J.; Faber, J.; Hanayama,*
Saxegård 2021	Saxegård, S. A. (2021) EPD BeerEcoSten® LCA report. OR 31.21

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EPD-Norge logo

ENVIRONMENTAL PRODUCT DECLARATION

This EPD is in accordance with ISO 14025 and EN 15804.

Owner of the declaration:	Beer Sten AS
Program operator:	Næringslivets Stiftelse for Miljødeklarasjoner
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-4059-3090-EN -A4 updated 2023
Issue date:	19.12.2022
Valid to:	19.12.2027

BeerEcoSten® Porto - The Star Selection, A4 note transport laps

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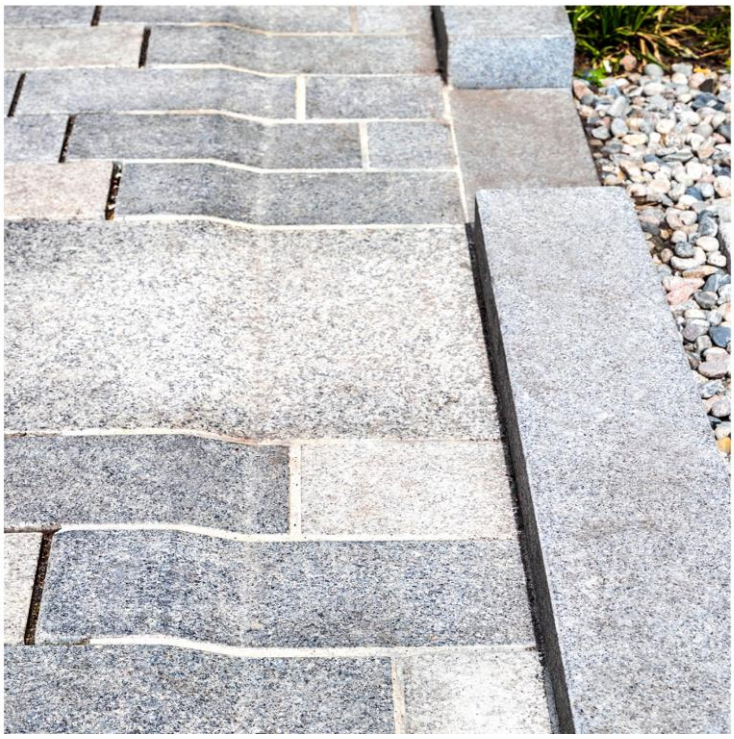


General information

Product

BeerEcoSten® Star White
BeerEcoSten® Star Blue
BeerEcoSten® Roriz

Program holder

Næringslivets Stiftelse for Miljødeklarasjoner
Postboks 5250 Majorstuen, 0303 Oslo
Phone: +47 977 22 020
e-mail: post@epd-norge.no

Declaration number

NEPD-4059-3090-EN - A4 updated 2023

This declaration is based on Product Category Rules:

EN 15804:2012+A1:2013 v.1.0 (24.11.2013).
NPCR Part A v.1.0 for Construction products and services (07.04.2017).
NPCR 018 v.1.0 Part B for natural stone products, aggregates and fillers (20.05.2020).

Statements:

The owner of the declaration shall be liable for the underlying information and evidence.
EPD Norway shall not be liable with respect to manufacturer, life cycle assessment data and evidences.

Declared unit:

1 tonne of BeerEcoSten® transported from manufacturing in Portugal to installation in Oslo.

Declared unit with option:

Functional unit:

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☑ external

Third party verifier:

sign

<Title Name>
(Independent verifier approved by EPD Norway)

Owner of the declaration

EPD owner	Beer Sten AS
Contact person:	Monica Midtun Sander
Phone:	+47 415 52 474
e-mail:	monica@beersten.no
Address:	Habornveien 56 1630 Gamle Fredrikstad

Manufacturer

The average distance from three manufacturers were declared, here named as:
Portugal 1
Portugal 2
Portugal 3
Can be provided upon request.

Place of production:

Portugal

Management system:

Organisation no:

952 440 330

Issue date

19.12.2022

Valid to

19.12.2027

Year of study:

2021

Comparability:

EPD of construction products may not be comparable if they do not comply with EN15804 and are seen in a building context. EPDs from other programs than EPD-Norway may not be comparable.

The EPD has been worked out by:

Simon A. Saxegård

NORSUS

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

Product specification
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

Use and application:
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

Technical data:
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

Market: Norway

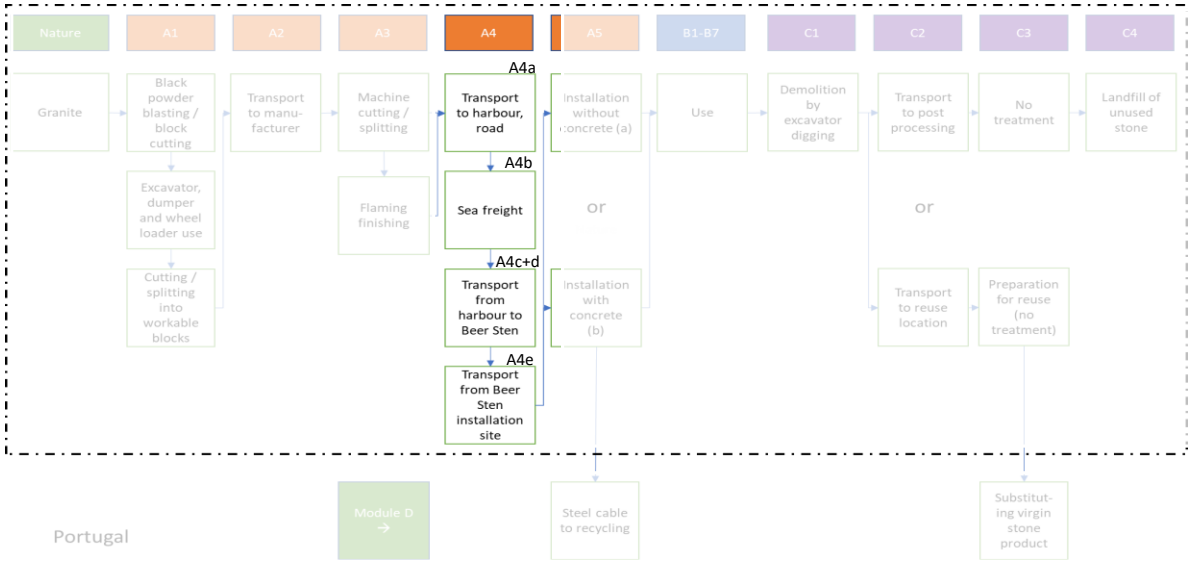
Reference service life:
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

LCA: Calculation rules

Declared Unit
1 tonne of BeerEcoSten® transported from manufacturing in Portugal to installation in Oslo.

System boundary:
The system boundary includes the transport laps Aa (Transport to harbor in Portugal), A4b (sea freight from Portugal to Fredrikstad harbor), A4c Transport form harbor to Central storage in Fredrikstad), A4d (Central storage in Fredrikstad and A4e (Transport from Fredrikstad to installation in Oslo. The shaded areas include the system boundary in the original EPD, NEPD-4059-3090.

Figure 1: System boundary



Data quality:
Data quality: Good quality. Data based on information directly from manufacturer and Beer Sten AS. Transport based on information from distribution actors.
Database data based on Ecoinvent 3.9, where no data are more than 10 years old.
LCA software: SimaPro 9.5.0.0.
Year of average data from manufacturer: 2019.

Cut-off criteria:
All major raw materials and all the essential energy flows are included. The production processes for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

Changes in net A4 results
The total transport A4 = A4a+A4b+A4c+A4d+A4e. The sum environmental impact for the road transports have increased by approximately +11% CO2-eq./tkm due to a change in background data from ecoinvent database from 3.8 to 3.9.

Allocation:
Mass allocation was used between the three factories according to the weighted production: 16.2% Portugal 1, 80.5% Portugal 2, and 3.3% Portugal 3.

LCA: Scenarios and additional technical information

The following information describes the scenarios in the different modules of the EPD.

Transport from production place to assembly/user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption (l/tkm)	Value (l/t)
Truck	55 %	>32 EURO 4	45	0,0221	1,0
Boat	60 %	10802 DWT container ship	1342	0,0040	5,4
Boat	60 %	13000 DWT container ship	1342	0,0054	7,3
Truck	55 %	>32 EURO 6 B7 fuel	90	0,0221	2,0

Stones are transported from the factories in Portugal to Leixões harbor (45 km) before being shipped to Fredrikstad with a transshipment in Rotterdam. Sea vessel sizes have been adjusted according to information from EPD owner. Fuel consumption is based on Smith et al. (2014).

Assembly (A4) Intermediate storage

	Unit	Value
Beer Sten AS' sales and storage operation	t	1

Activities at Beer Sten AS are included as storage activity during the transport phase A4. Impacts associated with the storage are yearly activities and direct emissions divided by the annual sales of all natural stones.

LCA: Results

The results present the environmental and resource impacts, as well as delivered outputs, connected to the declared unit as described in EN 15804+A1

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
			X													

Environmental impact

Parameter	Unit	A4a	A4b	A4c	A4d	A4e	A4
GWP	kg CO_2 -eq.	5,35E+00	2,39E+01	8,18E-02	5,66E-05	1,09E+01	4,03E+01
ODP	kg CFC11-eq.	9,72E-08	3,81E-07	1,54E-09	7,13E-13	2,06E-07	6,85E-07
POCP	kg C_2H_4 -eq.	8,50E-04	1,49E-02	1,39E-05	9,42E-09	1,85E-03	1,76E-02
AP	kg SO_2 -eq.	1,39E-02	4,00E-01	1,78E-04	2,33E-07	2,37E-02	4,38E-01
EP	kg PO_4^{3-}-eq.	3,53E-03	5,58E-02	5,23E-05	7,74E-08	6,98E-03	6,64E-02
ADPM	kg Sb-eq.	1,47E-05	3,86E-05	2,62E-07	2,78E-10	3,50E-05	8,85E-05
ADPE	MJ	8,18E+01	3,01E+02	1,29E+00	6,20E-04	1,72E+02	5,56E+02

GWP Global warming potential; **ODP** Depletion potential of the stratospheric ozone layer; **POCP** Formation potential of tropospheric photochemical oxidants; **AP** Acidification potential of land and water; **EP** Eutrophication potential; **ADPM** Abiotic depletion potential for non fossil resources; **ADPE** Abiotic depletion potential for fossil resources

Resource use

Parameter	Unit	A4a	A4b	A4c	A4d	A4e	A4
RPEE	MJ	1,16E+00	5,01E+00	6,56E-02	1,35E-04	8,74E+00	1,50E+01
RPEM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	1,16E+00	5,01E+00	6,56E-02	1,35E-04	8,74E+00	1,50E+01
NRPE	MJ	7,94E+01	2,94E+02	1,25E+00	6,11E-04	1,67E+02	5,41E+02
NRPM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	7,94E+01	2,94E+02	1,25E+00	6,11E-04	1,67E+02	5,41E+02
SM	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
W	kg	7,94E+01	2,94E+02	1,25E+00	6,11E-04	1,67E+02	5,41E+02

RPEE Renewable primary energy resources used as energy carrier; **RPEM** Renewable primary energy resources used as raw materials; **TPE** Total use of renewable primary energy resources; **NRPE** Non renewable primary energy resources used as energy carrier; **NRPM** Non renewable primary energy resources used as materials; **TRPE** Total use of non renewable primary energy resources; SM Use of secondary materials; **RSF** Use of renewable secondary fuels; **NRSF** Use of non renewable secondary fuels; **W** Use of net fresh water

End of life - Waste

Parameter	Unit	A4a	A4b	A4c	A4d	A4e	A4
HW	kg	4,93E-04	1,40E-03	7,74E-06	4,08E-09	1,03E-03	2,93E-03
NHW	kg	7,65E+00	4,05E+00	1,34E-01	2,12E-01	1,78E+01	2,99E+01
RW	kg	2,42E-05	1,00E-04	3,29E-07	3,27E-10	4,39E-05	1,68E-04

HW Hazardous waste disposed; **NHW** Non hazardous waste disposed; **RW** Radioactive waste disposed

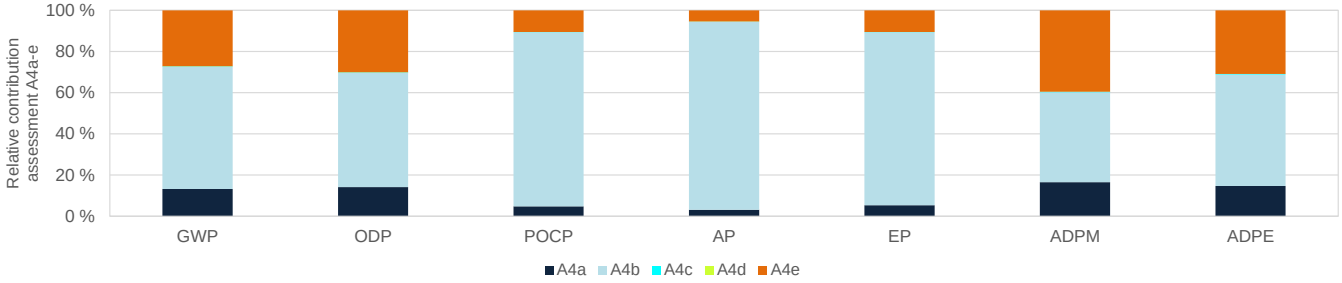
End of life - Output flow

Parameter	Unit	A4a	A4b	A4c	A4d	A4e	A4
CR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	0,00E+00	8,66E-01	0,00E+00	8,66E-01
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	1,20E+00	0,00E+00	1,20E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	2,47E+00	0,00E+00	2,47E+00

CR Components for reuse; **MR** Materials for recycling; **MER** Materials for energy recovery; **EEE** Exported electric energy; **ETE** Exported thermal energy

Reading example: 9.0 E-03 = 9.0*10-3 = 0.009

Figure 1: Relative impact contribution across all transport laps included in the A4 module



The relative contribution assessment shows that the transport lap A4b (sea freight from Portugal to Fredrikstad) is primarily the main contributor to all the included impact categories. The second largest contributor to all included environmental impact categories is A4e (transport from central storage in Fredrikstad to installation in Oslo). The third largest environmentally contributing transport lap in the A4 module is A4a (transport from stone manufacturing to harbor in Portugal). The transport from sea vessel to central storage (A4c) and in the central storage (A4d) in Fredrikstad contribute to negligible environmental burdens.

Additional Norwegian requirements

Greenhous gas emission from the use of electricity in the manufacturing phase
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

Dangerous substances

☑ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

☐ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.

☐ The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.

Name	CAS no.	Amount

Indoor environment
Not relevant information for this A4 note. See the reference EPD NEPD-4059-3090 that this A4 note is valid for.

Carbon footprint
Calculations connected to climate change and global warming potential (GWP) includes greenhouse gas emissions from fossil sources.

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Saxegård 2021 — Saxegård, S. A. (2021) EPD BeerEcoSten® LCA report. OR 31.21

epd-norway Global Program Operator

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