

Environmental product declaration

in accordance with ISO 14025 and EN 15804+A2

Emerald Pearl



The Norwegian EPD Foundation

Owner of the declaration:

Larvik Granite AS

Product:

Emerald Pearl

Declared unit:

1 tonne

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR

NPCR 018:2022 Part B for natural stone products, aggregates and fillers

Program operator:

The Norwegian EPD Foundation

Declaration number:

NEPD-7072-6460-EN

Registration number:

NEPD-7072-6460-EN

Issue date: 05.07.2024

Valid to: 05.07.2029

EPD software:

LCAno EPD generator ID: 646532

General information

Product

Emerald Pearl

Program operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 977 22 020
web: www.epd-norge.no

Declaration number:

NEPD-7072-6460-EN

This declaration is based on Product Category Rules:

CEN Standard EN 15804:2012+A2:2019 serves as core PCR
NPCR 018:2022 Part B for natural stone products, aggregates and fillers

Statement of liability:

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

Declared unit:

1 tonne Emerald Pearl

Declared unit with option:

A1-A3,A4,C1,C2,C3,C4,D

Functional unit:

Not applicable.

General information on verification of EPD from EPD tools:

Independent verification of data, other environmental information and the declaration according to ISO 14025:2010, § 8.1.3 and § 8.1.4. Verification of each EPD is made according to EPD-Norway's guidelines for verification and approval requiring that tools are i) integrated into the company's environmental management system, ii) the procedures for use of the EPD tool are approved by EPD-Norway, and iii) the process is reviewed annually by an independent third party verifier. See Appendix G of EPD-Norway's General Programme Instructions for further information on EPD tools

Verification of EPD tool:

Independent third party verification of the EPD tool, background data and test-EPD in accordance with EPDNorway's procedures and guidelines for verification and approval of EPD tools.

Third party verifier:

Martin Erlandsson, IVL Swedish Res. Inst

(no signature required)

Owner of the declaration:

Larvik Granite AS
Contact person: Stephan Christian Kleive
Phone: +47 33 13 82 00
e-mail: sales@larvik-granite.no

Manufacturer:

Larvik Granite AS
Storgata 128
N-3262 Larvik, Norway

Place of production: Not

Larvik Granite AS production site Skallist (Norway)
Syrristveien 63
3280 Tjodalyng, Norway

Management system:

Organisation no:

NO 930307378

Issue date:

05.07.2024

Valid to:

05.07.2029

Year of study:

2022

Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

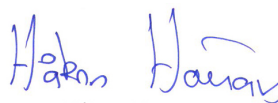
Development and verification of EPD:

The declaration is created using EPD tool lca.tools ver EPD2022.03, developed by LCA.no. The EPD tool is integrated in the company's management system, and has been approved by EPD Norway.

Developer of EPD: Pedro Ferreira

Reviewer of company-specific input data and EPD: Børge Heggen Johansen, Energiråd AS

Approved:



Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

Emerald Pearl is a natural stone produced from an igneous rock of the monzonite (larvikite) type.

Product specification

Natural stone of monzonite (larvikite) is a durable material and is very suitable for facades, monuments, worktops, tiles, crushed stone and environmental stone.

| Materials | Value | Unit |
|-----------|-------|------|
| Stone | 1000 | kg |

Technical data:

Petrographic classification: Magmatic rocks - intrusive rock - Syenite (EN 12670)

| Technical properties | Standard | Value |
|----------------------|----------|--------------------------------|
| Hardness (Mohs) | - | 6 - 7 |
| Apparent density | EN 1936 | 2710 kg/m ³ |
| Porosity | EN 1936 | 0,5 % |
| Flexural strength | EN 12372 | 13,1 ± 1,3 MPa (E- = 10,8 MPa) |
| Compressive strength | EN 1926 | 177 ± 21 MPa (E- = 140 MPa) |
| Wear resistance | EN 14157 | 19,8 ± 1 mm (E+ = 22 mm) |
| Frost resistance | EN 12371 | OK |

Market:

The market for block stone is China, Italy, Spain and India.

Reference service life, product

Depending on the area of use.

Reference service life, building or construction works

Normally, the lifespan of buildings is assumed to be around 60 years.

LCA: Calculation rules

Declared unit:

1 tonne Emerald Pearl

Cut-off criteria:

All major raw materials and all the essential energy is included. The production processes for raw materials and energy flows with very small amounts (less than 1%) are not included. These cut-off criteria do not apply for hazardous materials and substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house is allocated equally among all products through economic allocation. Effects of primary production of recycled materials is allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis. The inputs were economically allocated, with 93% going to Emerald Pearl production.

Data quality:

Specific data for the product composition are provided by the manufacturer. The data represent the production of the declared product and were collected for EPD development in the year of study. Background data is based on EPDs according to EN 15804 and different LCA databases.

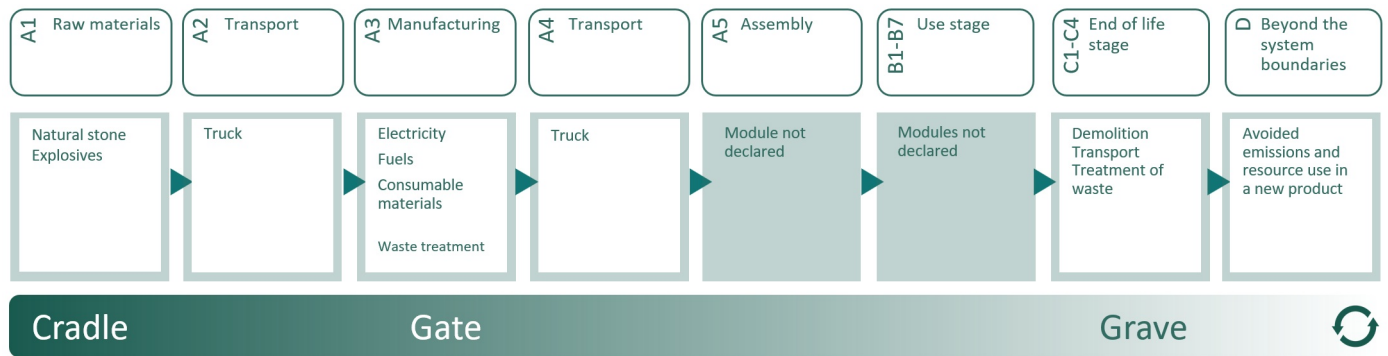
| Materials | Source | Data quality | Year |
|------------|-------------------|--------------|------|
| Explosives | ecoinvent 3.6 | Database | 2019 |
| Explosives | NEPD-5024-3977-EN | EPD | 2022 |
| Explosives | NEPD-5025-3977-EN | EPD | 2021 |
| Stone | LCA.no | Database | 2024 |

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

| Product stage | | | | Construction installation 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 | De-construction 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 | X | X | X | X | X | |

System boundary:

A1 is extraction of natural stone. A2 stands for transport of explosives. A3 and A4 are the actual production process with formatting of rough blocks into stone blocks, depositing of masses, as well as transport to the market. A4 is the transport of rough blocks from the quarry to the nearest port. The raw blocks are exported from the production site by ship to larger factories abroad, which are responsible for the further processing.



Additional technical information:

Not applicable.

LCA: Scenarios and additional technical information














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

Transport of explosives in the A2 from Drammen (96.3 km). The distance in A4 is calculated from the production site to the nearest port in Norway. Modules C and D present average values, based on Norwegian statistics. 50 km in C2 he is used as an industry average.

| Transport from production place to user (A4) | Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) |
|---|---------------------------------------|-------------------------|-------------------------|---------------------|---------------------|
| Truck, 16-32 tonnes, EURO 6 (km) | 36,7 % | 8 | 0,043 | l/tkm | 0,36 |
| De-construction demolition (C1) | | | | | |
| Unit | Value | | | | |
| Demolition of stone materials, C1 (kg) | kg/DU | 1000,000000000 | | | |
| Transport to waste processing (C2) | | | | | |
| Capacity utilisation (incl. return) % | Distance (km) | Fuel/Energy Consumption | Unit | Value (Liter/tonne) | |
| Truck, over 32 tonnes, EURO 6 (km) | 53,3 % | 50 | 0,023 | l/tkm | 1,15 |
| Waste processing (C3) | | | | | |
| Unit | Value | | | | |
| Waste treatment of stone products after demolition (kg) | kg/DU | 700,000000000 | | | |
| Disposal (C4) | | | | | |
| Unit | Value | | | | |
| Waste, stone, for landfill (kg) | kg/DU | 300,000000000 | | | |
| Benefits and loads beyond the system boundaries (D) | | | | | |
| Unit | Value | | | | |
| Substitution of stone materials (kg) | kg/DU | 700,000000000 | | | |

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document.

| Environmental impact | | | | | | | | | |
|--|------------------------|----------|----------|----------|----------|----------|----------|-----------|--|
| Indicator | Unit | A1-A3 | A4 | C1 | C2 | C3 | C4 | D | |
|  GWP-total | kg CO ₂ -eq | 6,72E+01 | 1,37E+00 | 4,00E+00 | 4,36E+00 | 5,04E-01 | 1,29E+00 | -1,64E+00 | |
|  GWP-fossil | kg CO ₂ -eq | 6,71E+01 | 1,37E+00 | 4,00E+00 | 4,35E+00 | 4,97E-01 | 1,28E+00 | -1,60E+00 | |
|  GWP-biogenic | kg CO ₂ -eq | 5,71E-02 | 5,68E-04 | 7,50E-04 | 1,87E-03 | 4,29E-03 | 1,09E-03 | -3,20E-02 | |
|  GWP-luluc | kg CO ₂ -eq | 8,96E-03 | 4,88E-04 | 3,15E-04 | 1,33E-03 | 6,88E-04 | 2,52E-04 | -1,08E-03 | |
|  ODP | kg CFC11 -eq | 1,37E-05 | 3,11E-07 | 8,64E-07 | 1,05E-06 | 9,80E-08 | 6,26E-07 | -2,92E-07 | |
|  AP | mol H ⁺ -eq | 1,19E+00 | 3,94E-03 | 4,19E-02 | 1,40E-02 | 4,02E-03 | 1,25E-02 | -1,44E-02 | |
|  EP-FreshWater | kg P -eq | 3,48E-04 | 1,10E-05 | 1,46E-05 | 3,47E-05 | 3,14E-05 | 9,59E-06 | -4,26E-05 | |
|  EP-Marine | kg N -eq | 4,55E-01 | 7,80E-04 | 1,85E-02 | 3,07E-03 | 1,18E-03 | 4,70E-03 | -5,00E-03 | |
|  EP-Terrestrial | mol N -eq | 5,89E+00 | 8,73E-03 | 2,00E-01 | 3,42E-02 | 1,36E-02 | 5,18E-02 | -5,88E-02 | |
|  POCP | kg NMVOC -eq | 1,36E+00 | 3,34E-03 | 5,57E-02 | 1,34E-02 | 3,64E-03 | 1,48E-02 | -1,55E-02 | |
|  ADP-minerals&metals ¹ | kg Sb-eq | 1,83E-04 | 3,79E-05 | 6,14E-06 | 7,76E-05 | 6,31E-06 | 1,14E-05 | -1,42E-04 | |
|  ADP-fossil ¹ | MJ | 9,09E+02 | 2,07E+01 | 5,51E+01 | 7,07E+01 | 1,54E+01 | 4,15E+01 | -2,71E+01 | |
|  WDP ¹ | m ³ | 1,22E+03 | 2,01E+01 | 1,17E+01 | 5,42E+01 | 1,70E+03 | 8,73E+01 | -1,27E+03 | |

GWP-total = Global Warming Potential total; GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

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







*INA Indicator Not Assessed

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

Remarks to environmental impacts

Not applicable.

Additional environmental impact indicators











| Indicator | Unit | A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
|---|-------------------|----------|----------|----------|----------|----------|----------|-----------|
|  PM | Disease incidence | 2,07E-05 | 8,40E-08 | 5,07E-06 | 4,00E-07 | 6,44E-08 | 2,67E-07 | -3,07E-07 |
|  IRP ² | kgBq U235 -eq | 3,77E+00 | 9,07E-02 | 2,40E-01 | 3,09E-01 | 2,59E-01 | 1,80E-01 | -2,49E-01 |
|  ETP-fw ¹ | CTUe | 3,46E+04 | 1,54E+01 | 3,01E+01 | 5,17E+01 | 1,09E+01 | 2,05E+01 | -2,79E+01 |
|  HTP-c ¹ | CTUh | 2,53E-08 | 0,00E+00 | 1,00E-09 | 0,00E+00 | 7,00E-10 | 6,00E-10 | -1,40E-09 |
|  HTP-nc ¹ | CTUh | 5,84E-07 | 1,68E-08 | 2,80E-08 | 5,00E-08 | 9,80E-09 | 1,20E-08 | -3,43E-08 |
|  SQP ¹ | dimensionless | 1,17E+02 | 1,45E+01 | 6,69E+00 | 8,11E+01 | 8,73E+00 | 1,51E+02 | 6,15E+01 |

PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Potential Soil Quality Index (dimensionless)

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

*INA Indicator Not Assessed




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

| Resource use | | | | | | | | | |
|---|----------------|----------|----------|----------|----------|----------|----------|-----------|--|
| Indicator | Unit | A1-A3 | A4 | C1 | C2 | C3 | C4 | D | |
|  PERE | MJ | 8,21E+01 | 2,97E-01 | 3,00E-01 | 8,90E-01 | 7,95E+00 | 6,38E-01 | -6,35E+00 | |
|  PERM | MJ | 9,85E-02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |
|  PERT | MJ | 8,22E+01 | 2,97E-01 | 3,00E-01 | 8,90E-01 | 7,95E+00 | 6,38E-01 | -6,35E+00 | |
|  PENRE | MJ | 9,07E+02 | 2,07E+01 | 5,51E+01 | 7,07E+01 | 1,54E+01 | 4,15E+01 | -2,86E+01 | |
|  PENRM | MJ | 1,38E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |
|  PENRT | MJ | 9,09E+02 | 2,07E+01 | 5,51E+01 | 7,07E+01 | 1,54E+01 | 4,15E+01 | -2,86E+01 | |
|  SM | kg | 8,40E-03 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | |
|  RSF | MJ | 2,02E-01 | 1,06E-02 | 0,00E+00 | 3,11E-02 | 0,00E+00 | 1,32E-02 | -1,30E-01 | |
|  NRSF | MJ | 1,79E+00 | 3,80E-02 | 0,00E+00 | 1,04E-01 | 0,00E+00 | 3,79E-02 | -1,33E-01 | |
|  FW | m ³ | 9,69E+00 | 2,22E-03 | 2,83E-03 | 8,05E-03 | 2,64E-02 | 4,94E-02 | -9,96E-01 | |

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = 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; FW = Net use of fresh water

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






*INA Indicator Not Assessed

| End of life - Waste | | | | | | | | | |
|---|------|-------|----------|----------|----------|----------|----------|----------|-----------|
| Indicator | Unit | A1-A3 | A4 | C1 | C2 | C3 | C4 | D | |
|  | HWD | kg | 1,09E-01 | 1,07E-03 | 1,62E-03 | 3,87E-03 | 1,54E-03 | 0,00E+00 | -6,54E-03 |
|  | NHWD | kg | 1,91E+00 | 1,01E+00 | 6,52E-02 | 6,15E+00 | 4,87E-02 | 3,00E+02 | -1,98E-01 |
|  | RWD | kg | 6,08E-03 | 1,41E-04 | 3,82E-04 | 4,83E-04 | 1,63E-04 | 0,00E+00 | -2,15E-04 |

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

*Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3} = 0,009$

*INA Indicator Not Assessed

| End of life - Output flow | | | | | | | | | |
|---|------|-------|----------|----------|----------|----------|----------|----------|----------|
| Indicator | Unit | A1-A3 | A4 | C1 | C2 | C3 | C4 | D | |
|  | CRU | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
|  | MFR | kg | 1,95E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 7,00E+02 | 0,00E+00 | 0,00E+00 |
|  | MER | kg | 4,24E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
|  | EEE | MJ | 2,62E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
|  | EET | MJ | 3,97E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy electrical; EET = Exported energy thermal

*Reading example: 9,0 E-03 = $9,0 \cdot 10^{-3} = 0,009$

*INA Indicator Not Assessed

| Biogenic Carbon Content | | |
|---|------|---------------------|
| Indicator | Unit | At the factory gate |
| Biogenic carbon content in product | kg C | 0,00E+00 |
| Biogenic carbon content in accompanying packaging | kg C | 0,00E+00 |

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO₂

Additional requirements

Greenhouse gas emissions from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3).

| Electricity mix | Source | Amount | Unit |
|---------------------------|---------------|--------|--------------|
| Electricity, Norway (kWh) | ecoinvent 3.6 | 24,33 | g CO2-eq/kWh |

Dangerous substances

The product contains no substances given by the REACH Candidate list.

Indoor environment

Not applicable.






Additional Environmental Information

| Additional environmental impact indicators required in NPCR Part A for construction products | | | | | | | | |
|--|------------------------|----------|----------|----------|----------|----------|----------|-----------|
| Indicator | Unit | A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
| GWPIOBC | kg CO ₂ -eq | 6,71E+01 | 1,37E+00 | 4,00E+00 | 4,36E+00 | 4,98E-01 | 1,29E+00 | -1,71E+00 |

GWPIOBC: Global warming potential calculated according to the principle of instantaneous oxidation. In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

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+A2:2019 Environmental product declaration - Core rules for the product category of construction products.
 ISO 21930:2007 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products.
 ecoinvent v3, Allocation, cut-off by classification, Swiss Centre of Life Cycle Inventories.
 Iversen et al., (2021) eEPD v2021.09 Background information for EPD generator tool system verification, LCA.no Report number: 07.21
 Vold, M., and Iversen, O. M. K. (2022) EPD generator for for NPCR 018 Part B for natural stone products, aggregates and fillers
 Background information for EPD generator application and LCA data, LCA.no report number: 09.22.
 NPCR Part A: Construction products and services. Ver. 2.0, 24.03.2021 EPD Norway.
 NPCR 018 Part B for natural stone products, aggregates and fillers, Ver. 1.1, 20.01.2022, EPD Norway.

| | | |
|---|--|---|
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