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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Minera Skifer AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
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Natural stone quartzite schist, natural cleft surface, with broken or sawn edges, Oppdal

Minera Skifer AS
www.epd-norge.no

General information

Product:
Natural stone quartzite schist, natural cleft surface, with broken or sawn edges, Oppdal

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Declaration number:
NEPD-2907-1588-EN

Place of production:
Engan, Oppdal, Norge

ECO Platform reference number:

Management system:
No

This declaration is based on Product Category Rules:
EN 15804:2012+A1:2013 og NPCR PART A: Construction Products and Services, 07.04.2017.
NPCR 018:2020. Part B for natural stone products, aggregates and fillers

Organisation no:
NO 980 253 708 MVA

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 or evidence.

Issue date:
02.07.2021

Issue date:
02.07.2026

Declared unit:
Production of 1 ton of natural stone quartzite schist, natural cleft surface, with broken or sawn edges, from Oppdal

Year of study:
Consumption data: 2019. Study preformed fall 2020/spring 2021.

Declared unit with option:

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

Functional unit:
Production of 1 ton natural stone of quartzite schist, natural cleft surface, with broken or sawn edges, from Oppdal, manufactured, delivered, installed, used for 60 years and disposed after end of service time.

The EPD has been worked out by:
Oddbjørn Dahlstrøm Andvik
Asplan Viak AS

Verification:
The CEN Norm EN 15804 serves as the core PCR.
Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☑ external

Third party verifier:

sign

(Independent verifier approved by EPD Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:

The 750 million year old Oppdal quartzite has several shades of grey and a varying surface structure. It is very easy to shape and can be easily scored and then snapped/cut to obtain an almost right-angled rustic edge. Oppdal quartzite has a high content of quartz and feldspar.

Natural cleft surface: Pavement block, massive slabs, wall cladding, flooring tiles, brick, slabs, fireplace mantels, stone furniture, window sills, roofing and steps.

Product specification:

Products with natural cleft surface, broken or sawn edges includes all products mentioned above.

Surface: Natural cleft surface

Broken edge: A scoring nail is used to make the score line. Thereafter the slab is broken by using hand tools. The edge is not as smooth as a sawn edge, but still quite precise.

Sawn edge: Sawn edges are completely straight, right-angled and precise. The color of the sawn edges becomes slightly lighter than the surface of the natural cleft schist.

Technical data:

Standard thickness, even thickness	30 mm
1 ton schist with even thickness	12,3 m^2

Petrography:	NS-EN 12407	Quartzite schist
Density:	NS-EN 1936	2,7 tonn/m^3
Water absorption	NS-EN 13755	0,2 weight-%
Flexural strength	NS-EN 12372	35,1 Mpa
Compressive strength	NS-EN 1926	247,5 Mpa
Slip resistance, SRV dry	NS-EN 14231	Antique 60 / Silk 71
Slip resistance, SRV wet	NS-EN 14231	Antique 30 / Silk 49
Dowel holes, breaking load	NS-EN 13364	1,92 kN
Frost resistance	NS-EN 12371	Yes

Materials	%
Natural stone, 1000 kg	100 %
Quartz	*35-45%*
Glimmer	*15-33%*
Feldspar	*20-25%*
Epidote	*2-8%*
Titanite	*2 %*
Fe-oxides	*1-2%*
Packaging: plastic film	0,01 kg
Packaging: Plastic strips	0,19 kg
Packaging: Plastic angle	0,04 kg

For Declaration of Performance (DoP) and complementary information, see www.mineraskifer.no

Market:

Main market is in Norway and the Nordic countries. Products are also exported to Europe and other continents.

Reference service life, product:

Reference service life is same as for buildings and normally set to 60 years. Natural stones of schist has almost unlimited life time.

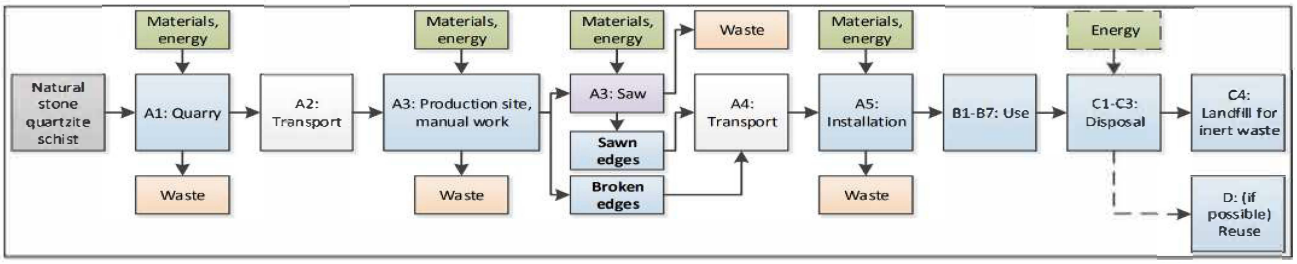
LCA: Calculation rules

Functional unit:

Production of 1 ton natural stone of quartzite schist, natural cleft surface, with broken or sawn edges, from Oppdal, manufactured, delivered, installed, used for 60 years and disposed after end of service time.

System boundary:

Flow sheet for manufacturing of natural stone of quartzite schist is shown below. Scenario A4–C4 are similar for all products, regardless if the edges are broken or sawn.



Datakvalitet:

Data for (A1-A3) is based on specific consumption data for Minera Skifer Oppdal 2019. Emissions from production and detonation of explosives are derived from safety data sheets for the relevant explosive types. Generic data is from Ecoinvent v3.5, Allocation, Recycled Content (November 2018) and SimaPro v 9.1.1.1. Characterization factors from EN15804: 2012 + A1: 2013. No data is older than 5 years.

Cut-off criteria:

All major raw materials and all the essential energy is included. The production process 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 or substances.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house (A3) is allocated equally among all products through mass allocation. Economic allocation is used upstream (A1 and A2) because machine blocks from the quarry are not subject for further processing. Price for machine blocks are significant lower compared with processed schist products (>25% difference).

Difference in material consumption, energy and waste production in the production of different products (floor tiles, slabs, roofing etc.) are considered to be marginal, as production processes are nearly the same.

LCA: Scenarios and additional technical information

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

Reference service life
Reference service life is same as for buildings and normally set to 60 years. Natural stones of schists has almost unlimited life time and is therefore normally not being replaced during service life.
Schist fixed with screws or nails on a façade or on a roof can be reused. Bricks installed dry (without mortar) can be changed, rebuilt and reused. Schist installed with mortar can be reused after removal of mortar. Schist installed with adhesives on floors and walls can to a minor extent be reused and must be deposed on landfill intended for inert deposal.

Transport from production place to user (A4)
All production is normally delivered directly from Oppdal to building site. As scenario a distance of 400 km delivered by lorry (>32 t) is calculated. This is corresponding to the distance from Oppdal to Oslo.

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	
Lorry, 50 ton	53 %	Lorry, >32t, EURO5	400	0,017 l/tkm	6,73 l/t

Installation in the building (A5)
Products of schists can be installed in various ways, from no installation on base of gravel (paving), installation with cement based adhesives (floor tiles, crazy paving and wall cladding), installation with mortar (chimney caps, and bricks) and installation as roofing with nails or screws).
In this scenario it is calculated with installation with cement based adhesives (similar as for installation of ceramic tiles).
It is assumed 10% spillage at installation.
Waste treatment of the packaging is included in the A5.

Thickness: 30 mm	Unit	Value
Auxiliary, mortar	kg	61,7
Water consumption	m3	0,012
Electricity consumption	kWh	0,386
Other energy carriers	MJ	0
Material loss	kg	0
Output materials from waste treatment	kg	100
Dust in the air	kg	0

Assume 5 kg cement mortar + 1,0 litre of water pr. m² installed schist. 20 kg of mortar mixed with an electric mixer with effect 1,5 kW for 5 min.

Use (B1 – B7)
Schists are in many cases characterized as maintenance free. Schist as roofing, crazy paving in the garden and paving on sidewalks are not being maintained. Schists installed inside are also often considered as maintenance free. Schists installed in a kitchen and a bathroom are normally impregnated with a chemical designed for this purpose. Since there are many manufacturers, products and types for surface treatment, and also the fact that some schists are not treated, impregnation of schists is not included in this scenario. This must be added where such products are considered used. All modules in the use stage (B1 – B7) are analysed, and apart from eventual application of impregnation or other types of surface treatment the schist requires no maintenance, repair or replacement during use stage. Therefore there is no effect on the environment during use stage.

End of Life (C1, C3, C4)
Installed schists are demolished in different ways, depending of type of installation. In this scenario it is assumed installation with cement based adhesive and therefore it must be demolished by chisel. Assume electric chisel hammer with effect 2 kW, using 1 min. per 1 m2 surface. The removed schist is transported 50 km to a landfill for inert disposal or used as landfill for different purpose.

	Unit	Value
Electricity consumption	kWh	0,412
Hazardous waste disposed	kg	0
Collected as mixed construction waste	kg	0
Reuse	kg	0
Recycling	kg	0
Energy recovery	kg	0
To landfill	kg	1000

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	
Lorry	Average in Europe	Lorry >16t, average	50	0,045 l/tkm	2,25 l/t

Beyond the system boundaries (D)
Scenario is schist disposed in landfill for inert waste. Module D is not relevant.

Additional technical information
Alternation of results from per ton to per m² can be done by multiplying results with thickness in meters and density 2,7 ton/m3.
Example:

Standard thickness 30 mm: 86,0 kg CO_2 e/ton * 0,030 m * 2,7 tonn/m^3 = 7,0 kg CO_2 e/m^2 schist.

LCA: Results

A1 – A3 and A5 is divided between broken or sawn edges for products with natural cleft surface.
Scenario A4 – C4 is similar for all natural cleft surfaces, independent if edges are broken or sawn, 30 cm thickness.

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	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	x	x	x	x	x	x	x	x	x	x	x	x	MID

Environmental impact

Parameter	Unit	A1-A3 Broken	A1-A3 Sawn	A4	A5 Broken	A5 Sawn	B1-B7	C1	C2	C3	C4
GWP	kg CO_2-ekv	8,60E+01	1,09E+02	2,74E+01	2,46E+01	2,69E+01	0	1,31E-02	8,21E+00	0	2,65E+00
ODP	kg CFC11-ekv	1,38E-05	1,61E-05	5,75E-06	2,66E-06	2,89E-06	0	1,22E-09	1,52E-06	0	4,53E-07
POCP	kg C_2H_4-ekv	1,87E-02	2,82E-02	5,06E-03	4,31E-03	5,26E-03	0	2,70E-06	1,35E-03	0	8,71E-04
AP	kg SO_2-ekv	5,07E-01	6,24E-01	1,05E-01	1,00E-01	1,12E-01	0	5,88E-05	2,65E-02	0	1,97E-02
EP	kg PO_4^{3-}-ekv	1,42E-01	2,15E-01	2,50E-02	2,88E-02	3,61E-02	0	3,67E-05	6,21E-03	0	4,62E-03
ADPM	kg Sb-ekv	2,57E-04	4,97E-04	7,78E-05	4,39E-05	6,79E-05	0	2,04E-07	2,47E-05	0	8,61E-07
ADPE	MJ	1,17E+03	1,50E+03	4,61E+02	2,49E+02	2,82E+02	0	1,55E-01	1,26E+02	0	3,79E+01

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 Broken	A1-A3 Sawn	A4	A5 Broken	A5 Sawn	B1-B7	C1	C2	C3	C4
RPEE	MJ	1,98E+02	5,89E+02	9,07E+00	3,98E+01	7,89E+01	0	1,67E+00	1,33E+00	0	3,00E-01
RPEM	MJ	8,83E+00	9,58E+00	0	8,83E-01	9,58E-01	0	0	0	0	0
TPE	MJ	2,07E+02	5,99E+02	9,07E+00	4,07E+01	7,99E+01	0	1,67E+00	1,33E+00	0	3,00E-01
NRPE	MJ	1,18E+03	1,48E+03	4,77E+02	2,58E+02	2,88E+02	0	2,23E-01	1,27E+02	0	3,78E+01
NRPM	MJ	1,10E+01	1,19E+01	0	1,10E+00	1,19E+00	0	0	0	0	0
TRPE	MJ	1,19E+03	1,49E+03	4,77E+02	2,59E+02	2,89E+02	0	2,23E-01	1,27E+02	0	3,78E+01
SM	kg	1,48E-01	6,63E-01	0	1,48E-02	6,63E-02	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
W	m^3	1,53E+00	4,45E+00	1,20E-04	1,53E-01	4,45E-01	0	1,25E-05	2,30E-05	0	5,18E-06

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 Broken	A1-A3 Sawn	A4	A5 Broken	A5 Sawn	B1-B7	C1	C2	C3	C4
HW	kg	7,31E-04	1,67E-03	2,77E-04	2,02E-04	2,96E-04	0	2,88E-07	7,99E-05	0	1,66E-05
NHW	kg	1,68E+04	1,83E+04	5,77E+01	1,78E+03	1,94E+03	0	1,01E-02	5,97E+00	0	1,00E+03
RW	kg	7,78E-03	9,17E-03	3,35E-03	1,71E-03	1,85E-03	0	1,64E-06	8,56E-04	0	2,54E-04

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

End of life - Output flow

Parameter	Unit	A1-A3 Broken	A1-A3 Sawn	A4	A5 Broken	A5 Sawn	B1-B7	C1	C2	C3	C4
CR	kg	0	0	0	0	0	0	0	0	0	0
MR	kg	3,53E-01	1,58E+00	0	3,53E-02	1,58E-01	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	9,64E-01	1,05E+00	0	9,64E-02	1,05E-01	0	0	0	0	0
ETE	MJ	9,41E+00	1,02E+01	0	9,41E-01	1,02E+00	0	0	0	0	0

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

INA = Indicator not assessed

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

Additional Norwegian requirements

Greenhous gas emission from the use of electricity in the manufacturing phase
National production mix with import, on low voltage (included production of transmission lines, in addition to direct emissions and losses in grid) is applied for electricity in the manufacturing process.

Data source	Amount	Unit
Ecoinvent v3.5 (nov 2018). Electricity, low voltage {NO}| market for | Cut-off, U	0,0317	kg CO_2-ekv/kWh

Dangerous substances

- ☑ 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

Transport
Transport from production site to a construction site according to scenario A4: 400 km

Type	Capacity utilisation (incl. retum) %	Type of vehicle	Distance km	Fuel/Energy consumption	
Lorry, 50 ton	53 %	Lorry, >32t, EURO5	400	0,017 l/tkm	6,73 l/t

Indoor environment
Concentration of radium in a schistosious stone is in the range of 10 - 120 Bq/kg. There is nothing in the mineral content in the schist from Oppdal that should imply a high potential of radon.

Use of schist indoor (flooring, wall cladding, fire places etc.) should normally not imply increased radon concentrations exceeding the background level. This is related to the volume of schist compared to other building materials (gravel, sand) used in the building ground. It should also imply that the contribution of radon from the schist normally will have a small or no impact on the level of radon in a house. Geological survey of Norway, NGU 06.12.04.

Carbon footprint
Carbon footprint has not been worked out for the product.

Bibliography

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