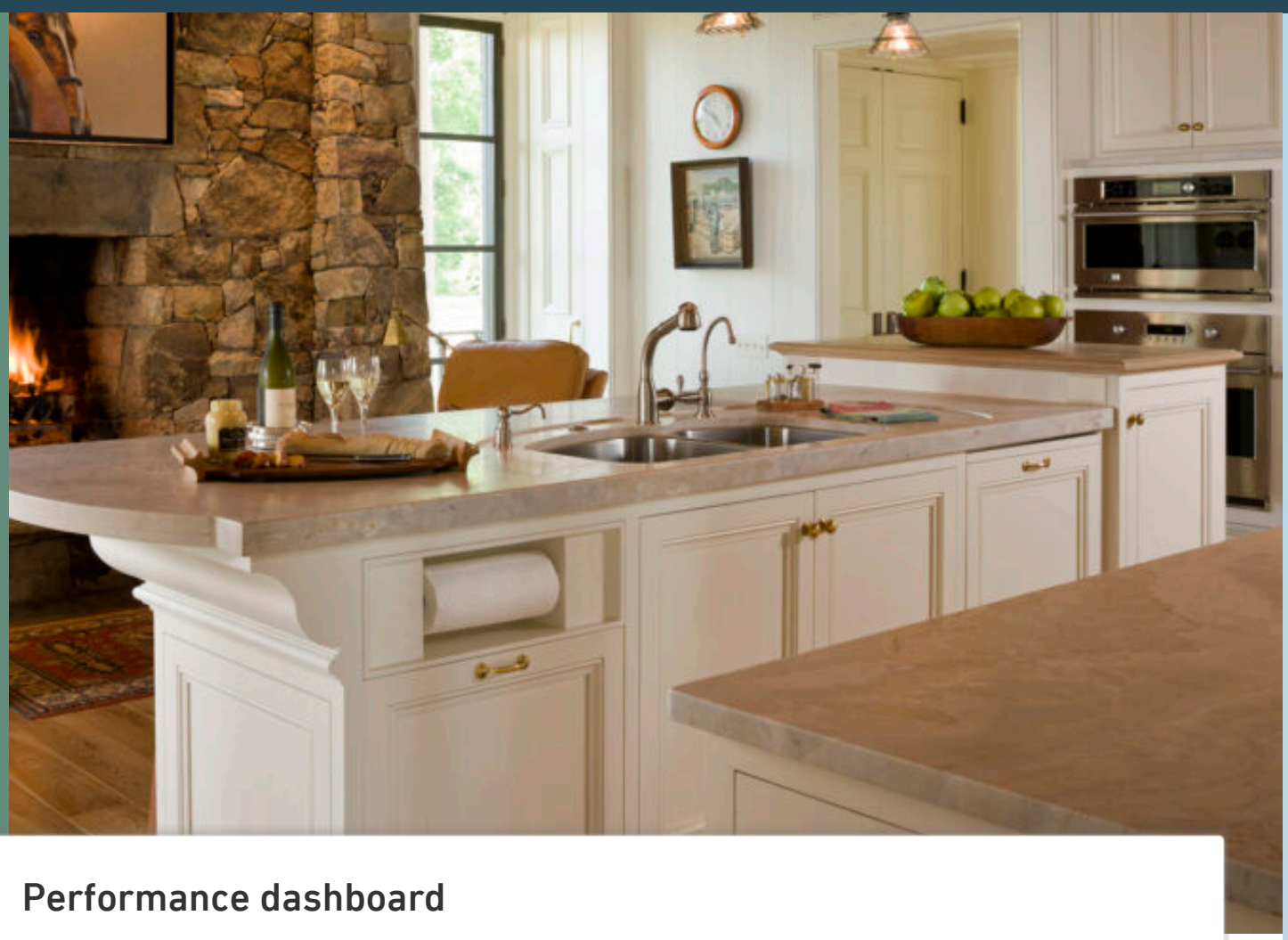
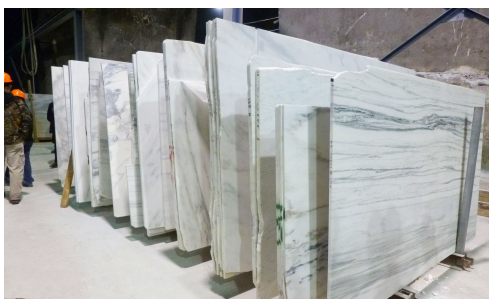
NATURAL STONE INSTITUTE

Industry-wide Type III EPD

Natural Stone Countertops

Natural stone is an easy solution to many green building goals. It is nearly complete as a building material in its natural state as mother nature does most of the manufacturing. It is a single-ingredient natural material that emits no VOCs. Its durability allows stone to perform impeccably in commercial & residential applications, interior or exterior.





Participating manufacturers

Coldspring
Continental Cut Stone
Colorado Stone Quarries
Cutting Edge Countertops
Delgado Stone Distributors
Freshwater Stone
Independent Limestone Company
Ontra Stone Concepts
Planet Granite
Polycor
Quality Stone
Royal Bedrock
Russel Stone
Stone Interiors
Stony Creek Quarry
Valley View Granite
Vermont Quarries
Vetter Stone

Performance dashboard

Features & functionality

Typical thickness for countertops is 1 ¼” or 7/8”

Materials are available in lengths up to ±8 feet, some available in lengths of ~10 feet

At final stage of fabrication, slabs are transformed into custom sizes considering joinery, spans and cantilevers, sink mounts, edge profiles, and backsplashes

Surface finishes include polished, honed, and brushed/antique/leather

Countertop installation include sealers and adhesives

Stone types include granite, limestone, marble, quartzite, sandstone, serpentine, slate, soapstone, and travertine

Visit NSI for more product information

Environment & materials

Emits no VOCs, and poses no health hazards

Quarries and processing facilities are located across N. America, making shipping distances never too far

Can be refinished and recycled with endless opportunities for reuse after initial service life

Scrap stone used as fill on premises, kept onsite for reclamation, or crushed as aggregates used in construction

Select natural stone products have qualified for one or more of the following certifications, rating systems, and disclosures:

Sustainable Stone Certified

Dimension Stone Design Manual

Health Product Declaration (HPD)

MasterFormat® 12 36 40

For specification information, refer to:

Dimension Stone Design Manual

Natural Stone Sustainability Standard

For spec help, contact us or call 440.250.9222

See LCA, interpretation & rating systems

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
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SUMMARY

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NSF PCR for Residential Countertops

Regions; system boundaries
North America; Cradle to grave

Functional unit / reference service life:
1 m^2 of countertops; 10 years

LCIA methodology: TRACI 2.1

LCA software; LCI database
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Public LCA:
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LCA results & interpretation

Natural Stone Countertops

Life cycle assessment

Scope and summary

○ Cradle to gate ○ Cradle to gate with options ✓ Cradle to grave

Product description

Countertops refer to a raised, flat, and horizontal surface, built for work mainly in kitchens, bathrooms, and workrooms. This surface is mostly supported by cabinets and is positioned at a suitable height for the user to comfortably carry out their tasks. Countertops can be constructed of different materials with different attributes of functionality, durability, and aesthetics. Natural stone makes up 100% of the total mass of natural stone countertops and the different stone types included in this study are granite, marble, quartzite, limestone, sandstone, and soapstone.

Functional unit

The functional unit is one square meter of natural stone countertops for a service life of 10 years in residential use, inclusive of front edge and backsplash. The natural stone countertop product system is an industry-average product, i.e., the product profile represents the weighted average of NSI's natural stone countertops based on NSI's industry-average quarrying for all stone types and also includes industry-average production of countertops of all stone types. The product system in this study also includes the ancillary materials used in the installation of the product. NSI members produce only the natural stone component, while the installer purchases the ancillary materials separately.

Functional mass - 92.23 kg per m^2
Thickness - 28.58 mm (industry-weighted average)

Manufacturing data

The data for all stone products were collected from NSI members covering a period of two years, from January 2019 to December 2020. Data for quarry operations were collected from twelve NSI quarry members covering 36 quarries across North America. The participant quarries in this study are Coldspring, Delgado Stone Distributors, Freshwater Stone, Independent Limestone Company, Polycor, Quality Stone Corporation, Royal Bedrock Inc., Russell Stone Products, Stony Creek Quarry, Vermont Quarries Corporation, and Vetter Stone Company.

After the stone is extracted from the quarry, it goes to a processing facility. Stone processor operations data were collected from six NSI member processors covering 17 facilities across North America. The participant processors in this study are Delgado Stone Distributors, Polycor, Russell Stone Products, Vetter Stone Company, and Continental Cut Stone.

Countertops require additional manufacturing operations at fabricators. Fabricator operations data were collected from six NSI member fabricators in the US, each with a single facility. The participant fabricators in this study are Cutting Edge Countertops, Freshwater Stone, Omega Concepts, Planet Granite, Stone Interiors, and Valley View Granite. NSI resources and other literature data were used to develop estimates or assumptions for other upstream or downstream activities where necessary.

Industry-wide results calculation methodology

Based on the data provided by the participating natural stone countertop fabricators, granite represented 93.56% of natural stone countertops in the market. Marble countertops covered 3.69% of the market share, while the rest (2.75%) was from other natural stones (including quartzite and soapstone).

For quarry data, an average inventory per kg of stone quarried for each stone category (granite, limestone, marble, and other natural stone) was developed, and later a weighted inventory per kg of stone quarried was generated using the quarry production share of each stone type among the participant quarries. After that, the inventory per kg of stone quarried specific to stone countertops was developed using the market distribution of natural stone countertops by stone type, as collected from participant stone processing facilities (93.56% granite, 3.69% marble, and 2.75% other natural stone).

Similarly, the inventory for one square meter of processed stone countertops was developed. An average inventory per square meter of stone processed for each stone category (granite, limestone, marble, and other natural stone) was developed, and later a weighted inventory per square meter of stone processed was generated using the production share of each stone type, using the stone processing share of each stone type among the participant processors. After that, the inventory per square meter of stone processing specific to countertops was developed using the market distribution of natural stone countertops (93.56% granite, 3.69% marble, and 2.75% other natural stone). Processing countertops uses more energy than processing other products, so to reflect this, the inventory for countertop stone processing was scaled up by 10%.

In the case of countertop fabricators, inputs and outputs were normalized using total production area to develop the inventory for a square meter of countertop fabrication.

Material composition greater than 1% by weight

FLOW	MASS PERCENTAGE
Natural stone	100%

Total impacts by life cycle stage [mPts per functional unit]

LIFE CYCLE STAGE	MPTS/FUNC. UNIT
Quarry operations and transport	1.38E+00
Construction	4.38E+00
Stone transport to building sites	1.91E-01
Installation	6.24E-01
Maintenance	2.08E-01
Waste transport	1.70E-02
End of life disposal	3.84E-03

What's causing the greatest impacts

All life cycle stages

For natural stone countertops, the cradle-to-gate stage (A1-A3) dominates the results for all impact categories. This is mainly due to energy consumption in the quarrying and construction stages. The manufacturing stage (A3) is the highest contributor to all impact categories, followed by quarry operations (A1) in all impact categories but ozone depletion. In total, the stages in A1-A3 contribute about 65% of the total impacts in all impact categories. The transportation of stone between the facilities (A2) and final shipment to the installation sites (A4) also makes a significant impact.

The overall results are consistent with expectations for stone countertop products' life cycles, as these products are not associated with energy consumption during their use stage.

Quarry operations and transport to processors

Impacts generated at quarries (A1) are mainly due to the use of grid electricity and fuels in the quarries. Other material inputs generate little impact in comparison to the electricity and fuel consumed. Transporting the stone from quarries to processing plants also generates significant impacts in numerous impact categories.

Construction and transport to building sites

Manufacturing operations at processing facilities and fabricator sites make up the greatest share of total life cycle impacts in all impact categories. Energy consumed at the construction sites, including both processors and fabricators, is responsible for the majority of impacts, while other material inputs have little contribution. Transporting countertops from fabricators includes not only the shipment of countertops to the building sites, but also the initial visit for site measurements, which also makes significant contributions to overall impacts.

Other life cycle stages

Use of ancillary materials, including adhesives and various sealants during installation, also generates significant impacts in the overall life cycle of stone countertops. Under normal operating conditions, stone countertops require weekly cleaning, and non-granite countertops additionally need resealing every five years. Impacts during the use stage are driven by the use of silicone-based sealants for resealing.

Due to the nature of natural stone, it is anticipated that the stone countertops will last for a service life of 10 years. End-of-life stages have lower contributions on the total life cycle impacts.

Variation analysis

A variation analysis was performed to study the environmental impacts variations between natural stone countertops from different stone types. Results were generated for both quarry operations and the construction stage, specific to various stone types based on the production share of different quarries, processors, and fabricators for each stone type. One of the major parameters that influences the results is the amount of stone that needs to be quarried to produce 1 m^2 of stone countertops, which varies per stone type.

The variation between weighted average, minimum, and maximum LCIA results is greater than 20% for all the impact categories. This is due to varying quarry and construction operations used by different quarries and processors.

Sensitivity analysis

Based on NSI's expert judgement, it was assumed that the energy consumed for processing one square meter of stone countertops makes up about 10% of the average energy consumed for processing different stone products. A sensitivity analysis was performed to check the robustness of the results when energy consumed is changed by +/-20% of the estimate used in this study. The resulting variation in the total life cycle impacts was less than 10% and is considered to be insignificant.

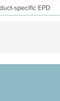
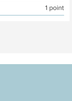
The natural stone industry is committed to making sure our inherently eco-friendly building material is produced efficiently and responsibly. Through the Natural Stone Sustainability Standard, we have defined metrics for responsible production in the following categories:

- Energy
- Water
- Chemicals
- Land reclamation & adaptive reuse
- Site management
- Transportation
- Social governance
- Human health & safety
- Excess process materials
- Solid waste
- Innovation

Companies have the opportunity to third-party verify compliance with these metrics. As the industry's leader in education, the Natural Stone Institute is also striving to build awareness around best practices for sustainability among all quarriers and fabricators globally.

See how we make it greener

LCA results

LIFE CYCLE STAGE	MATERIAL ACQUISITION AND PRE-PROCESSING	CONSTRUCTION	INSTALLATION	USE AND MAINTENANCE	END-OF-LIFE
Information modules: Included | Stages B1, B3-B7, C1, C3, and D have no associated activities and are not applicable for this study.	**A1 Quarry operations** **A2 Transport to processors**	**A3 Construction**	**A4 Transport to building sites** **A5 Installation**	**B2 Maintenance**	**C2 Waste transport** **C4 Disposal**
					

SM Single Score

Learn about SM Single Score results

Impacts of 1 square meter of natural stone countertop	1.38E+00 mPts	4.38E+00 mPts	8.15E-01 mPts	2.08E-01 mPts	2.09E-02 mPts
Materials or processes contributing >20% to total impacts in each life cycle stage	Energy consumed during stone quarrying (electricity and fuels).	Energy consumed during stone processing and fabrication (electricity and fuels).	Use of ancillary materials (adhesives) for installation and transport of product to building site.	Material consumed for maintenance.	Waste transport to end-of-life centers.

TRACI v2.1 results per functional unit

LIFE CYCLE STAGE	MATERIAL ACQUISITION AND PRE-PROCESSING	CONSTRUCTION	INSTALLATION	USE AND MAINTENANCE	END-OF-LIFE
Ecological damage					
Impact category / Unit					
Acidification — kg SO_2 eq	8.21E-02	1.51E-01	6.73E-02	1.93E-02	1.96E-03
Eutrophication — kg N eq	7.42E-03	3.04E-02	5.82E-03	1.46E-02	2.38E-04
Global warming (Embodied carbon) — kg CO_2 eq	1.01E+01	3.67E+01	9.76E+00	7.61E-02	4.75E-01
Ozone depletion — kg CFC-11 eq	5.41E-07	2.12E-06	1.18E-06	1.83E-07	9.28E-08
Human health damage					
Impact category / Unit					
Carcinogenics — CTU_h	3.81E-07	1.28E-06	3.37E-09	1.29E-07	1.89E-10
Non-carcinogenics — CTU_h	1.07E-06	3.19E-06	1.26E-07	8.38E-07	1.60E-08
Respiratory effects — kg $PM_{2.5}$ eq	1.01E-02	5.32E-02	2.88E-03	7.59E-03	1.69E-04
Smog — kg O_3 eq	2.39E+00	2.90E+00	1.95E+00	2.56E-01	5.40E-02
Additional environmental information					
Impact category / Unit					
Fossil fuel depletion — MJ, LHV	1.80E+01	5.55E+01	2.09E+01	4.13E+00	9.74E-01
Ecotoxicity — CTU_e	1.85E+01	3.25E+01	1.43E+01	3.61E+00	2.27E-01

See the additional content required by the NSF PCR for residential countertops on page 4 of the **Transparency Report PDF**.

References

LCA Background Report
NSI Natural Stone Countertops LCA Background Report (public version), NSI 2022. SimaPro Analyst 9.4, ecoinvent 3.4 database.

PCRs
ISO 21930:2017 serves as the core PCR along with EN 15804 & UL Environment Part A.

NSF's PCR for residential countertops
PCR review conducted by Evan Griffing, Ph.D.; Thomas P. Gloria, Ph.D.; and Jack Geibig.

ISO 14025, "Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services", ISO21930:2017

Download PDF SM Transparency Report, which includes the additional EPD content required by the NSF PCR.

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products on a life cycle basis. This EPD was not written to support comparative assertions. Even for similar products, differences in functional unit, use and end-of-life stage assumptions, and data quality may produce incomparable results. It is not recommended to compare EPDs with another organization as there may be differences in methodology, assumptions, allocation methods, data quality such as variability in datasets, and results of variability in assessment software tools used. A limitation to this study is that not all manufacturers in North America participated. TRs/EPDs of products that conform to the same PCR and include the same life cycle stages, but are made by different manufacturers, may not sufficiently align to support direct comparisons. They therefore, cannot be used as comparative assertions unless the conditions defined in ISO 14025 Section 6.7.2. 'Requirements for Comparability' are satisfied.

Rating systems

The intent is to reward project teams for selecting products from manufacturers who have verified improved life-cycle environmental performance.

LEED BD+C: New Construction | v4 - LEED v4
Building product disclosure and optimization
Environmental product declarations

✓ Industry-wide (generic) EPD	½product
○ Product-specific Type III EPD	1 product

LEED BD+C: New Construction | v4.1 - LEED v4.1
Building product disclosure and optimization
Environmental product declarations

✓ Industry-wide (generic) EPD	1 product
○ Product-specific Type III EPD	1.5 product

BREEAM New Construction 2018
Mat 02 - Environmental impacts from construction products
Environmental Product Declarations (EPD)

✓ Industry-average EPD	.5 points
○ Multi-product specific EPD	.75 points
○ Product-specific EPD	1 point

SM Transparency Report (EPD)™

VERIFICATION	LCA
3rd-party reviewed	✓
Transparency Report (EPD)	
3rd-party verified	✓

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Environmental Consultants

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How we make it greener

Natural Stone Countertops

Collapse all

See LCA results by life cycle stage

RAW MATERIALS ACQUISITION

Usable material vs excess process material ratios vary at each quarry and at times the excess exceeds the usable. It is important to know that excess process materials are almost always reclaimed or recycled. It is extremely uncommon for any stone to be diverted to a landfill. The Natural Stone Institute is working with their quarrier members to identify ways to make use of this excess and educate the industry about techniques and product lines that can effectively improve quarry yield.

The design community can help with this issue. Most natural stone's have a specific set of characteristics for the most desirable pieces. For example, limestone is generally either buff or gray in color. The blocks that are variegated, containing both buff and gray hues, are less desirable. If design teams are more accepting of natural variation in the material, then there is more usable material, and less excess, available from the source.

TRANSPORTATION

Using stone from local sources is the single biggest opportunity to reduce its embodied carbon. Since natural stone is a heavy material, the environmental impacts for transporting it end up being the most significant accrual of carbon. Natural stone is sourced world-wide and each deposit has unique aesthetic and performance characteristics so this is not always avoidable. Be sure to understand the distances between the quarry, the fabrication facility, and sometimes the distribution centers. In most North American operations the quarry is within miles of the fabrication facility. However, some natural stone producers will take advantage of lower labor costs in other countries and ship the stone large distances to be fabricated and then back again.

MANUFACTURING

To ensure the health and safety of our workforce, water is used during quarrying and fabrication to reduce dust and heat. Recycling this water is both environmentally responsible and economical. It is very common for stone facilities to recycle over 85% of the water used in their facilities.

There are a large variety of sizes and finishes that are commonly used for natural stone cladding. Design teams can help to reduce energy consumption in the following ways:

- Appreciate natural color and pattern variations.
- Understand how finishes are achieved and additional work that may be required on edges or adjacent surfaces.
- Optimize panel sizes based on block availability.
- Reduce thickness if possible.
- Avoid complex geometries such as radiuses and solid corners.
- Consult an expert for guidance on most the sustainable ways of achieving your desired aesthetic.

OTHER (USE, END OF LIFE)

There are endless opportunities for natural stone to be refinished, reused, and recycled.

Countertop surfaces can be professionally refinished. This process will refresh the beauty of its original finish by removing evidence high use. It can also restore extreme cases including years of poor maintenance, exposure to water or fire, or other circumstances.

Because of these capabilities, stone rarely reaches an end to its potential service life. When an owner chooses to replace natural stone, it can be removed and altered into an entirely new product and reinstalled in a new location.

There are also stone companies that have 'take-back' programs, to divert the stone from a landfill back to a quarry to be used as part of their land reclamation plan. If stone does end up in a construction landfill, there will be no toxic chemicals seeping into the earth as the material degrades. It simply returns to the earth, cradle to cradle.

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Additional EPD content required by: NSF PCR for Residential Countertops EPD Requirements

Data

Background This industry-average declaration was created by collecting product data for 1 square meter of natural stone countertops.

Allocation The allocation methods used were examined according to the updated allocation rules in ISO 21930:2017. Quarry inputs and outputs were divided evenly among the quarried stone by mass, and no co-product allocation was needed. Although different stone products go through different processing steps, processor inputs and outputs were also evenly distributed between different stone products based on their production area. More resources were allocated to countertops (10%) than the average stone processing, but no adjustments were made for cladding and flooring. No co-product allocation was needed for countertop fabricators as well.

Cut-off criteria for the inclusion of mass and energy flows are 1% of renewable primary resource (energy), 1% non-renewable primary resource (energy) usage, 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exception to these criteria is substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass. No known flows are deliberately excluded from this declaration; therefore, these criteria have been met. Biogenic carbon is included in reported results.

Relevant Technical Properties

PARAMETER	VALUE	UNIT	TEST METHOD
Thickness to achieve functional unit	28.58	mm	
Density	2507	kg /m^3	
Length	1.54	m	
Width	0.65	m	
Flexural strength	3.45 – 8.27	MPa	ASTM C880
Modulus of rupture	2.76 – 10.34	MPa	ASTM C99
Compressive strength	12.41 – 131.00	MPa	ASTM C170
Thermal conductivity (k-value)	1.26 – 5.38	W/mK	ASTM C518
Thermal resistance (R-value)	0.26 – 0.79	m.K/W	ASTM C518
Liquid water absorption	0.2 – 12.00	% of dry weight	ASTM C97
VOC emissions	0	µg/m^3	

Scenarios and additional technical information

Hazardous waste Stone countertops do not contain substances that are identified as hazardous according to the Resource Conservation and Recovery Act (RCRA), Subtitle C, though the equipment used in quarrying stones generate waste oil, which is considered to be a hazardous waste and is either sent to recycling centers or landfilled according to regulations.

Transport from Quarry to Processor [A2] Based on the data from some quarries, this transportation distance varies significantly, and the weighted average transportation distance is 65 km. For the quarries who had no primary information, a conservative stone transportation distance of 100 km via truck & trailer was assumed.

PARAMETER	VALUE	UNIT
Transport to the building site [A4]		
Vehicle type	Passenger vehicle (for initial visit) Lorry, 16-32 ton (for countertop transport)	
Fuel type	Petrol (for initial visit) Diesel (for countertop transport)	
Liters of fuel	0.36	l/100 km
Distance from manufacturer to site	80	km (wt. avg)
Gross density of products transported	2,508	kg/m^3 (wt. avg)
Installation into the building [A5]		
Installation scrap assumed	0	%
Ancillary materials - Adhesives (includes adhesives, silicones, caulk, epoxy)	0.20	kg
Net freshwater consumption	0	m^3
Electricity consumption	0.15	kWh
Product loss per functional unit (scrap)	0	kg
Waste materials at the construction site before waste processing (stone scrap and packaging waste)	0.028	kg
Output materials from on-site waste processing	0	kg
Mass of packaging waste by type Plastic Wood	0.01 0.042	kg
Biogenic carbon contained in packaging	0.08	kg CO_2
Direct emissions to ambient air, soil and water	0	kg
VOC emissions	0	µg/m^3
Use in the building [B1-B7]		
Reference Service Life (RSL)	10	years
Estimated Service life (ESL)	10	years
Maintenance process information and cycles	Resealing every 5 years (0.165 kg silicone sealant for each cycle) Weekly cleaning (0.005 kg detergent with 0.1 liter water for each cycle)	
End of life [C1-C4]		
Assumptions for scenario development	The product is dismantled and removed from the building manually. It is transported to a local facility where it requires no further processing before final disposition.	
Collection process	Collected separately	0 kg
	Collected with mixed construction waste	92.23 kg
Recovery	Reuse	0 kg
	Recycling (68.5%)	63.18 kg
	Landfill (31.5%)	29.05 kg
Waste transport		32 km
Final disposal		29.05 kg
Removals of biogenic carbon (excluding packaging)		0 kg CO_2

LCIA results, resource use, output and waste flows, and carbon emissions and removals per m^2 of natural stone countertops

Parameter	Unit	Material acquisition and pre-processing stage	Construction stage	Installation stage	Use and maintenance stage	End-of-life stage	Total
LCIA results (per m^2 of natural stone countertops)							
Ozone depletion	kg CFC-11 eq	5.41E-07	2.12E-06	1.18E-06	1.83E-07	9.28E-08	**4.11E-06**
Global warming	kg CO_2 eq	1.01E+01	3.67E+01	9.79E+00	7.61E-02	4.77E-01	**5.71E+01**
Smog	kg O_3 eq	2.39E+00	2.90E+00	1.95E+00	2.56E-01	5.40E-02	**7.54E+00**
Acidification	kg SO_2 eq	8.21E-02	1.51E-01	6.73E-02	1.93E-02	1.96E-03	**3.21E-01**
Eutrophication	kg N eq	7.42E-03	3.04E-02	5.82E-03	1.46E-02	2.38E-04	**5.85E-02**
Carcinogenics	CTUh	3.81E-07	1.28E-06	1.29E-07	2.09E-08	1.89E-10	**1.81E-06**
Non-carcinogenics	CTUh	1.07E-06	3.19E-06	8.38E-07	2.22E-07	1.60E-08	**5.34E-06**
Respiratory effects	kg $PM_{2.5}$ eq	1.01E-02	5.32E-02	2.88E-03	7.59E-03	1.69E-04	**7.40E-02**
Ecotoxicity	CTUe	1.85E+01	3.25E+01	1.43E+01	3.61E+00	2.27E-01	**6.92E+01**
Fossil fuel depletion	MJ surplus	1.80E+01	5.55E+01	2.09E+01	4.13E+00	9.74E-01	**9.95E+01**
Energy consumption and Material resources (per m^2 of natural stone countertops)							
Renewable fuels	MJ, LHV	6.60E+00	1.60E+02	8.59E+00	1.14E+02	1.05E-02	**2.88E+02**
Virgin renewable resources	MJ, LHV	1.85E+00	3.53E+00	4.81E-01	0	0	**5.87E+00**
Fossil fuels	MJ, LHV	1.35E+02	4.86E+02	3.20E+02	3.04E+01	6.38E+00	**9.79E+02**
Nuclear fuels	MJ, LHV	1.88E+01	2.04E+02	5.48E+00	4.40E+00	3.46E-02	**2.32E+02**
Miscellaneous fuels (surplus heat, incineration of waste)	MJ, LHV	9.54E-04	2.00E-02	1.60E-03	1.10E+01	1.57E-06	**1.10E+01**
Virgin non-renewable resources	MJ, LHV	5.27E-01	1.59E-01	2.18E+00	0	0	**2.87E+00**
Secondary materials / Recycled resources	kg	0	0	0	0	0	**0**
Renewable secondary fuels	MJ, LHV	0	0	0	0	0	**0**
Non-renewable secondary fuels	MJ, LHV	0	0	0	0	0	**0**
Recovered energy	MJ, LHV	0	0	0	0	0	**0**
Use of net fresh water resources	m^3	8.90E-01	1.57E-01	2.26E+00	1.81E-01	1.09E-03	**1.07E+02**
Energy type and usages (per m^2 of natural stone countertops)							
Primary energy demand	MJ	1.62E+02	8.53E+02	3.35E+02	1.59E+02	6.43E+00	**1.52E+03**
Primary energy demand (fossil based energy, nuclear)	MJ	1.54E+02	6.90E+02	3.26E+02	3.48E+01	6.42E+00	**1.21E+03**
Renewable (solar, wind, hydro, biomass)	MJ	8.45E+00	1.63E+02	9.07E+00	1.14E+02	1.05E-02	**2.94E+02**
Emissions to air (per m^2 of natural stone countertops)							
Sulphur oxides (SOx)	kg	1.23E-02	6.41E-02	1.20E-02	5.46E-03	4.24E-04	**9.43E-02**
Nitrogen oxides (NOx)	kg	8.55E-02	1.16E-01	7.75E-02	8.57E-03	2.18E-03	**2.90E-01**
Carbon-dioxide (CO2)	kg	7.59E+00	4.62E+01	9.24E+00	4.30E+00	4.58E-01	**6.78E+02**
Methane (CH4)	kg	1.18E-02	1.13E-01	1.82E-02	1.31E-02	4.39E-04	**1.57E-01**
Nitrous oxide (N20)	kg	1.92E-04	1.17E-06	3.37E-04	1.57E-03	1.79E-05	**2.12E-03**
Carbon monoxide (CO)	kg	5.69E-02	9.09E-02	2.01E-01	6.23E-02	2.89E-04	**4.11E-01**
Water usage and emissions to water (per m^2 of natural stone countertops)							
Phosphates, nitrates, dioxin, heavy metals (arsenic, lead, mercury, cadmium, and chromium)	kg	1.32E-03	2.07E-02	7.85E-04	3.58E-02	1.70E-06	**5.86E-02**
Consumption (total water input)	m^3	1.12E+02	2.69E+01	5.53E+00	2.52E-01	1.24E-03	**1.45E+02**
Output flows and waste category indicators (per m^2 of natural stone countertops)							
Hazardous waste disposed	kg	1.51E-03	1.96E-03	0	0	0	**3.47E-03**
Non-hazardous waste disposed	kg	6.41E-02	2.41E+01	9.45E-05	0	2.91E+01	**5.32E+01**
High-level radioactive waste, conditioned, to final repository	kg	4.75E-03	5.50E-02	4.47E-05	1.84E-04	6.70E-07	**5.99E-02**
Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	3.94E-06	1.10E-05	4.08E-07	3.19E-08	5.95E-07	**1.60E-05**
Components for re-use	kg	0	0	0	0	0	**0**
Landfill avoidance (Materials for recycling)	kg	2.79E+02	6.53E+01	2.80E-02	0	6.32E+01	**4.07E+02**
Incineration with energy recovery	kg	0	0	0	0	0	**0**
Incineration without energy recovery	kg	0	0	0	0	0	**0**
Exported energy	MJ, LHV	0	0	0	0	0	**0**
Carbon emissions and removals (per m^2 of natural stone countertops)							
Biogenic carbon removal from product	kg CO_2	0	0	0	0	0	**0**
Biogenic carbon emission from product	kg CO_2	0	0	0	0	0	**0**
Biogenic carbon removal from packaging	kg CO_2	0	7.63E-02	3.81E-03	0	0	**8.01E-02**
Biogenic carbon emission from packaging	kg CO_2	0	0	1.12E+02	0	0	**1.12E-02**
Biogenic carbon emission from combustion of waste from renewable sources used in production processes	kg CO_2	0	0	0	0	0	**0**
Calcination carbon emissions	kg CO_2	0	0	0	0	0	**0**
Carbonation carbon removals	kg CO_2	0	0	0	0	0	**0**
Carbon emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2	0	0	0	0	0	**0**