

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO14025 and EN15804 + A2:2019/AC: 2021 for Nonvitreous , EN 14411-BIII from Villeroy & Boch Tiles

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General Information

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ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR) Product Category Rules (PCR): 2019:14 Version 1.2.5, Construction Products and Construction Services, EN 15804:2012 + A2:2019 Sustainability of Construction Works

PCR review was conducted by: The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

EPD process certification

EPD verification X

Third party verifier: Prof. Ing. Vladimír Kočí, Ph.D., MBA LCA Studio Šárcká 5, 16000 Prague 6 - Czech Republic

Approved by: The International EPD® System Technical Committee, supported by the Secretariat.

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

Life Cycle Assessment (LCA)

LCA accountability: Metsims Sustainability Consulting

Difference From Previous Version:

V1.01 - 2023-10-16

Word errors and design updates have been made within the document.

About Villeroy & Boch Tiles

As one of the leading suppliers of high-quality wall and floor tiles, V&B Fliesen GmbH is a reliable partner for architects and interior designers. The Merzig-based company is active in over 65 countries. It is part of the international Eczacıbaşı Group. With sophisticated colour and format concepts in Nonvitreous, Glazed Vitreous and Porcelain Stoneware, Villeroy & Boch Tiles opens up a wide range of creative possibilities for use in private, commercial and public spaces. Villeroy & Boch brand tiles are also always a commitment to high-quality furnishings, first-class design - and a passion for designing interior architecture. Awarded the EPD label, they can be used in all properties that are classified according to BREEAM, LEED, DGNB or comparable international declarations for sustainable construction.



Product Information

Product Description

Nonvitreous EN14411-BIII contain inorganic materials such as clay, kaolin, and calcite, but they may also include other raw materials. The production technology of tiles is dry pressing. The required composition is blended with water to form a slurry. This slurry is then fed into spray driers to form uniform granules ready for compaction. These granules are then shaped to form the green body. The formed green body may then be glazed if required. The green ceramic body is fired at high temperatures, resulting in a hard body. Nonvitreous EN14411-BIII come in several various dimensions depending on the intended use. Nonvitreous EN14411-BIII have water absorption of more than 10%. This EPD covers the production of Nonvitreous EN14411-BIII in the Bozüyük, Bilecik plant.

UN CPC code for wall tiles is 3731. The assessment is based on the most produced tile type within the product range for 1 m² of Nonvitreous EN14411-BIII.

Product Application

Nonvitreous EN14411-BIII are largely used as interior wall coverings. Interior applications are mainly in living rooms, bathrooms and kitchens in residential applications. No substances included in the Candidate List of Substances of Very High Concern for authorisation under the REACH Regulations are present in the ceramic tiles manufactured, either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).



Technical Specifications

Technical characteristics Teknik Özellikler	Test standard	Nonvitreous BIII body Glazed	
		EN 14411 Group BIII Annex L	
		Nominal size \geq 15cm	
Length and width	EN ISO 10545-2	\pm 0,5 %	\pm 2mm
Thickness	EN ISO 10545-2	\pm 10%	\pm 0,5mm
Straightness of sides	EN ISO 10545-2	+ 0,3%	\pm 1,5mm
Rectangularity	EN ISO 10545-2	\pm 0,5%	\pm 2mm
Surface Flatness	EN ISO 10545-2	\pm 0,5%	\pm 2mm
Surface quality	EN ISO 10545-2	Min. 95%	
Physical properties			
Water absorption	EN ISO 10545-3	E > 10%	
Modulus of rupture	EN ISO 10545-4	Min. 15 N/mm ²	
Breaking strength	EN ISO 10545-4	Min.600N (t \geq 7,5mm) Min.200 N (t < 7,5mm)	
Surface abrasion	EN ISO 10545-7	Not intended to be used on the floor	
Deep abrasion	EN ISO 10545-6	N.A.	
Linear thermal expansion	EN ISO 10545-8	Max 9 x 10 ⁻⁶ K ⁻¹	
Thermal shock resistance	EN ISO 10545-9	Pass	
Frost resistance	EN ISO 10545-12	----	
Coefficient of friction	Declared test method	Not intended to be used on the floor	
Crazing resistance	EN ISO 10545-11	Pass	
Reaction to fire	-----	Class A1	
Small colour differences for plain coloured tiles	EN ISO 10545-16	$\Delta E < 0,75$	
Chemical resistance			
Staining resistance	EN ISO 10545-14	Min. Class 3	
Resistance to household chemicals and swimming pool water cleaners	EN ISO 10545-13	Class Min. B	
Resistance to low concentrations acids&alkalis	EN ISO 10545-13	Class LA-LC	
Resistance to high concentrations acids&alkalis	EN ISO 10545-13	Class HA-HC	

System Boundaries & Description

PRODUCT STAGE

A1. Raw Material Supply includes raw material extraction and pre-treatment processes before production. In this report, production for each product starts with raw material acquisition.

A2. Transport is relevant for delivery of raw materials to the plant and involves forklift usage within the factory.

A3. Manufacturing stages include production of granules by spray drying, forming, drying, glazing, firing and packaging. Transport is only relevant for delivery of raw materials to the plant and forklift usage within the factory. Packaging waste scenario is created separately depending on the geographic location of the installation process. Renewable energy is used as energy source in the manufacturing.

CONSTRUCTION PROCESS STAGE

A4. Transport includes transportation of Nonvitreous EN14411-BIII to the construction site. Villeroy & Boch transport tiles by seaway, airway and road haulage to the distribution centres for export.

A5. Installation of the Product stage includes the adhesive mortar and water usage in the construction site. For 1 m² Nonvitreous EN14411-BIII installation; 5 kg mortar and 1.5 L water usage was assumed.

USE STAGE

B1. Use stage concerns emissions into environment. Nonvitreous EN14411-BIII are inert materials, so during the use stage, they do not cause any emissions. Hence, use phase is not relevant for the assessment.

B2. Maintenance includes cleaning of tiles. Villeroy & Boch advises to use 0.2 mL detergent which contains stain remover or neutral low-sulphate and rinse with 0.1 L tap water after cleaning. The results are given for a one-time cleaning activity, as the activity will vary by user.

B3. Repair: Villeroy & Boch Nonvitreous EN14411-BIII require no repairing during the use phase and therefore no impacts has occurred in this module.

B4. Replacement: Villeroy & Boch Nonvitreous EN14411-BIII require no replacement during the use phase and therefore no impacts has occurred in this module.

B5. Refurbishment: Villeroy & Boch Nonvitreous EN14411-BIII require no refurbishment during the use phase and therefore no impacts has occurred in this module.



B6. Operational Energy Use: Operational energy use is not relevant for this product.

B7. Operational Water Use: Operational water use is not relevant for this product.

END OF LIFE STAGE

C1. De-construction. Demolition at the end of RSL is usually conducted with a selective deconstruction/demolition. The environmental impacts generated during this phase are very low and therefore can be neglected.

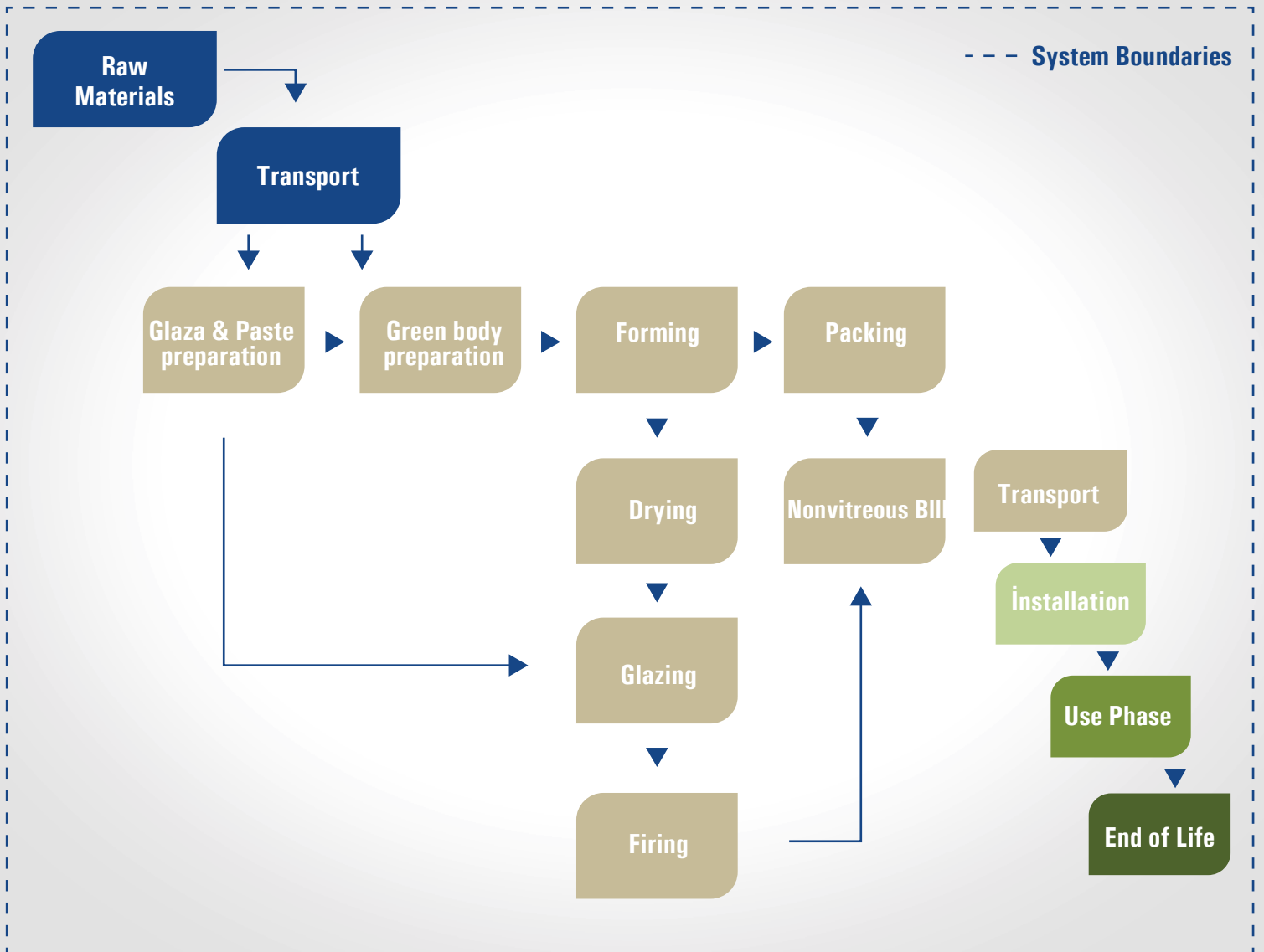
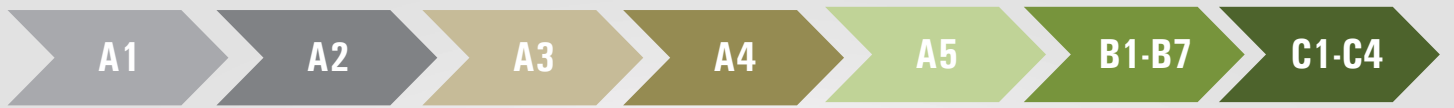
C2. Transport (Waste) includes the transportation of the discarded tiles. Packaging material and adhesive mortar to final disposal. Average distance from demolition site to inert landfill site for final disposal is assumed to be 50 km.

C3. Waste Processing concerns processing of discarded Nonvitreous EN14411-BIII for recycle or reuse. The environmental impacts generated during this phase are very low and therefore can be neglected.

C4. Disposal is the final stage of product life. Nonvitreous EN14411-BIII end up at construction and demolition waste landfills as their final fate and modelled as such in this LCA.

BENEFITS AND LOADS

D. Benefits & Loads from the tiles are calculated in this stage.



Benefits & Loads

LCA Information

Functional Unit	The functional unit is the production of 1 m ² the most produced Nonvitreous EN14411-BIII with a mass of 14.18 kg.
Goal and Scope	Evaluation of environmental impacts for 1 m ² Nonvitreous EN14411-BIII from the range of products that are produced the most from cradle to grave.
System Boundary	The system boundary covers A1 - A3 product stages referred as 'Raw material supply', 'Transport' and 'Manufacturing', A4 - A5 'Construction', B1 - B7 'Use' and C1 - C4 'End of life' stages.
Cut-off Rules	For this LCA study. 1 % cut-off was applied.
Background Data	Ecoinvent database (Ver.3.9) (www.ecoinvent.org) is used for the background data.
Data Quality	Raw materials, energy and water consumption, waste and material and product transport data is collected from Villeroy & Boch.
Period Under Review	All primary data collected from Villeroy & Boch refers to the period year of 2022.
Allocations	No allocation was performed for this LCA study.

	Product stage			Construction process stage		Use stage							End of life stage				Benefits and Loads	
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential	
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
Modules declared	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Geography	GLO	GLO	TR	GLO													GLO	
Specific data used	> 90%																.	
Variation – products	0%																.	
Variation – sites	0%																.	

Description of the system boundary (X = Included in LCA. MND= Module Not Declared. NR= Not Relevant)

The system boundaries in tabular form for all modules are shown in the table above. The results of the LCA with the indicators as per EPD requirement are given in the following tables for product stage (A1 - A3), construction process (A4. A5), use stage (B1 - B7), and end of life (C1 - C4).

REACH Regulation

No substances included in the Candidate List of Substances of Very High Concern for authorization under the REACH regulations are present in this product either above the threshold for registration with the European Chemicals Agency or above 0.1% (wt/wt).

LCA Modelling, Calculation and Data Quality

Life Cycle Inventory Analysis indicators describing the use of resources are determined respectively to the following impact categories. calculated using CML-IA Baseline (Ver. 3.5) method: Global Warming Potential (GWP) for time span of 100 years, Ozone Layer Depletion Potential (ODP) with time span of infinity, Formation Potential of Tropospheric Ozone Photochemical Oxidants (POCP) with time span of 5 days, Acidification Potential (AP) with time span of eternity. Eutrophication Potential (EP) with time span of eternity, Photochemical Oxidation (POCP) and Abiotic Depletion Potential for Fossil (ADPF) and Non-fossil (ADPE) resources. All energy calculations were done using Cumulative Energy Demand (LHV) methodology. The freshwater use value for manufacturing life cycle was taken from the manufacturer as the net freshwater consumption occurs during the manufacturing stage only.

Content Declaration

Products are packed in cardboard boxes, stretch hoods, plastic stripes and glue.

Packaging Material	Weight, %/m ²
Cardboard	83.8
Plastic	13.0
Glue	3.2

Information on biogenic carbon content according to EN 15804 + A2

Biogenic Carbon Content	Unit	Quantity
Biogenic carbon content in product	kg C	0.003
Biogenic carbon content in packaging	kg C	0.029

Base and Ancillary Materials

Main raw materials for Nonvitreous EN14411-BIII:

Clay	55-60%
Calcite	5-15%
Kaolin	5-10%
Recycled Content	0-15%
Other	< 1%

Auxiliary substances / additives:

- Dispersant
- Pigment
- Binder
- Rheological additives

LCA Results

ENVIRONMENTAL IMPACTS

Parameter	Unit	A1-3	A4	A5	B1	B2	B3-7	C1	C2	C3	C4	D	
Global Warming Potential	Total	kg CO ₂ eq.	7.09	2.02	7.00	0	0.494	0	0	0.179	0	0.357	-0.583
	Biogenic	kg CO ₂ eq.	-0.019	0.002	0.059	0	-0.536	0	0	163E-6	0	0.107	-708E-6
	Fossil	kg CO ₂ eq.	7.11	2.02	6.93	0	0.379	0	0	0.178	0	0.250	-0.581
	Land Use & Transformation	kg CO ₂ eq.	0.004	1.09E-3	0.007	0	0.651	0	0	88.0E-6	0	182E-6	-1.13E-3
Acidification	mol H+ eq	0.012	0.015	0.030	0.045	0	0.004	0	0	390E-6	0	0.002	
Particulate matter	disease inc.	138E-9	154E-9	110E-9	452E-9	0	71.7E-9	0	0	13.3E-9	0	38.2E-9	
Eutrophication. marine	kg N eq	0.004	0.004	0.006	0.007	0	0.005	0	0	98.3E-6	0	769E-6	
Eutrophication. freshwater	kg P eq	377E-6	654E-6	230E-6	0.002	0	0.007	0	0	12.7E-6	0	65.4E-6	
Eutrophication. terrestrial	mol N eq	0.039	0.041	0.071	0.078	0	0.016	0	0	999E-6	0	0.007	
Human toxicity. cancer	CTUh	1.82E-9	1.96E-9	800E-12	4.30E-9	0	842E-12	0	0	81.3E-1	0	140E-12	
Human toxicity. cancer - inorganics	CTUh	912E-12	1.02E-9	445E-12	2.52E-9	0	273E-12	0	0	2	0	69.0E-12	
Human toxicity. cancer - organics	CTUh	908E-12	948E-12	355E-12	1.78E-9	0	569E-12	0	0	39.6E-1	0	70.7E-12	
Human toxicity. non-cancer	CTUh	28.4E-9	33.9E-9	14.5E-9	103E-9	0	19.1E-9	0	0	2	0	1.73E-9	
Human toxicity. non-cancer - inorganics	CTUh	26.1E-9	31.5E-9	13.8E-9	97.0E-9	0	16.9E-9	0	0	41.7E-1	0	1.47E-9	
Human toxicity. non-cancer - organics	CTUh	2.29E-9	2.35E-9	674E-12	6.39E-9	0	2.17E-9	0	0	2	0	261E-12	
Ionising radiation	kBq U-235 eq	0.085	0.238	0.110	0.349	0	0.021	0	0	1.80E-9	0	0.007	
Land use	Pt	21.8	23.4	10.6	36.4	0	37.9	0	0	1.70E-9	0	12.3	
Ozone depletion	kg CFC11 eq	175E-9	201E-9	220E-9	273E-9	0	20.5E-9	0	0	96.3E-1	0	5.88E-9	
Photochemical ozone formation	kg NMVOC eq	0.019	0.019	0.020	0.029	0	0.003	0	0	2	0	0.002	
Resource use. fossils	MJ	101	97.7	28.8	103	0	3.96	0	0	0.003	0	5.39	
Resource use. minerals and metals	kg Sb eq	16.9E-6	20.9E-6	3.35E-6	79.7E-6	0	3.78E-6	0	0	1.53	0	508E-9	
Water use	m3 depriv.	0.877	0.943	0.158	3.51	0	0.719	0	0	3.88E-9	0	0.228	

Legend A1: Raw Material Supply, A2: Transport, A3: Manufacturing, A1-A3: Sum of A1, A2, and A3. A4: Transport to Site, A5: Installation, B1: Use, B2: Maintenance, B3: Repair, B4: Replacement, B5: Refurbishment, B6: Operational Energy Use, B7: Operational Water Use, C1: De-Construction, C2: Waste Transport, C3: Waste Processing, C4: Disposal, D: Benefits and Loads Beyond the System Boundary.

ENVIRONMENTAL IMPACTS

Parameter	Unit	A1-3	A4	A5	B1	B2	B3-7	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq.	7.14	2.02	6.99	0	1.07	0	0	0.179	0	0.332	-0.583
Legend	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology which excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator.											

RESOURCE USE

Parameter	Unit	A1-3	A4	A5	B1	B2	B3-7	C1	C2	C3	C4	D
PENRE	MJ	97.7	28.8	103	0	4.66	0	0	2.53	0	5.40	-7.95
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	97.7	28.8	103	0	4.66	0	0	2.53	0	5.40	-7.95
PERE	MJ	3.08	0.567	6.73	0	18.6	0	0	0.040	0	0.093	-0.165
PERM	MJ	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	3.08	0.567	6.73	0	18.6	0	0	0.040	0	0.093	-0.165
SM	kg	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m ³	0.045	0.004	0.090	0	0.125	0	0	415E-6	0	0.005	-0.050
Legend	PERE: Use of renewable primary energy excluding resources used as raw materials, PERM: Use of renewable primary energy resources used as raw materials, PERT: Total use of renewable primary energy, PENRE: Use of non-renewable primary energy excluding 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, SM: Secondary material, RSF: Renewable secondary fuels, NRSF: Non-renewable secondary fuels, FW: Net use of fresh water											

RESOURCE USE

Parameter	Unit	A1-3	A4	A5	B1	B2	B3-7	C1	C2	C3	C4	D
HWD	MJ	0.008	0	0	0	0	0	0	0	0	0	0
NHWD	MJ	1.30	0	0	0	0	0	0	0	0	16.7	0
RWD	MJ	0	0	0	0	0	0	0	0	0	0	0
CRU	MJ	0	0	0	0	0	0	0	0	0	0	0
MFR	MJ	0	0	0	0	0	0	0	0	0	0	0
MER	MJ	0	0	0	0	0	0	0	0	0	0	0
EE (Electrical)	kg	0	0	0	0	0	0	0	0	0	0	0
EE (Thermal)	MJ	0	0	0	0	0	0	0	0	0	0	0
Legend	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material for recycling, MER: Materials for energy recovery, EE (Electrical): Exported energy electrical, EE (Thermal): Exported energy thermal.											

References

- /GPI/ General Programme Instructions of the International EPD® System. Version 4.0
- /EN ISO 9001/ Quality Management Systems - Requirements
- /EN ISO 14001/ Environmental Management Systems - Requirements
- /Ecoinvent / Ecoinvent Centre. www.ecoinvent.org
- /ISO 14020:2000/ Environmental Labels and Declarations — General principles
- /EN 15804:2012+A2:2019/ Sustainability of construction works - Environmental Product Declarations — Core rules for the product category of construction products
- /ISO 14025/ DIN EN ISO 14025:2009-11: Environmental labels and declarations - Type III environmental declarations — Principles and procedures
- /ISO 14040/44/ DIN EN ISO 14040:2006-10. Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006) and Requirements and guidelines (ISO 14044:2006)
- /PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute. Swedish Environmental Protection Agency. SP Trä. Swedish Wood Preservation Institute. Swedisol. SCDA. Svenskt Limträ AB. SSAB. The International EPD System. 2019:14 Version 1.11 DATE 2019- 12-20
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- /SimaPro/ SimaPro LCA Software. Pré Consultants. the Netherlands. www.presustainability.com



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