Environmental Product Declaration

NZSIP Structural Insulated Panels

In accordance with ISO 14025 and EN 15804+A2:2019

Structural Insulated Panels

From New Zealand Structural Insulated Panels (NZSIP) Limited

ECO PLATFORM EPD VERIFIED

AUSTRALASIA EPD® ENVIRONMENTAL PRODUCT DECLARATION

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BRANZ Appraised
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NEW ZEALAND MADE®

About NZSIP

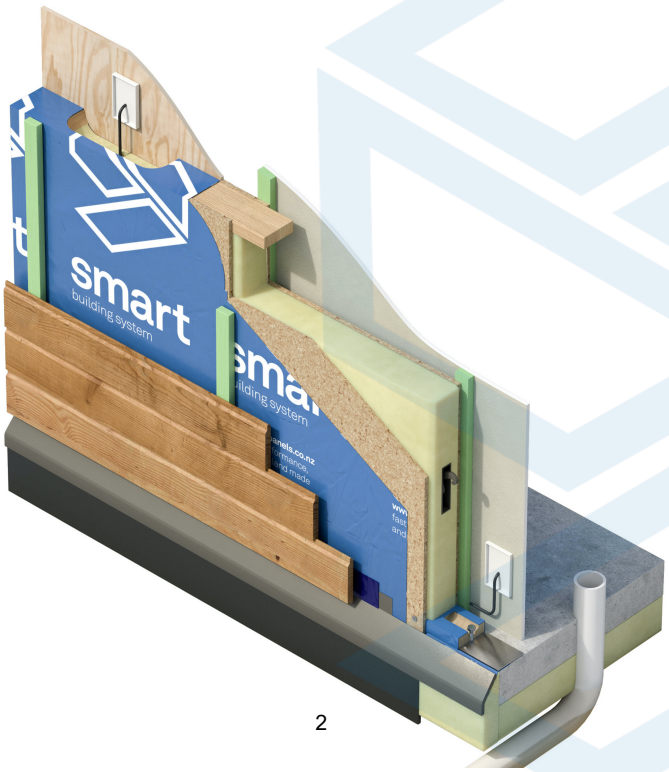
New Zealand Structural Insulated Panels (NZSIP) located in Cromwell, Central Otago has delivered more than 100 building projects across Aotearoa New Zealand since 2017, from Waiheke Island in Auckland's Hauraki Gulf to Antarctica.

NZSIP was formed in 2016 by a group of Kiwis who wanted to see premium structural insulated panels create smart building systems manufactured in New Zealand, rather than imported from the United States, as they typically were then.

We are one hundred per cent New Zealand owned, and fully manufacture all our panels in Cromwell, where we employ a small team dedicated to producing the highest quality building solutions. Our company holds current BRANZ certification for our NZSIP Smart Panel Building System, giving customers confidence in knowing our product has been through a rigorous test regime for New Zealand conditions, including a high-level documentation review and a factory audit. Our BRANZ Appraisal can be found here.

Each panel is made to the architectural and engineering specifications by our small team of skilled employees. NZSIP provides to market a complete building system that includes structural insulated panel walls, roofs, and floors made from a polyurethane foam. This is sandwiched between a strandboard skin. All the protective membranes, wraps, tapes and metal fasteners required are supplied to create a premium, weathertight structure. Building teams receive everything necessary for an easy, fast installation on site.
The panels lock into place using a camlock technology to create a strong airtight bond between panels. This elegantly simple process shortens build-assembly times and means that most building project teams constructing with NZSIP systems spend less time on site than those using standard timber-framed building structures.

New Zealand-made structural insulated panels have a rigid, high-density polyurethane (PUR) core that makes them dense, strong, and capable of achieving high R-values. Strong, airtight and super-insulated to maintain a stable interior environment, our New Zealand-made polyurethane structural insulated panels are recognised as one of the easiest ways to build next-generation, energy-efficient buildings. NZSIP products and systems have featured in building projects for research and development, light industrial, commercial, residential and tourism sectors.



Product information

Products covered by EPD

This product specific EPD covers structural insulated panel products manufactured by NZSIP at the manufacturing site in Cromwell, New Zealand.

NZSIP Smart Panel Building System is a house building system based on structural insulated panels (SIPs) which are used for walls, roofs, and floors. The design and construction of the remainder of the building structure, comprising foundation, interior walls, and roof framing, are conventional. Wall and roof cladding are conventional and fixed to timber battens or purlins attached to the panels. Joinery and internal finishing are also conventional.

NZSIP Smart Panels are manufactured of Strandboard® facings with a factory foamed polyurethane insulation (PUR) core. The panels are 115, 165 or 215 mm thick, nominally 1,205 mm wide, with standard lengths up to 3.6 m. Panels can also be manufactured to varying lengths and widths depending on their design location. The panels have different types of joinery depending on function. Wall panels use camlocks, floor panels use timber joists and roof panels use timber rafter and end plates.

Table 1: Industry classification

Product	Classification	Code	Category
Product name/type	UN CPC Ver.2	54650	Insulation services
	ANZSIC 2006	3239	Other building installation services

Declared unit

The declared unit for the EPD is 1m² of structural insulated panel with a specific thermal resistance (R-value) covering the following product:

- 115mm Wall Panels (R4.5)
- 165mm Floor, Wall & Roof Panels (R7)
- 215mm Floor & Roof Panels (R9.4)

The products are provided with supplementary material (building wrap and screws) and joinery (camlocks for wall panels, LVL timber joists for floor panels and LVL timber rafter and end plates) that are included as part of the declared unit.

Table 2: Details of products manufactured by NZSIP

NZSIP product list	R-value	Area density (kg/m²)	Supplementary material (kg/m²)
115mm Wall Panel	4.5	23.7	0.907
165mm Wall Panel	7	30.6	0.391
165mm Roof Panel	7	35.0	0.391
165mm Floor Panel	7	31.6	0.391
215mm Roof Panel	9.4	42.9	0.588
215mm Floor Panel	9.4	38.2	0.588

Product composition and packaging per declared unit

Table 3: Content declaration per declared unit

Materials/ Components	115mm Panels (Wall)	165mm Panels (Wall)	165mm Panels (Roof)	165mm Panels (Floor)	215mm Panels (Roof)	215mm Panels (Floor)	Hazardous properties (HSNO and GHS classifications*)
Strand board	50.7%	39.2%	34.2%	38.0%	28.0%	31.4%	None
Nails	1.04%	1.24%	1.08%	1.20%	0.89%	0.99%	None
LVL Timber	29.2%	35.3%	30.8%	34.2%	34.5%	38.8%	None
PUR	14.1%	18.9%	16.5%	18.3%	16.4%	18.4%	None
Tapes	1.53%	1.18%	1.04%	1.15%	0.85%	0.95%	None
Joinery							
Steel	0.50%	0.39%	0.00%	0.00%	0.00%	0.00%	None
LVL Timber	0.00%	0.00%	13.9%	4.59%	15.5%	5.16%	None
Supplementary materials							
Building Wrap	1.50%	1.16%	0.00%	0.00%	0.00%	0.00%	None
Screws	1.42%	2.69%	2.35%	2.61%	3.87%	4.35%	None
Total mass (kg)	**23.7**	**30.6**	**35.0**	**31.6**	**42.9**	**38.2**	

*Hazardous properties for Hazardous Substances and New Organisms (HSNO classifications) and Globally Harmonized System (GHS) classifications were searched for via supplier Safety Data Sheets (SDS) and OECD's global portal to information on chemical substances available at: https://www.echemportal.org.

None of the materials identified in the European Chemicals Agency's Candidate List of Substances of Very High Concern are present in the products at a concentration greater than 0.1% (ECHA, 2022).

The products and packaging do not contain post-consumer material. Strandboard and LVL timber components of the product, and the wooden pallet packaging contain renewable material (wood).

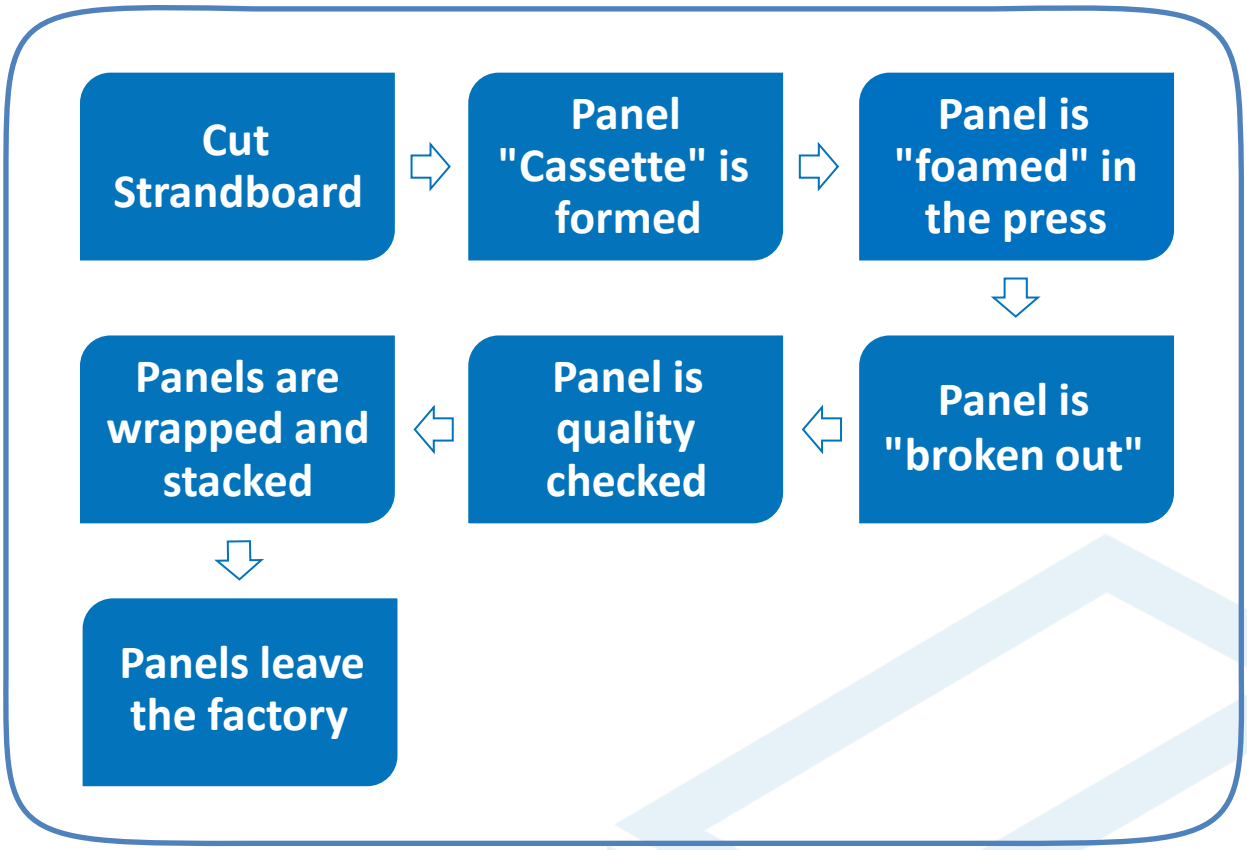
Table 4: Packaging details per declared unit (i.e. 1 m^2 of product)

Packaging	115mm Panels (Wall)	165mm Panels (Wall)	165mm Panels (Roof)	165mm Panels (Floor)	215mm Panels (Roof)	215mm Panels (Floor)
Steel Strapping	6.89%	16.0%	16.0%	16.0%	10.6%	10.6%
Plastic Wrap	3.75%	7.36%	7.36%	7.36%	5.96%	5.96%
Shrink Wrap	1.10%	2.56%	2.56%	2.56%	1.70%	1.70%
Wooden Pallet	88.3%	74.1%	74.1%	74.1%	81.7%	81.7%
Total mass (kg)	**0.907**	**0.391**	**0.391**	**0.391**	**0.588**	**0.588**
Packaging mass as % of product mass	3.83%	1.28%	1.12%	1.24%	1.37%	1.54%

Manufacturing Process

A simplified flow diagram reflecting manufacturing process for NZSIP products is given below.

Figure 1: Simplified flow diagram for NZSIP manufacture



System boundaries

This EPD is a cradle to gate with modules C1–C4 and module D included. This means following modules are covered: A1–A3 + C + D. Modules A4-A5 and B1-B7 have not been included In the EPD due to the inability to predict how the material will be used following manufacture.

Table 5: Modules included in the scope of the EPD

	Product stage			Construction process stage		Use stage							End of life stage				Resource Recovery
	Raw material supply	Transport of raw materials	Manufacturing	Transport to customer	Construction/Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to waste processing	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	ND	ND	ND	ND	ND	ND	ND	ND	ND					X
Geography	NZ	NZ	NZ										NZ	NZ	NZ	NZ	NZ
Specific Data	>90																
Variation: Products	Not relevant																
Variation: Sites	Not relevant																

X = included in the EPD; ND = Module not declared (such a declaration shall not be regarded as an indicator result of zero).

The production stage includes the environmental impacts associated with raw materials extraction and processing of inputs, transport to, between, and within the manufacturing site, and manufacturing of average product at the exit gate of the manufacturing site.

When a building reaches its end-of-life, NZSIP products are disposed of. In New Zealand, the waste materials are typically disposed of in a landfill or recycled. Module C includes demolition impacts, transport of waste to a landfill, and the impact of landfilling.

Table 6: End of life scenarios for products

Processes	Unit (expressed per declared unit of components products or materials by type of material)
Collection process specified by type	1m^{2}of product collected separately
Recovery system specified by type	N/A
Disposal specified by type	1 m^2 of product disposal as waste to landfill: • The wood-based components (strandboard and LVL including joinery are modelled as wood waste on landfill • PUR waste is modelled as plastic waste on landfill • Remaining materials (including supplementary materials and joinery) are modelled as inert matter on landfill
Assumptions for scenario development	Deconstruction of building using a 100 kW construction excavator (fuel consumption of 0.172g diesel per kg of product), Transport of waste to disposal over 100 km via a diesel driven, Euro 4 truck (28 - 34t gross weight / 22t payload capacity Sphera) with empty return.

Primary data

Processes within the system boundary are accounted for via primary data consisting of production for the 12-month period covering raw material inputs; raw material packaging; transport of raw materials, packaging and auxiliary inputs; energy and water inputs for production; internal transport; production outputs and overheads (e.g. water, etc.).

Primary data for NZSIP operations were sourced for the 12-month period from 1st July 2020 to 30th June 2021.

Background data

All data in the background system were from the GaBi Life Cycle Inventory Database 2021 (Sphera, 2021). Most datasets have a reference year between 2017 and 2020 and fall within the 10-year limit allowable for generic data under EN 15804 (CEN, 2019). New Zealand-specific data were used where possible. For some materials, background data represent Australian or European conditions as no geographically relevant matching New Zealand LCI dataset was available within the GaBi databases.

Allocation

The raw material inputs for the products were taken from the bill of materials (BOMs). Site level data such as electricity, water input and output, and raw material packaging were allocated to products based on production percentage (by mass) for the study period.

Transport

Primary transport data was used for transport of production inputs (A2). Any wastes from the production process (A3) and end-of-life (C2) are assumed to be transported over a 100 km distance. Transport was modelled using:

- Truck-trailer (diesel), Euro 0 - 6 mix, 34 - 40t gross weight / 27t payload capacity (utilisation factor: 0.5).
- Container ship (heavy fuel oil), 5,000 to 200,000 dwt payload capacity, ocean going (utilisation factor: 0.48).
- Transport fuels have been modelled using the Australian average as no New Zealand-specific datasets are available.

Energy

Electricity for NZSIP production has been modelled with the New Zealand-specific grid mix from the GaBi Database 2021 (Sphera, 2021). The New Zealand electricity grid consumption mix (2017) is made up of hydro (57.02%), geothermal (17.9%) natural gas (15.97%), wind (4.85%), hard coal gases (1.44%) hard coal (1.26%), biomass (0.74%), biogas (0.59%), and photovoltaics (0.17%), lignite (0.05%) and fuel oil (0.01%). The emission factor for the New Zealand national grid for the GWP-GHG indicator is 0.145 kg CO2e/kWh (Sphera, 2021).

End of life - landfill and recovery

NZSIP products are assumed to be landfilled at end of life. The impacts associated with landfill are declared in module C4. The wood-based components (strandboard and LVL) are modelled as wood waste on landfill where emissions from landfill are dependent on the Degradable Organic Carbon fraction (DOCf). The degradation of biogenic carbon content in a solid waste disposal site is calculated without time limit.

DOCf for LVL was assumed to be the same as particle board (0.8%), while DOCf for strand board (softwood based) was 0.1%. The DOCf values are based on bioreactor laboratory research by Wang et al (2011).

Landfill gas combusted for energy recovery (module C4) is assumed to occur in a power plant with an electrical conversion efficiency of 36% (Australian Government 2014, p. 189) and the resulting electricity receives a credit for offsetting average electricity from the New Zealand grid (module D) in line with EN 16485:2014 (Section 6.3.4.5).

Cut off criteria

Personnel is excluded as per section 4.3.1 in the PCR (EPD International, 2021). thinkstep-anz consistently excludes environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process, ('capital goods') regardless of potential significance.

High-quality infrastructure-related data isn't always available and there is no clear cut-off for what to include. For this reason, capital goods data are applied to LCA studies inconsistently. This is expected to lead to reduced consistency and comparability of EPDs. Capital goods were previously excluded from EPDs, thus including capital goods in current EPDs would further reduce their comparability.

Assessment indicators

The results tables describe the different environmental indicators for each product per declared unit:

- The first table contains the environmental impact indicators, describing the potential environmental impacts of the product (Table 7).
- The second set of results show the resource indicators, describing the use of renewable and non-renewable material resources, renewable and non- renewable primary energy and water (Table 8).
- The third table displays the waste and other outputs (Table 9).
- The fourth table includes the additional environmental impact indicators (Table 10).
- EN15804+A2 (CEN, 2019) requires the declaration of biogenic carbon content of the product and its packaging (Table 11).
- The last table contains results for EN15804+A1 (CEN, 2013) environmental indicators to allow for backward comparison.

Life cycle inventory (LCI) data and assumption

Disclaimers to the declaration of core and additional environmental impact indicators are provided in this section to be referred to from the results tables.

Table 7: Environmental impact indicators for life cycle impact assessment

Indicator	Abbrev.	Unit
Climate change – total	GWP-total	kg CO_2-eq.
Climate change - fossil	GWP-fossil	kg CO_2-eq.
Climate change - biogenic	GWP-biogenic	kg CO_2-eq.
Climate change - land use and land use change	GWP-luluc	kg CO_2-eq.
Ozone depletion	ODP	kg CFC11-eq.
Acidification	AP	Mole of H+ eq.
Eutrophication aquatic freshwater	EP-fw	kg P eq.
Eutrophication aquatic marine	EP-fm	kg N eq.
Eutrophication terrestrial	EP-tr	Mole of N eq.
Photochemical ozone formation	POCP	kg NMVOC eq.
Depletion of abiotic resources - minerals and metals*	ADP-mm	kg Sb-eq.
Depletion of abiotic resources - fossil fuels*	ADP-fossil	MJ
Water use*	WDP	m^3 world equiv.

*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 experience with the indicator.

Table 8: Life cycle inventory indicators on use of resources

Indicator	Abbreviation	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ, NCV
Use of renewable primary energy resources used as raw materials	PERM	MJ, NCV
Total use of renewable primary energy resources	PERT	MJ, NCV
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, NCV
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ, NCV
Total use of non-renewable primary energy resources	PENRT	MJ, NCV
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ, NCV
Use of non-renewable secondary fuels	NRSF	MJ, NCV
Total use of net fresh water	FW	m^3

Table 9: Life cycle inventory indicators on waste categories and output flows

Indicator	Abbreviation	Unit
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Components for reuse	CRU	kg
Materials for energy recovery	MER	kg
Materials for recycling	MFR	kg
Exported electrical energy	EEE	MJ
Exported thermal energy	EET	MJ

Table 10: Additional environmental impact indicators

Indicator	Abbreviation	Unit
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.
Respiratory inorganics	PM	Disease incidences
Ionizing radiation - human health***	IRP	kBq U235 eq.
Eco-toxicity – freshwater*	ETP fw	CTUe
Human toxicity, cancer*	HTPc	CTUh
Human toxicity, non-canc.*	HTPnc	CTUh
Land use related impacts/soil quality*	SQP	Dimensionless

*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 experience with the indicator.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR. The indicator is more likely to be in line with other GHG reporting in Australia and New Zealand.

***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 some construction materials, is also not measured by this indicator.

Table 11: Biogenic carbon content indicators

Indicator	Abbrev.	Unit
Biogenic carbon content - product	BCC-prod	kg C
Biogenic carbon content - packaging	BCC-pack	kg C

Table 12: EN15804+A1 indicators

EN15804+A1		Unit
Global warming potential (total)	GWP	kg CO_2 eq.
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.
Acidification potential of land and water	AP	kg SO_2-eq.
Eutrophication potential	EP	kg PO_4^3-eq.
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.
Abiotic depletion potential – elements	ADPE	kg Sb-eq.
Abiotic depletion potential – fossil fuels	ADPF	MJ

Table 13: Core environmental impact indicators for 1m² of 115 mm wall panels

Environmental impact		Unit	A1-A3	C1	C2	C3	C4	D
Climate change – total	GWP	kg CO_2 eq.	11.4	0.0152	0.172	0	34.1	-0.00680
Climate change - fossil	GWPf	kg CO_2-eq	40.0	0.0152	0.165	0	2.21	-0.00673
Climate change - biogenic	GWPb	kg CO_2 eq	-28.6	0	0.00724	0	31.9	5.41E-05
Climate change - land use and land use change	GWPluc	kg CO_2 eq	0.0346	3.07E-07	3.44E-06	0	0.00158	1.18E-06
Ozone Depletion	ODP	kg CFC11-eq.	2.98E-06	2.24E-18	2.52E-17	0	5.31E-15	-2.77E-17
Acidification	AP	Mole of H_+ eq.	0.182	7.65E-05	3.69E-04	0	0.00791	-1.74E-05
Eutrophication aquatic freshwater	EPfw	kg P eq.	1.86E-04	2.51E-09	2.81E-08	0	1.26E-04	-2.35E-08
Eutrophication aquatic marine	EPm	kg N eq.	0.0470	3.63E-05	1.60E-04	0	0.00226	-6.97E-06
Eutrophication terrestrial	EPt	Mole of N eq.	0.507	3.97E-04	0.00177	0	0.0248	7.46E-05
Photochemical ozone formation	POFP	kg NMVOC eq.	0.153	1.02E-05	3.55E-04	0	0.00651	-1.82E-05
Depletion of abiotic resources - minerals and metals*	ADPmm	kg Sb-eq.	9.27E-05	2.35E-10	2.64E-09	0	2.31E-07	-1.18E-10
Depletion of abiotic resources - fossil fuels*	ADPf	MJ	786	0.202	2.27	0	31.6	-0.0822
Water use*	WDP	m^3 world equiv.	7.60	9.77E-05	0.00112	0	-0.0177	-0.00906

Table 14: Resource use indicators for 1m² of 115 mm wall panels

Resource use		Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	355	9.86E-04	0.0111	0	3.07	-0.292
Renewable primary energy resources as material utilization	PERM	MJ	258	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	613	9.86E-04	0.0111	0	3.07	-0.292
Non-renewable primary energy as energy carrier	PENRE	MJ	734	0.202	2.27	0	31.7	-0.0822
Non-renewable primary energy as material utilization	PENRM	MJ	52.2	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	786	0.202	2.22	0	31.7	-0.0822
Use of secondary material	SM	kg	0	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0.00170	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0.0177	0	0	0	0	0
Use of net fresh water	FW	m^3	0.230	1.92E-06	2.20E-05	0	0.00261	-7.35E-04

Table 15: Waste material and output flow indicators for 1m² of 115mm wall panels

Waste categories and output flows		Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	3.83E-05	7.29E-13	8.18E-12	0	3.05E-09	-2.18E-11
Non-hazardous waste disposed	NHWD	kg	4.12	4.83E-06	5.42E-05	0	23.6	-4.58E-05
Radioactive waste disposed	RWD	kg	0.00923	2.79E-08	3.13E-07	0	1.68E-04	-3.43E-08
Components for re-use	CRU	kg	0	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0.160	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0

Table 16 Additional environmental impact indicators for 1m² of 115mm wall panels

Additional Indicators		Unit	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	40.9	0.0152	0.164	0	2.64	-0.00677
Respiratory inorganics	PM	Disease incidences	4.75E-06	8.79E-10	2.48E-09	0	6.43E-08	-1.05E-11
Ionizing radiation - human health***	IR	kBq U235 eq.	1.33	3.27E-06	3.67E-05	0	0.0156	-3.94E-06
Eco-toxicity - freshwater*	ETf	CTUe	414	0.0772	0.866	0	22.6	-0.714
Human toxicity, cancer*	HTc	CTUh	3.93E-07	1.32E-12	1.48E-11	0	1.19E-09	-3.46E-12
Human toxicity, non-canc.*	HTnc	CTUh	6.48E-07	6.77E-11	5.76E-10	0	1.16E-07	-1.79E-11
Land use related impacts/soil quality*	LU	Pt	4,160	5.18E-04	0.00581	0	1.89	-0.0415

Table 17: Biogenic carbon content indicators for 1m² of 115mm wall panels

Indicator	Abbrev.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg C	7.81
Biogenic carbon content - packaging	BCC-pack	kg C	0.336

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2

Table 18: EN15804+A1 indicators for 1m² of 115mm wall panels

EN15804+A1		Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (total)	GWP	kg CO_2-eq.	6.10	0.0150	0.170	0	2.49	-0.00663
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.	3.03E-06	2.99E-18	3.35E-17	0	7.07E-15	-3.69E-17
Acidification potential of land and water	AP	kg SO_2-eq.	0.145	5.35E-05	2.63E-04	0	0.00620	-1.27E-05
Eutrophication potential	EP	kg PO_4^{3-}- eq.	0.0189	1.22E-05	5.45E-05	0	0.00161	-2.65E-06
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	0.0187	5.02E-06	-5.81E-05	0	3.87E-04	-1.09E-06
Abiotic depletion potential - elements	ADPE	kg Sb-eq.	9.27E-05	2.316E-10	2.64E-09	0	2.32E-07	-1.18E-09
Abiotic depletion potential - fossil fuels	ADPF	MJ	732	0.202	2.26	0	30.7	-0.0819

Table 19: Core environmental impact indicators for 1m² of 165mm wall panels

Environmental impact		Unit	A1-A3	C1	C2	C3	C4	D
Climate change - total	GWP	kg CO_2-eq.	20.8	0.0197	0.223	0	41.2	-0.00995
Climate change - fossil	GWPf	kg CO_2-eq	54.1	0.0197	0.213	0	2.82	-0.00986
Climate change - biogenic	GWPb	kg CO_2-eq	-33.3	0	0.00938	0	38.4	-7.92E-05
Climate change - land use and land use change	GWPluc	kg CO_2-eq	0.0481	3.97E-07	4.46E-06	0	0.00201	-1.73E-05
Ozone Depletion	ODP	kg CFC11-eq.	2.87E-06	2.90E-18	3.26E-17	0	6.78E-15	-4.05E-17
Acidification	AP	Mole of H+ eq.	0.247	9.91E-05	4.78E-04	0	0.0102	-2.54E-05
Eutrophication aquatic freshwater	EPfw	kg P eq.	2.33E-04	3.24E-09	3.64E-08	0	2.18E-04	-3.44E-08
Eutrophication aquatic marine	EPm	kg N eq.	0.0633	4.70E-05	2.08E-04	0	0.00291	-1.02E-05
Eutrophication terrestrial	EPt	Mole of N eq.	0.687	5.14E-04	0.00229	0	0.0319	-1.09E-05
Photochemical ozone formation	POFP	kg NMVOC eq.	0.207	1.31E-04	4.60E-04	0	0.00839	-2.67E-05
Depletion of abiotic resources - minerals and metals*	ADPmm	kg Sb-eq.	1.98E-04	3.05E-10	3.42E-09	0	3.05E-07	-1.73E-09
Depletion of abiotic resources - fossil fuels*	ADPf	MJ	1,070	0.262	2.94	0	40.4	-0.120
Water use*	WDP	m^3 world equiv.	11.2	1.29E-04	0.00145	0	-0.0165	-0.00133

Table 20: Resource use indicators for 1m² of 165mm wall panels

Resource use		Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	424	0.00128	0.0143	0	3.91	-0.427
Renewable primary energy resources as material utilization	PERM	MJ	303	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	727	0.00128	0.0143	0	3.91	-0.427
Non-renewable primary energy as energy carrier	PENRE	MJ	985	0.262	2.94	0	40.5	-0.120
Non-renewable primary energy as material utilization	PENRM	MJ	86.7	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	1,070	0.262	2.94	0	40.5	-0.120
Use of secondary material	SM	kg	0	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0.00164	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0.0171	0	0	0	0	0
Use of net fresh water	FW	m^3	0.332	2.54E-06	2.84E-05	0	0.00342	-0.00108

Table 21: Waste material and output flow indicators for 1m² of 165mm wall panels

Waste categories and output flows		Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	3.69E-05	9.44E-13	1.06E-11	0	3.89E-09	-3.20E-11
Non-hazardous waste disposed	NHWD	kg	3.69	6.26E-06	7.02E-05	0	30.5	-6.70E-05
Radioactive waste disposed	RWD	kg	0.0125	3.61E-08	4.05E-07	0	2.19E-04	-5.03E-08
Components for re-use	CRU	kg	0	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0.235	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0

Table 22: Additional environmental impact indicators for 1m² of 165mm wall panels

Additional Indicators		Unit	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	54.7	0.0197	0.213	0	3.45	-0.00992
Respiratory inorganics	PM	Disease incidences	6.69E-06	1.14E-09	3.21E-09	0	8.35E-08	-1.54E-11
Ionizing radiation - human health***	IR	kBq U235 eq.	1.84	4.23E-06	4.75E-05	0	0.0202	-5.77E-06
Eco-toxicity - freshwater*	ETf	CTUe	594	0.100	1.12	0	32.1	-0.105
Human toxicity, cancer*	HTc	CTUh	6.01E-07	1.71E-12	1.91E-11	0	1.54E-09	-5.06E-12
Human toxicity, non-canc.*	HTnc	CTUh	8.15E-07	8.77E-11	7.46E-10	0	1.51E-07	-2.63E-11
Land use related impacts/soil quality*	LU	Pt	5,930	6.71E-04	0.00753	0	2.47	-0.0608

Table 23: Biogenic carbon content indicators for 1m² of 165mm wall panels

Indicator	Abbrev.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg C	9.24
Biogenic carbon content - packaging	BCC-pack	kg C	0.122
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2			

Table 24: EN15804+A1 indicators for 1m² of 165mm wall panels

EN15804+A1		Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (total)	GWP	kg CO_2-eq.	16.0	0.0194	0.220	0	3.27	-0.00970
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.	2.91E-06	3.87E-18	4.34E-17	0	9.04E-15	-5.40E-17
Acidification potential of land and water	AP	kg SO_2-eq.	0.197	6.93E-05	3.40E-04	0	0.00800	-1.86E-05
Eutrophication potential	EP	kg PO_4^3-eq.	0.0248	1.57E-05	7.05E-05	0	0.00245	-3.89E-06
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	0.0256	6.50E-06	-7.53E-05	0	5.00E-04	-1.59E-06
Abiotic depletion potential - elements	ADPE	kg Sb-eq.	1.98E-04	3.05E-10	3.42E-09	0	3.07E-07	-1.73E-09
Abiotic depletion potential - fossil fuels	ADPF	MJ	992	0.261	2.93	0	39.0	-0.120

165mm Panels (Roof)

Table 25: Core environmental impact indicators for 1m² of 165mm roof panels

Environmental impact		Unit	A1-A3	C1	C2	C3	C4	D
Climate change - total	GWP	kg CO_2-eq.	16.2	0.0226	0.255	0	49.9	-0.0139
Climate change - fossil	GWPf	kg CO_2-eq	56.0	0.0226	0.244	0	3.42	-0.0138
Climate change - biogenic	GWPb	kg CO_2-eq	-39.8	0	0.0107	0	46.5	-1.11E-04
Climate change - land use and land use change	GWPluc	kg CO_2-eq	0.0582	4.54E-07	5.10E-06	0	0.00239	-2.42E-05
Ozone Depletion	ODP	kg CFC11-eq.	2.87E-06	3.32E-18	3.73E-17	0	8.21E-15	-5.66E-17
Acidification	AP	Mole of H+ eq.	0.260	1.13E-04	5.46E-04	0	0.0122	-3.55E-05
Eutrophication aquatic freshwater	EPfw	kg P eq.	2.57E-04	3.71E-09	4.16E-08	0	2.19E-04	-4.80E-08
Eutrophication aquatic marine	EPm	kg N eq.	0.0689	5.37E-05	2.38E-04	0	0.00349	-1.43E-05
Eutrophication terrestrial	EPt	Mole of N eq.	0.747	5.88E-04	0.00262	0	0.0382	-1.53E-04
Photochemical ozone formation	POFP	kg NMVOC eq.	0.222	1.50E-04	5.26E-04	0	0.00101	-3.73E-05
Depletion of abiotic resources - minerals and metals*	ADPmm	kg Sb-eq.	1.98E-04	3.49E-10	3.91E-09	0	3.61E-07	-2.41E-09
Depletion of abiotic resources - fossil fuels*	ADPf	MJ	1,100	0.299	3.36	0	48.9	-0.168
Water use*	WDP	m^3 world equiv.	11.9	1.48E-04	0.00166	0	-0.0252	-0.00185

Table 26: Resource use indicators for 1m² of 165mm roof panels

Resource use		Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	529	0.00146	0.0164	0	4.75	-0.596
Renewable primary energy resources as material utilization	PERM	MJ	360	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	889	0.00146	0.0164	0	4.75	-0.596
Non-renewable primary energy as energy carrier	PENRE	MJ	1,020	0.299	3.36	0	49.0	-0.168
Non-renewable primary energy as material utilization	PENRM	MJ	88.3	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	1,100	0.299	3.36	0	49.0	-0.168
Use of secondary material	SM	kg	0	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0.00164	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0.0171	0	0	0	0	0
Use of net fresh water	FW	m^3	0.357	2.90E-06	3.25E-05	0	0.00409	-0.00150

Table 27: Waste material and output flow indicators for 1m² of 165mm roof panels

Waste categories and output flows		Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	3.70E-05	1.08E-12	1.21E-11	0	4.72E-09	-4.46E-11
Non-hazardous waste disposed	NHWD	kg	3.79	7.16E-06	8.03E-05	0	34.9	-9.36E-05
Radioactive waste disposed	RWD	kg	0.0128	4.13E-08	4.63E-07	0	2.62E-04	-7.02E-08
Components for re-use	CRU	kg	0	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0.328	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0

Table 28: Additional environmental impact indicators for 1m² of 165mm roof panels

Additional Indicators		Unit	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	56.6	0.0225	0.243	0	4.30	-0.00138
Respiratory inorganics	PM	Disease incidences	8.45E-06	1.30E-09	3.68E-09	0	9.85E-08	-2.15E-10
Ionizing radiation - human health***	IR	kBq U235 eq.	1.94	4.84E-06	5.43E-05	0	0.0242	-8.06E-06
Eco-toxicity - freshwater*	ETf	CTUe	609	0.114	1.28	0	36.3	-1.46
Human toxicity, cancer*	HTc	CTUh	6.02E-07	1.95E-12	2.19E-11	0	1.84E-09	-7.07E-12
Human toxicity, non-canc.*	HTnc	CTUh	8.58E-07	1.00E-10	8.54E-10	0	1.80E-07	-3.67E-11
Land use related impacts/soil quality*	LU	Pt	8,380	7.68E-04	0.00861	0	2.92	-0.0849

Table 29: Biogenic carbon content indicators for 1m² of 165mm roof panels

Indicator	Abbrev.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg C	11.0
Biogenic carbon content - packaging	BCC-pack	kg C	0.122
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2			

Table 30: EN15804+A1 indicators for 1m² of 165mm roof panels

EN15804+A1		Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (total)	GWP	kg CO_2-eq.	11.4	0.0222	0.251	0	4.06	-0.0135
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.	2.91E-06	4.43E-18	4.97E-17	0	1.09E-14	-7.55E-17
Acidification potential of land and water	AP	kg SO_2-eq.	0.206	7.92E-05	3.89E-04	0	0.00959	-2.60E-05
Eutrophication potential	EP	kg PO_4^{3-} eq.	0.0269	1.80E-05	8.07E-05	0	0.00265	-5.43E-06
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	0.0259	7.44E-06	-8.61E-05	0	6.32E-04	-2.22E-06
Abiotic depletion potential - elements	ADPE	kg Sb-eq.	1.98E-04	3.49E-10	3.91E-09	0	3.63E-07	-2.41E-09
Abiotic depletion potential - fossil fuels	ADPF	MJ	1,020	0.299	3.35	0	47.4	-0.168

165mm Panels (Floor)

Table 31: Core environmental impact indicators for 1m² of 165mm floor panels

Environmental impact		Unit	A1-A3	C1	C2	C3	C4	D
Climate change - total	GWP	kg CO_2-eq.	18.6	0.0204	0.230	0	43.8	-0.0111
Climate change - fossil	GWPf	kg CO_2-eq	53.8	0.0204	0.220	0	2.99	-0.0110
Climate change - biogenic	GWPb	kg CO_2-eq	-35.3	0	0.00968	0	40.8	-8.85E-05
Climate change - land use and land use change	GWPluc	kg CO_2-eq	0.0507	4.10E-07	4.60E-06	0	0.00211	-1.94E-05
Ozone Depletion	ODP	kg CFC11-eq.	2.87E-06	3.00E-18	3.36E-17	0	7.19E-15	-4.53E-17
Acidification	AP	Mole of H+ eq.	0.249	1.02E-04	4.93E-04	0	0.0108	-2.84E-05
Eutrophication aquatic freshwater	EPfw	kg P eq.	2.39E-04	3.35E-09	3.76E-08	0	2.19E-04	-3.84E-08
Eutrophication aquatic marine	EPm	kg N eq.	0.0644	4.84E-05	2.14E-04	0	0.00307	-1.14E-05
Eutrophication terrestrial	EPt	Mole of N eq.	0.699	5.31E-04	0.00236	0	0.0337	-1.22E-04
Photochemical ozone formation	POFP	kg NMVOC eq.	0.210	1.36E-04	4.74E-04	0	0.00887	-2.98E-05
Depletion of abiotic resources - minerals and metals*	ADPmm	kg Sb-eq.	1.98E-04	3.15E-10	3.53E-09	0	3.21E-07	-1.93E-09
Depletion of abiotic resources - fossil fuels*	ADPf	MJ	1,060	0.270	3.03	0	42.8	-0.135
Water use*	WDP	m^3 world equiv.	11.3	1.33E-04	0.00149	0	-0.0196	-0.00148

Table 32: Resource use indicators for 1m² of 165mm floor panels

Resource use		Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	454	0.00132	0.0148	0	4.15	-0.477
Renewable primary energy resources as material utilization	PERM	MJ	320	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	774	0.00132	0.0148	0	4.15	-0.477
Non-renewable primary energy as energy carrier	PENRE	MJ	971	0.270	3.03	0	43.0	-0.135
Non-renewable primary energy as material utilization	PENRM	MJ	87.2	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	1,060	0.270	3.03	0	43.0	-0.135
Use of secondary material	SM	kg	0	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0.00164	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0.0171	0	0	0	0	0
Use of net fresh water	FW	m^3	0.336	2.62E-06	2.93E-05	0	0.00360	-0.00120

Table 33: Waste material and output flow indicators for 1m² of 165mm floor panels

Waste categories and output flows		Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	3.69E-05	9.75E-13	1.09E-11	0	4.13E-09	-3.57E-11
Non-hazardous waste disposed	NHWD	kg	3.71	6.46E-06	7.25E-05	0	31.5	-7.49E-05
Radioactive waste disposed	RWD	kg	0.0122	3.72E-08	4.18E-07	0	2.31E-04	-5.62E-08
Components for re-use	CRU	kg	0	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0.263	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0

Table 34: Additional environmental impact indicators for 1m² of 165mm floor panels

Additional Indicators		Unit	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	54.4	0.0203	0.220	0	3.70	-0.0111
Respiratory inorganics	PM	Disease incidences	7.18E-06	1.17E-09	3.32E-09	0	8.75E-08	-1.72E-10
Ionizing radiation - human health***	IR	kBq U235 eq.	1.81	4.37E-06	4.90E-05	0	0.0213	-6.45E-06
Eco-toxicity - freshwater*	ETf	CTUe	587	0.103	1.16	0	33.3	-0.117
Human toxicity, cancer*	HTc	CTUh	6.01E-07	1.76E-12	1.98E-11	0	1.62E-09	-5.66E-12
Human toxicity, non-canc.*	HTnc	CTUh	8.07E-07	9.05E-11	7.70E-10	0	1.59E-07	-2.94E-11
Land use related impacts/soil quality*	LU	Pt	6,660	6.92E-04	0.00777	0	2.59	-0.0680

Table 35: Biogenic carbon content indicators for 1m² of 165mm floor panels

Indicator	Abbrev.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg C	9.77
Biogenic carbon content - packaging	BCC-pack	kg C	0.122
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2			

Table 36: EN15804+A1 indicators for 1m² of 165mm floor panels

EN15804+A1		Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (total)	GWP	kg CO_2-eq.	13.8	0.0200	0.227	0	3.50	-0.01080
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.	2.91E-06	3.99E-18	4.48E-17	0	9.58E-15	-604E-17
Acidification potential of land and water	AP	kg SO_2-eq.	0.198	7.15E-05	3.51E-04	0	0.00844	-2.08E-05
Eutrophication potential	EP	kg PO_4^{3-} eq.	0.0252	1.63E-05	7.28E-05	0	0.00250	-4.34E-06
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	0.0254	6.71E-06	-7.77E-05	0	5.37E-04	-1.78E-06
Abiotic depletion potential - elements	ADPE	kg Sb-eq.	1.98E-04	3.15E-10	3.53E-09	0	3.23E-07	-1.93E-09
Abiotic depletion potential - fossil fuels	ADPF	MJ	980	0.270	3.02	0	41.5	-0.134

Table 37: Core environmental impact indicators for 1m² of 215mm roof panels

Environmental impact		Unit	A1-A3	C1	C2	C3	C4	D
Climate change - total	GWP	kg CO_2-eq.	18.9	0.0276	0.311	0	60.3	-0.0186
Climate change - fossil	GWPf	kg CO_2-eq	66.9	0.0276	0.298	0	4.20	-0.0184
Climate change - biogenic	GWPb	kg CO_2-eq	-48.1	0	0.0131	0	56.1	-1.48E-04
Climate change - land use and land use change	GWPluc	kg CO_2-eq	0.0743	5.56E-07	6.24E-06	0	0.00295	-3.23E-05
Ozone Depletion	ODP	kg CFC11-eq.	2.87E-06	4.06E-18	4.56E-17	0	1.01E-14	-7.56E-17
Acidification	AP	Mole of H+ eq.	0.306	1.39E-04	6.69E-04	0	0.0151	-4.75E-05
Eutrophication aquatic freshwater	EPfw	kg P eq.	2.99E-04	4.54E-09	5.09E-08	0	2.65E-04	-6.42-08
Eutrophication aquatic marine	EPm	kg N eq.	0.0826	6.57E-05	2.91E-04	0	0.00430	-1.91E-05
Eutrophication terrestrial	EPt	Mole of N eq.	0.896	7.20E-04	0.00320	0	0.0471	-2.04E-04
Photochemical ozone formation	POFP	kg NMVOC eq.	0.266	1.84E-04	6.43E-04	0	0.0125	-4.98E-05
Depletion of abiotic resources - minerals and metals*	ADPmm	kg Sb-eq.	3.51E-04	4.27E-10	4.78E-10	0	4.44E-07	-3.22E-09
Depletion of abiotic resources - fossil fuels*	ADPf	MJ	1,310	0.366	4.11	0	60.2	-0.225
Water use*	WDP	m^3 world equiv.	14.2	1.81E-04	0.00203	0	-0.0299	-0.0248

Table 38: Resource use indicators for 1m² of 215mm roof panels

Resource use		Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	652	0.00179	0.0200	0	5.81	-0.797
Renewable primary energy resources as material utilization	PERM	MJ	427	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	1,080	0.00179	0.0200	0	5.85	-0.797
Non-renewable primary energy as energy carrier	PENRE	MJ	1,200	0.366	4.11	0	60.3	-0.225
Non-renewable primary energy as material utilization	PENRM	MJ	107	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	1,310	0.366	4.11	0	60.3	-0.225
Use of secondary material	SM	kg	0	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0.00159	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0.0165	0	0	0	0	0
Use of net fresh water	FW	m^3	0.432	3.55E-06	3.98E-05	0	0.00506	-0.00201

Table 39: Waste material and output flow indicators for 1m² of 215mm roof panels

Waste categories and output flows		Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	3.60E-05	1.32E-12	1.48E-11	0	5.82E-09	-5.96E-11
Non-hazardous waste disposed	NHWD	kg	3.42	8.76E-06	9.83E-05	0	42.6	-1.25E-04
Radioactive waste disposed	RWD	kg	0.0153	5.05E-08	5.66E-07	0	3.23E-04	-9.38E-08
Components for re-use	CRU	kg	0	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0.438	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0

Table 40: Additional environmental impact indicators for 1m² of 215mm roof panels

Additional Indicators		Unit	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	67.2	0.0275	0.298	0	5.39	-0.0185
Respiratory inorganics	PM	Disease incidences	1.09E-05	1.59E-09	4.50E-09	0	1.21E-07	-12.87E-10
Ionizing radiation - human health***	IR	kBq U235 eq.	2.35	5.92E-06	6.64E-05	0	0.0298	-1.08E-05
Eco-toxicity - freshwater*	ETf	CTUe	724	0.140	1.57	0	44.4	-1.95
Human toxicity, cancer*	HTc	CTUh	6.08E-07	2.39E-12	2.68E-11	0	2.27E-09	-9.44E-12
Human toxicity, non-canc.*	HTnc	CTUh	1.01E-06	1.23E-10	1.04E-09	0	2.22E-07	-4.09E-11
Land use related impacts/soil quality*	LU	Pt	11,300	9.39E-04	0.0105	0	3.59	-0.113

Table 41: Biogenic carbon content indicators for 1m² of 215mm roof panels

Indicator	Abbrev.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg C	13.1
Biogenic carbon content - packaging	BCC-pack	kg C	0.202
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2			

Table 42: EN15804+A1 indicators for 1m² of 215mm roof panels

EN15804+A1		Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (total)	GWP	kg CO_2-eq.	14.5	0.0272	0.307	0	5.09	-0.0181
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.	2.83E-06	5.42E-18	6.08E-17	0	1.35E-14	-1.01E-16
Acidification potential of land and water	AP	kg SO_2-eq.	0.241	9.70E-05	4.76E-04	0	0.0118	-3.47E-05
Eutrophication potential	EP	kg PO_4^{3-} eq.	0.0319	2.20E-05	9.87E-05	0	0.00323	-7.25E-06
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	0.0306	9.10E-06	-1.05E-04	0	7.97E-04	-2.97E-06
Abiotic depletion potential - elements	ADPE	kg Sb-eq.	3.51E-04	4.27E-10	4.79E-09	0	4.46E-07	-3.22E-09
Abiotic depletion potential - fossil fuels	ADPF	MJ	1,210	0.366	4.10	0	58.4	-0.224

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Table 43: Core environmental impact indicators for 1m² of 215mm floor panels

Environmental impact		Unit	A1-A3	C1	C2	C3	C4	D
Climate change - total	GWP	kg CO_2-eq.	22.1	0.0246	0.277	0	51.9	-0.0148
Climate change - fossil	GWPf	kg CO_2-eq	63.9	0.0246	0.266	0	3.63	-0.0146
Climate change - biogenic	GWPb	kg CO_2-eq	-41.8	0	0.0117	0	48.3	-1.18E-04
Climate change - land use and land use change	GWPluc	kg CO_2-eq	0.0641	4.95E-07	5.56E-06	0	0.00256	-2.57E-05
Ozone Depletion	ODP	kg CFC11-eq.	2.78E-06	3.62E-18	4.06E-17	0	8.72E-14	-6.02E-17
Acidification	AP	Mole of H+ eq.	0.291	1.24E-04	5.96E-04	0	0.0131	-3.78E-05
Eutrophication aquatic freshwater	EPfw	kg P eq.	2.75E-04	4.05E-09	4.54E-08	0	2.65E-04	-5.11E-08
Eutrophication aquatic marine	EPm	kg N eq.	0.0765	5.85E-05	2.59E-04	0	0.00373	-1.52E-05
Eutrophication terrestrial	EPt	Mole of N eq.	0.831	6.41E-04	0.00285	0	0.0408	-1.62E-04
Photochemical ozone formation	POFP	kg NMVOC eq.	0.249	1.64E-04	5.73E-04	0	0.0108	-3.97E-05
Depletion of abiotic resources - minerals and metals*	ADPmm	kg Sb-eq.	3.51E-04	3.80E-10	4.26E-09	0	3.89E-07	-2.57E-09
Depletion of abiotic resources - fossil fuels*	ADPf	MJ	1,250	0.326	3.66	0	51.9	-0.179
Water use*	WDP	m^3 world equiv.	13.4	1.61E-04	0.00181	0	-0.0224	-0.0197

Table 44: Resource use indicators for 1m² of 215mm floor panels

Resource use		Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	PERE	MJ	550	0.00159	0.0178	0	5.03	-0.634
Renewable primary energy resources as material utilization	PERM	MJ	373	0	0	0	0	0
Total use of renewable primary energy resources	PERT	MJ	922	0.00159	0.0178	0	5.03	-0.634
Non-renewable primary energy as energy carrier	PENRE	MJ	1,140	0.326	3.66	0	52.0	-0.179
Non-renewable primary energy as material utilization	PENRM	MJ	105	0	0	0	0	0
Total use of non-renewable primary energy resources	PENRT	MJ	1,250	0.326	3.66	0	52.0	-0.179
Use of secondary material	SM	kg	0	0	0	0	0	0
Use of renewable secondary fuels	RSF	MJ	0.00159	0	0	0	0	0
Use of non-renewable secondary fuels	NRSF	MJ	0.0165	0	0	0	0	0
Use of net fresh water	FW	m^3	0.403	3.16E-06	3.55E-05	0	0.00440	-0.00160

Table 45: Waste material and output flow indicators for 1m² of 215mm floor panels

Waste categories and output flows		Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	HWD	kg	3.59E-05	1.18E-12	1.32E-11	0	5.01E-09	-4.75E-11
Non-hazardous waste disposed	NHWD	kg	3.30	7.80E-06	8.75E-05	0	38.0	-9.96E-05
Radioactive waste disposed	RWD	kg	0.0146	4.50E-08	5.05E-07	0	2.80E-04	-7.47E-08
Components for re-use	CRU	kg	0	0	0	0	0	0
Materials for recycling	MFR	kg	0	0	0	0	0	0
Materials for energy recovery	MER	kg	0	0	0	0	0	0
Exported electrical energy	EEE	MJ	0	0	0	0	0.349	0
Exported thermal energy	EET	MJ	0	0	0	0	0	0

Table 46: Additional environmental impact indicators for 1m² of 215mm floor panels

Additional Indicators		Unit	A1-A3	C1	C2	C3	C4	D
IPCC AR5 GWP-GHG**	GWP-GHG	kg CO_2-eq.	64.2	0.0245	0.265	0	4.57	-0.0147
Respiratory inorganics	PM	Disease incidences	9.19E-06	1.42E-09	4.01E-09	0	1.06E-07	-2.28E-10
Ionizing radiation - human health***	IR	kBq U235 eq.	2.18	5.28E-06	5.92E-05	0	0.0259	-8.57E-06
Eco-toxicity - freshwater*	ETf	CTUe	695	0.125	1.40	0	40.3	-1.55
Human toxicity, cancer*	HTc	CTUh	6.07E-07	2.13E-12	2.39E-11	0	1.97E-09	-7.52E-12
Human toxicity, non-canc.*	HTnc	CTUh	9.36E-07	1.09E-10	9.30-10	0	1.93E-07	-3.90E-11
Land use related impacts/soil quality*	LU	Pt	8,910	8.37E-04	0.00938	0	3.14	-0.0903

Table 47: Biogenic carbon content indicators for 1m² of 215mm floor panels

Indicator	Abbrev.	Unit	A1-A3
Biogenic carbon content - product	BCC-prod	kg C	11.4
Biogenic carbon content - packaging	BCC-pack	kg C	0.202
Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2			

Table 48: EN15804+A1 indicators for 1m² of 215mm floor panels

EN15804+A1		Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential (total)	GWP	kg CO_2-eq.	17.8	0.0242	0.274	0	4.32	-0.0144
Depletion potential of the stratospheric ozone layer	ODP	kg CFC11-eq.	2.83E-06	4.83E-18	5.41E-17	0	1.16E-14	-8.03E-17
Acidification potential of land and water	AP	kg SO_2-eq.	0.230	8.64E-05	4.24E-04	0	0.0102	-2.77E-05
Eutrophication potential	EP	kg PO_4^{3-} eq.	0.0295	1.96E-05	8.79E-05	0	0.00303	-5.77E-06
Photochemical ozone creation potential	POCP	kg C_2H_4-eq.	0.0299	8.11E-06	-9.38E-05	0	6.67E-04	-2.37E-06
Abiotic depletion potential - elements	ADPE	kg Sb-eq.	3.51E-04	3.80E-10	4.27E-10	0	3.91E-07	-2.56E-09
Abiotic depletion potential - fossil fuels	ADPF	MJ	1,150	0.326	3.65	0	50.2	-0.178

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General Information

An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

The results for EN15804+A1 (CEN, 2013) compliant EPDs are not comparable with EN15804+A2 (CEN, 2020) compliant studies as the methodologies are different. Results that are A1 compliant are given in this document to assist comparability across EPDs.

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General Information

CEN standard EN 15804+A2 served as the core PCR

PCR:	PCR 2019.14 Construction Products Version 1.11, 2021-02-05 of the International EPD® System
PCR review was conducted by:	The Technical Committee of the International EPD® System
Chair:	Martin Erlandsson. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025:	☐ EPD process certification (Internal) ☑ EPD verification (External)
Third party verifier: **Approved by:**	Andrew D. Moore Life Cycle Logic Pty. Ltd Website: lifecyclelogic.com.au Email: Andrew@lifecyclelogic.com.au Post: PO Box 571 Fremantle WA 6959 Australia EPD Australasia
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