Statement of Verification

BREG EN EPD No.: 000486 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Klasse Group

BRE Global Verified EPD

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

1m2 of Cement Board

Company Address

Klasse Group
Beacon House,
Queensway,
Swansea West Business Park,
Swansea
SA5 4DH

Klasse

Signed for BRE Global Ltd	Emma Baker Operator	09 May 2023 Date of this Issue
09 May 2023 Date of First Issue		08 May 2028 Expiry Date

BRE Global Verified EPD

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ECO PLATFORM EPD VERIFIED

Environmental Product Declaration

EPD Number: 000486

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013
Commissioner of LCA study	**LCA consultant/Tool**
Klasse Group Beacon House, Queensway, Swansea West Business Park, Swansea SA5 4DH	BRE LINA 2.0 Bala Subramanian
Declared/Functional Unit	**Applicability/Coverage**
1 m² of cement board	Product specific.
EPD Type	**Background database**
Cradle to Gate with options	ecoinvent 3.2

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Nigel Jones
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A1:2013 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Klasse Group
Beacon House,
Swansea West Business Park,
Swansea
SA5 4DH

Construction Product

Product Description

Fibre cement board product is generally made by preheating and autoclave the slurry prepared from mixing the raw materials like silica, cellulose fibre, cement, additives etc. with water. This method gives the sheet uniform thickness.

The C – boards (fibre cement boards) are manufactured using cement, cellulose fibres, and special additives as per IS:14862- 2000 in a laminar process to give a stable crystalline structure which makes the board durable and dimensionally stable and provides superior sound and thermal insulation properties.

S - Board (Calcium silicate board) is Klasse's flagship product in the green line up is S- boards. It is a calcium silicate board made from siliceous and calcareous material reinforced with cellulose fibres. The boards are made in a laminar process and then autoclaved to give a stable crystalline structure. S- boards finds niche applications across wide spectrum of industries including Pharma, Hospitality, Textile, Engineering, Information Technology and Medical care.

S -Board is available in a range of thicknesses from 6mm to 16mm and C-Board is available in range of thicknesses from 4mm to 18mm; as a representative among the different thicknesses in both C and S Board, this EPD calculates the impact of 12mm S-Board and C-Board (the most selling product in the UK), and the end-user table has been provided to enable the impacts of other thicknesses.

S- Board available thicknesses	Kg/m²
6mm	6.25
8mm	8.33
9mm	9.37
10mm	10.42
12mm	12.5
16mm	16.67

C- Board available thicknesses	Kg/m²
4mm	5.81
6mm	8.72
8mm	11.62
10mm	14.53
12mm	17.43
16mm	23.24
18mm	26.15

Technical Information

Property	S - Board	C - Board
Thickness mm	6, 8, 9, 10, 12, 16	4, 6, 8, 10, 12, 16 and 18
Nominal Length mm	595, 610, 1195, 1220, 1830 and 2440	595, 610, 1195, 1220, 1830 and 2440
Nominal Width mm	595, 610 and 1220	595, 610 and 1220
Apparent Density (Dry) kg/m^3	900 (+/- 50)	> 1200
Impact Strength J/m^2	>1900	> 2100
Bending strength MPa	Longitudinal – 10 & Transvers – 5.5	20 - Parallel, 18 - Perpendicular
Screw Withdrawal Strength N	>1500	> 1500 (Typical 1850)
Moisture Content (EMC) %	<15	12
Dry/Wet Shrinkage %	0.10	≤ 0.19
Water absorption %	60 – 65	38
Alkalinity	9-10	8 - 9
Thermal Conductivity W/mK	0.15	0.18

Note: Technical properties of all products assessed within this average EPD

Figure 1 S-Board

Figure 2 C- Board

Main Product Contents

Product contents of S-Board and C-Board

Material/Chemical Input	S- Board (%)	C- Board (%)
Cellulose pulp	4.39%	5.32%
Silica	10.49%	9.35%
Fly Ash	8.48%	17.21%
Portland cement	12.85%	27.60%
Lime	16.27%	7.53%
Other (water)	47.53%	33.00%

Note: Main product contents of all products assessed within this average EPD

Manufacturing Process

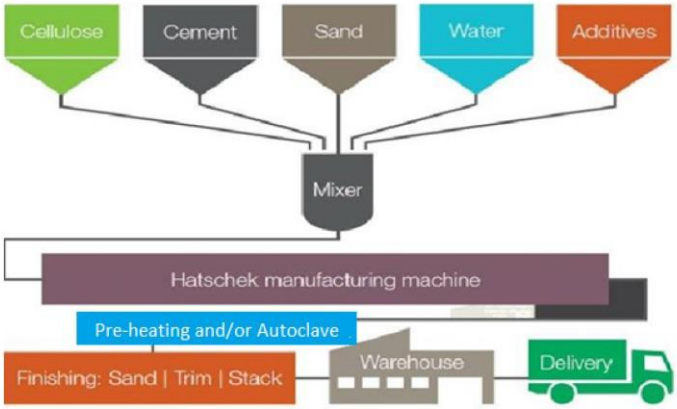
Raw Material Mixing: Mix of raw materials (silica, fly ash, lime, cellulose fibre and Portland cement) to form a slurry to which additives and other compounds are added depending on the desired properties.

Production: Composite production by Hatschek process through deposition of slurry on a porous fabric belt positioned on a series of support rolls depending on the desired thickness (from 4 to 18 millimetres).

Pre- heating and/or Autoclave: Moisture is mostly drained off by the application of vacuum to the slurry and product final shape and dimensions are obtained.

Storage and Dispatch: The fibre cement product is then stored in warehouses which is then dispatched to the corresponding locations.

Process flow diagram



Construction Installation

S-board: Construction board that is an outer structural layer of the building wall used to strengthen the building structure and create a perfect base for siding or other finishing materials. It has passive fire protection in external sheathing or for roofs, floors, ceilings, and internal partitions. Install boards vertically in a staggered brick pattern. Locate screw at least 13mm and no more than 20mm from the board edges. Fix to studs at 300mm maximum centres.

C-Board: Construction board that is an outer structural layer of the building wall used to strengthen the building structure and create a perfect base for siding or other finishing materials. High density, high impact resistant

board can also be used in all types of façade solutions as well as many floor and roof constructions. Install boards vertically in a staggered brick pattern. Locate screw at least 13mm and no more than 20mm from the board edges. Fix to studs at 300mm maximum centres.

Life Cycle Assessment Calculation Rules

Declared unit description.

The functional unit used for conducting the LCA is 1 m² of cement board.

System boundary

This is a cradle-to-gate with options study that follows the modular design defined in EN 5804:2012+A1:2013. The LCA models and reports the modules, A1 to A3, A4, and A5.

Data sources, quality and allocation

Datasets are derived from Ecoinvent v3.2 (2015) and the LCA tool used was BRE LINA v2.0. The quantity used in the data collection for this EPD is therefore the total amount of C-Board and S-Board distributed in the UK over the period of one year from 01/01/2022 to 31/12/2022.

In this EPD, manufacturing taken from the existing board EPD and combined with Klasse impacts for storage and distribution. Klasse Group receives the fully manufactured cement boards from India, where they are stored in the warehouse and distributed all around the UK. Further Klasse provided the manufacturer's EPD, where the environmental impacts are calculated using the Gabi dataset and the PCR used is EN 15804 and ISO 14025. The LCA analysis has been accomplished for the different thicknesses in S-Board and C-Board. The functional unit used for the LCA analysis is 1 m² of calcium silicate board. In this EPD, 12mm C and S Board is chosen as a representative among the other thicknesses because it has the highest selling percentage in the UK. By taking the A1-A3 impacts of 12mm thickness from the manufacturer's EPD, it is converted to kg and fed into the LINA as a raw material to calculate the impacts from storage, transportation etc.

Klasse group distributes other products in addition to C and S-Board, therefore the allocation of electricity and fuel was required, and this has been done according to the provisions of the BRE PCR PN514 and EN15804. The original data collection form has been used while doing an LCA analysis and there was a no uplift in the given data.

No ancillary materials are used and Klasse receives the silicate boards as a fully packed, so no additional packaging involved during the distribution. The transportation distance from the manufacturing site to storage unit is included. The emissions to water and soil, which are not measured.

ISO14044 guidance. **Quality Level**	**Geographical representativeness**	**Technical representativeness**	**Time representativeness**
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e., identical technology).	n/a
Fair	n/a	n/a	There is approximately 5-6 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Electricity used for storage was the UK grid electricity. Secondary data has been drawn from the BRE LINA database v2.1.27. The background LCI datasets are based on ecoinvent v3.2 (2015) which was used for all other material energy and waste data requirements. The quality level of geographical and technical representativeness is therefore Very Good. The quality level of time representativeness is Fair as the background LCI datasets are based on ecoinvent v3.2 which was compiled in 2015. Therefore, there is approximately 5-6 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

All the raw materials, process energy, fuels, have been included. Direct emissions to air, water, and soil are not measured and no ancillary materials, packaging and water is used during the storage

LCA Results - 1 m² of 12mm S – Board (Calcium silicate board) at 12.5 kg/m²

Parameters describing environmental impacts

			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO2 equiv.	kg CFC 11 equiv.	kg SO2 equiv.	kg (PO4)3- equiv.	kg C2H4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	1.02E+01	1.08E-10	7.00E-02	5.86E-03	4.21E-03	6.39E-06	7.48E+01
	Transport	A2	2.08E+00	3.48E-07	3.62E-02	4.20E-03	2.66E-03	1.67E-06	3.00E+01
	Manufacturing	A3	4.43E-03	6.29E-10	3.04E-05	7.41E-06	4.27E-06	2.85E-09	6.53E-02
	Total	A1-3	1.23E+01	3.49E-07	1.06E-01	1.01E-02	6.88E-03	8.06E-06	1.05E+02
Construction process stage	Transport	A4	1.18E+00	2.17E-07	3.94E-03	1.04E-03	6.87E-04	3.10E-06	1.78E+01
	Construction	A5	5.00E+00	2.02E-07	1.79E-02	1.08E-02	3.43E-03	3.83E-05	4.12E+01

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels;

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	7.58E+01	1.20E+01	8.77E+01	7.70E+01	0.00E+00	7.70E+01
	Transport	A2	6.72E-01	9.21E-07	6.72E-01	3.05E+01	0.00E+00	3.05E+01
	Manufacturing	A3	2.30E-03	4.28E-09	2.30E-03	7.26E-02	0.00E+00	7.26E-02
	Total	A1-3	7.64E+01	1.20E+01	8.84E+01	1.08E+02	0.00E+00	1.08E+02
Construction process stage	Transport	A4	2.36E-01	8.79E-07	2.36E-01	1.77E+01	0.00E+00	1.77E+01
	Construction	A5	6.22E+00	4.79E-01	6.69E+00	4.41E+01	0.00E+00	4.41E+01

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

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water

			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	3.60E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	7.15E-03
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	1.35E-05
	Total	A1-3	0.00E+00	0.00E+00	0.00E+00	3.67E-01
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	3.85E-03
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	9.87E-02

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

Other environmental information describing waste categories

			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	5.12E-07	1.70E-01	8.66E-04
	Transport	A2	1.27E-02	3.28E-01	2.05E-04
	Manufacturing	A3	2.99E-05	5.89E-05	4.73E-07
	Total	A1-3	1.27E-02	4.98E-01	1.07E-03
Construction process stage	Transport	A4	7.45E-03	8.29E-01	1.23E-04
	Construction	A5	7.92E-01	1.12E+00	1.42E-04

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

Other environmental information describing output flows – at end of life

			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	7.24E+00	6.07E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling
MER = Materials for energy recovery;
EE = Exported Energy

LCA Results - 1 m² of 12mm C – Board (Fibre cement board) with 17.43 kg/m²

Parameters describing environmental impacts

			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO2 equiv.	kg CFC 11 equiv.	kg SO2 equiv.	kg (PO4)3- equiv.	kg C2H4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	1.05E+01	1.18E-10	6.70E-02	4.87E-03	3.39E-03	9.38E-06	8.41E+01
	Transport	A2	2.90E+00	4.85E-07	5.05E-02	5.85E-03	3.72E-03	2.32E-06	4.19E+01
	Manufacturing	A3	5.76E-03	8.09E-10	3.94E-05	9.59E-06	5.47E-06	3.79E-09	8.51E-02
	Total	A1-3	1.34E+01	4.86E-07	1.18E-01	1.07E-02	7.11E-03	1.17E-05	1.26E+02
Construction process stage	Transport	A4	1.64E+00	3.02E-07	5.49E-03	1.45E-03	9.58E-04	4.32E-06	2.48E+01
	Construction	A5	1.31E+01	6.03E-07	5.12E-02	1.76E-02	5.23E-03	4.59E-05	1.35E+02

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels;

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	4.71E+01	1.39E+01	6.10E+01	8.64E+01	0.00E+00	8.64E+01
	Transport	A2	9.38E-01	1.28E-06	9.38E-01	4.26E+01	0.00E+00	4.26E+01
	Manufacturing	A3	3.10E-03	5.76E-09	3.10E-03	9.51E-02	0.00E+00	9.51E-02
	Total	A1-3	4.80E+01	1.39E+01	6.19E+01	1.29E+02	0.00E+00	1.29E+02
Construction process stage	Transport	A4	3.29E-01	1.23E-06	3.29E-01	2.46E+01	0.00E+00	2.46E+01
	Construction	A5	1.31E+01	5.56E-01	1.36E+01	1.69E+02	0.00E+00	1.69E+02

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

LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water

			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	4.00E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	9.97E-03
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	1.77E-05
	Total	A1-3	0.00E+00	0.00E+00	0.00E+00	5.00E-02
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	5.37E-03
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	1.11E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

Other environmental information describing waste categories

			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	4.75E-07	1.10E-01	9.12E-04
	Transport	A2	1.77E-02	4.57E-01	2.86E-04
	Manufacturing	A3	3.84E-05	7.82E-05	6.17E-07
	Total	A1-3	1.77E-02	5.67E-01	1.20E-03
Construction process stage	Transport	A4	1.04E-02	1.16E+00	1.71E-04
	Construction	A5	8.18E-01	2.14E+00	8.28E-04

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

Other environmental information describing output flows – at end of life

			CRU	MFR	MER	EE
			kg	kg	kg	MJ per energy carrier
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	9.35E+02	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling
MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	The cement boards will be stored in warehouses which is then dispatched to the corresponding locations.		
	Vehicle type	vehicle type	Lorry, 16 - 32 metric ton
	Distance	km	563.3
	Capacity utilisation (incl. empty returns)	%	26
	Bulk density of transported products	kg/m^3	342
A5 – Installation in the building	Install boards vertically in a staggered brick pattern. Locate screw at least 13mm and no more than 20mm from the board edges. Fix to studs at 300mm maximum centres.		
	Installation wastage rate	4	%
	Saw Blades	0.7	kg
	Drill bit – battery drill	0.6	kg
	Electricity	10	kWh
	Packaging wastes from installation	100% recycling	
	Board waste – 4% installation waste rate	100% landfill	

Interpretation of results

The bulk of the environmental impacts and primary energy demand are attributed to the upstream manufacturing process, covered by information modules A1-A3 of EN15804:2012+A1:2013.

Individual product calculations

The LCA results listed in the tables above are calculated for C-Board with 17.43 kg/m^2 and S- Board with 12.5 kg/m^2. The end-user of this EPD can therefore use these results to calculate impact for each thickness by using the weight per m^2. For example, in the below calculation table, the GWP impacts have been calculated for 1 kg/m^2, and the other impacts can be broken down to 1 kg/m^2, which will allow the end-user to calculate the impacts for the required thicknesses.

End- user calculation for S- Board

Thickness	**12mm**	**1**	**6mm**	**8mm**	**9mm**	**10mm**	**16mm**
kg/m2	**12.5**		**6.25**	**8.33**	**9.37**	**10.42**	**16.67**
A1	1.02E+01	8.16E-01	5.10E+00	6.80E+00	7.65E+00	8.50E+00	1.36E+01
A2	2.08E+00	1.66E-01	1.04E+00	1.39E+00	1.56E+00	1.73E+00	2.77E+00
A3	4.43E-03	3.54E-04	2.22E-03	2.95E-03	3.32E-03	3.69E-03	5.91E-03
A1-A3	1.23E+01	9.83E-01	6.14E+00	8.19E+00	9.21E+00	1.02E+01	1.64E+01

End- user calculation for C- Board

Thickness	12mm	1	4mm	6mm	8mm	10mm	16mm	18mm
kg/m2	17.43		5.81	8.72	11.62	14.53	23.24	26.15
A1	1.05E+01	6.02E-01	3.50E+00	5.25E+00	7.00E+00	8.75E+00	1.40E+01	1.58E+01
A2	2.90E+00	1.66E-01	9.67E-01	1.45E+00	1.93E+00	2.42E+00	3.87E+00	4.35E+00
A3	5.76E-03	3.30E-04	1.92E-03	2.88E-03	3.84E-03	4.80E-03	7.68E-03	8.64E-03
A1-A3	1.34E+01	7.69E-01	4.47E+00	6.71E+00	8.94E+00	1.12E+01	1.79E+01	2.01E+01

References

BSI. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. BS EN 15804:2012+A1:2013. London, BSI, 2013.

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