PASQUILL

SAINT-GOBAIN

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025:2006, EN 15804:2012+A2:2019/AC:2021 and ISO 21930:2017
for:

Pasquill Treated Roof Trusses

Version: 1
Date of publication: 2024/02/20
Validity: 5 years
Valid until: 2029/02/20

EPD®
THE INTERNATIONAL EPD® SYSTEM

The International EPD®
Programme operator: EPD international AB
System Registration number:
S-P-11882

EPD Type: Single product (average across multiple sites)
Scope of the EPD®: Cradle-to-grave and Module D

EPD VERIFIED

ECO PLATFORM EPD VERIFIED

Manufacturer address: 1 Herald Way, Binley Industrial Estate, Coventry, CV3 2GZ

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

SAINT-GOBAIN

General Information

Company and EPD Information

Manufacturer: Saint-Gobain Pasquill: Pasquill is one of largest suppliers of trussed rafters in the UK, with a nationwide network of design and manufacturing sites, supported by local knowledge and service. As part of the Saint-Gobain Off-Site Solutions' division, we share the group's common purpose of 'making the world a better home'; manufacturing timber products that have a positive impact on quality of life and performance, with an emphasis on sustainability.

Site of Manufacture: Saint-Gobain Pasquill sites located in:

- Bodmin, PL31 2RH
- Chorley, PR7 4BU
- Inverness, IV2 7XB
- Redhill, RH1 5GJ
- Stoney Stanton, LE9 4NA
- Uddingston, G71 6ET

Management System-related Certification: ISO 14001 [1], ISO 50001 [2], ISO 9001 [3]

Product Name: Pasquill Roof Trusses (Treated)
EPD for Multiple Products: ☒ No ☐ Yes, the EPD represents the following products:
UN CPC CODE: 316 Builders' joinery and carpentry of wood

Owner of the declaration: Saint-Gobain Construction Products UK t/a Saint-Gobain Pasquill
LCA & EPD® prepared by: Charnett Chau (Charnett.chau@saint-gobain.com), Daniel Moss (Daniel.moss@saint-gobain.com) and Gareth Morris (Gareth.morris@saint-gobain.com)

Geographical scope of the EPD®: United Kingdom
EPD® registration number: S-P-11881
Declaration issued: 2024/02/20 valid until 2029/02/20
Demonstration of verification: an independent verification of the declaration was made, according to ISO 14025:2010 [4]. This verification was external and conducted by the following third party based on the PCR mentioned above.

Programme Information

PROGRAMME:	The International EPD® System [5]
ADRESS:	EPD International AB - Box 210 60 - SE-100 31 Stockholm – Sweden
WEBSITE:	www.environdec.com
E-MAIL:	info@environdec.com

CEN standard EN 15804:2012 + A2:2019/AC:2021 [6] and ISO 21930:2017 [7] serves as the Core Product Category Rules (PCR)

Product category rules (PCR): PCR 2019:14 Construction Products, version 1.3.2 [8], c-PCR-006 Wood and wood base products for use in construction (EN 16485)[9]
Note: the original study was carried out under PCR 2019:14 v1.3.1 prior to the launch of 1.3.2. However, upon reviewing v.1.3.2, we determined that our study is compliant to v1.3.2.

PCR review was conducted by: The Technical Committee of the International EPD® System See www.environdec.com for a list of members.
Chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact - Contact via info@environdec.com

Independent third-party verification of the declaration and data, according to ISO 14025:2006:
☐ EPD process certification ☒ EPD verification

Third-party verifier: Claudia A. Peña
cpena@addere.cl
Approved by: The International EPD© System

Procedure for follow-up of data during EPD validity involves third part verifier: ☐ Yes ☒ No

The EPD owner has sole ownership, liability, and responsibility for the EPD.
EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025. As modules C1-C4 are considered in the EPD, don't just consider A1-A3 or A1-A5 results without considering the results of Module C.

Product Description

Product Description and Description of Use

This Environmental Product Declaration (EPD®) describes the environmental impacts of **1 m³ of Pasquill Treated Roof Trusses.**

Pasquill designs, manufactures, and supplies timber roof trusses assembled from solid structural timber (European Whitewood/Redwood graded TR26) with individual timber members joined together with punched metal plate fasteners. Engineered timber roof trusses are designed and manufactured specifically to support the roof structure of each building's specific purpose, layout, roof covering, and location. The engineered timber roof truss is designed in accordance with BS5268-3:2006 or EC5 and with a life span of 60 years to conform with NHBC requirements.

Technical data/physical characteristics:

Product Density (kg/m³)	545 Range: 542 - 597	Moisture content dependent
Moisture Content (%)	12 - 22	EN 14250:2010 [10] specifies < 22%
Timber Grade	TR26	EN 14081-1 [11]
Reaction to Fire	D-s2, d0	EN 13501-1:2007+A1:2009 [12]

Content Declaration

All raw materials contributing more than 5% to any environmental impact are listed in the following table.

Product components	Weight - %	Post-consumer recycled material, weight - %	Biogenic Material - kg C/kg	Biogenic material, weight - %
TR26 Timber	> 95	0	~0.45	100
Steel	< 5	0	0	0
Packaging materials	**Weight - kg**	**Weight - % (versus the product)**	**Biogenic Material - kg C/kg**	**Biogenic material, weight - %**
Slings (Polyester)	0.023	< 1	0	0
Banding (Polypropylene)	0.43	< 1	0	0

During the life cycle of the product, any hazardous substance listed in the “Candidate List of Substances of Very High Concern (SVHC) [13] for authorization” has not been used in a percentage higher than 0.1% of the weight of the product. The verifier and the program operator do not make any claim nor have any responsibility for the legality of the product.

LCA Calculation Information

TYPE OF EPD	Cradle-to-grave and Module D
FUNCTIONAL UNIT **FUNCTIONAL MASS**	1 m^3 of Pasquill Treated Roof Trusses - Moisture content less than 22% in accordance with (BS EN 14250 :2010) Pasquill treated Roof Trusses = 544.6 kg/m^3* *After Installation the total mass increases by 0.005 kg/m^3 due to the additional steel. [9]
SYSTEM BOUNDARIES	A1-A5, B1-B7, C1-C4 and D
REFERENCE SERVICE LIFE (RSL)	60 years. By default, it corresponds to standard building design life, and it is noted that roof truss products are in place for this duration.
CUT-OFF RULES	In the case that there is not enough information, the process energy and materials representing less than 1% of the whole energy and mass used can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded cannot be bigger than 5% of the whole mass and energy used, as well as emissions to the environment, per module. The construction of plants, production of machines (i.e. capital goods/infrastructure), and transportation systems are excluded since the related flows are supposed to be negligible compared to the production of the building product when compared to these systems' lifetime level. Flows related to human activities such as employee transport are excluded. The manufacture of packaging used for supplying raw materials (waste treatment of these was considered).
ALLOCATIONS	The allocation criteria are based on the mass flow of products and co-products – i.e. mass allocation between the different product ranges produced at Saint-Gobain Pasquill. Where raw materials and energy usage cannot be directly attributed to individual products the total quantity used in the factory was divided by the total mass of products produced to achieve materials and energy per kilogram of product. The polluter pays and modularity principles have been followed. The impact arising from the treatment of waste generated within the system boundaries is allocated to the product until waste reaches the end-of-waste state.
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Scope: UK (production, use & disposal) Data is collected from multiple Saint-Gobain Pasquill production sites. These are Bodmin, Chorley, Inverness, Redhill, Stoney Stanton and Uddingston. Data collected for the year: January – December 2022
BACKGROUND DATA SOURCE	The databases Sphera v2023.1 [14] and ecoinvent v.3.9 [15]
SOFTWARE	LCA for Experts – Sphera v2023.1 [16]
LCA METHODOLOGY	In addition to EN 15804:2019+A2 (the EN 15804 reference package based on EF 3.1 has been used to calculate the various impact categories) [17], PCR 2019:14 v 1.3.2 [18], c-PCR-006 EN 16485 [9] the study was carried out in accordance with ISO 14040:2006 [19], ISO 14044:2006 [20], and General Programme Instructions (GPI) for the International EPD® system [21]

According to EN 15804:2012+A2:2019, EPDs of construction products may not be comparable if they do not comply with this standard. According to ISO 21930:2017 [22], EPDs might not be comparable if they are from different programmes.

LCA Scope

System boundaries (X=included. ND=not declared)

	PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	Raw material supply	Transport	Manufacturing	Transport	Construction-Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-recovery
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
Geography	EU-28/GLO		GB	GB													
Specific data used	10.6%*																
Variation products	0%																
Variation sites	< 22%**																

*Share of specific data that is specified according to PCR 2019:14. We gathered site-specific data on the generation of electricity provided by contracted suppliers (using Guarantee of Origin), transportation data on distances, means of transportation, load factor, fuel/other energy consumption at the site. The value in the table is calculated on the share of impact deriving from LCI data from databases on transportation and energy ware that are combined with actual transportation and energy parameters.
Due to A1-A4 total being negative, the percentage share is presented as a modulus, the value average share across the sites is taken while the range is between 8.63% and 13.86%
**Due to the shapes of roof trusses, the amount of materials required does not correlate directly/proportionally with the size of the truss required. The average roof truss made per site will vary depending on local needs/ housing size.

Life Cycle Stages

Note: Module D (Recycling) is outside of the system boundary.

A1-A3: Product Stage

Modules A1-A3 sit within the product stage of a building's life cycle, where raw and secondary materials are extracted and processed (A1) before being transported (A2) to manufacturing facilities for the fabrication of building products (A3). Here we detail A1-A3 for the Roof Truss produced across Pasquill's multiple manufacturing sites. Information on the supply of materials and manufacturing of the product(s) were primary data from Saint-Gobain Pasquill. Secondary data from Sphera (2023.1) and ecoinvent (3.9) databases were used to obtain LCIs for input materials and the processing of waste materials. Electricity used at the Saint-Gobain manufacturing site was modelled based on the power mix purchased with a guarantee of origin (GO) electricity mix from the UK market.

A1, Raw materials supply
Raw materials that are required to manufacture Pasquill Treated Roof Trusses are supplied from various countries around Europe and the UK. These raw materials can be categorised as "virgin" materials (e.g., timber) and "processed" materials (e.g., steel plates).

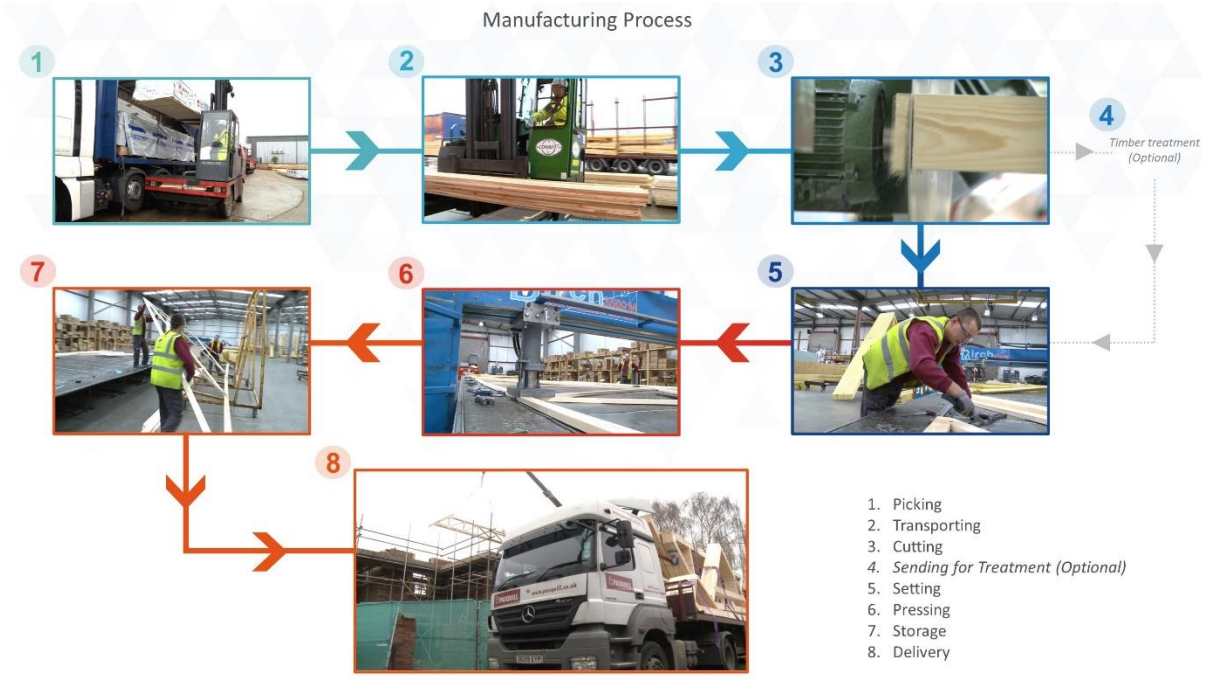
A2, Transport to the manufacturer
Virgin and processed raw materials are transported to the manufacturing sites across the UK. The manufacturing sites are Bodmin, Chorley, Inverness, Redhill, Stoney Stanton and Uddingston.

A3, Manufacturing
See below for a complete breakdown of the manufacturing process.

In A3, the processing of waste arising from the manufacturing process is also modelled. How manufacturing waste is processed was based on waste reports from waste contractors, however, where processes are unavailable from Sphera and ecoinvent databases, the worst-case process was used (landfill).

Manufacturing Process Flow Diagram

The flow diagram below depicts Saint-Gobain Pasquill's [23] manufacturing processes across the multiple sites in the UK.



For A4-A5, B and C4, assumptions pertaining to the scenarios of the declared modules are in accordance with the project report.

A4-A5: Construction Process Stage

A4, Transport to the building site

Distribution distances of products were obtained by mapping the transport distances from each manufacturing site to the client. The average distance was then taken along with the typical mode and load of transport to form the transport scenario. All clients were included in the calculation from the year 2022, no assumptions or cut-offs were made to find the average distribution distance. Additionally, it's assumed that no product is lost, broken, or wasted during transportation due to the efficiency of our courier and our packing process.

The specific data on transporting the product was combined with secondary data from the Sphera database on transportation, specific emissions per distance, and utilisation based on vehicle size/capacity and fuel type to obtain the environmental performance of transportation.

NATIONAL PARAMETERS (100% OF SALES)	VALUE
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long-distance truck, boat, etc.	Long-distance truck: 27t payload capacity Euro 0 – 6 mix Fuel type: Diesel
Distance	100 km
Average load weight	24 tonnes
Bulk density of transported products*	597 kg/m^3 (worst case scenario, 22% moisture content)
Average utilisation	0.85

A5, Installation in the building

The installation into the building was modelled for the roof truss using a worst-case scenario. Pasquill and the UK & I LCA Team have assumed that the crane run time would be 5 minutes. This is an overestimation; however, it accounts for contingencies. Although additional steel isn't required for all installation of a roof truss, we have also modelled the average amount of steel supplied and used for installation in the year 2022. Lastly, the disposal of packaging was also modelled. The worst-case scenario, where waste is landfilled, was assumed.

PARAMETER	QUANTITY PER FU OF PASQUILL ROOF TRUSSES (TREATED)
Roof Truss Installation Requirements. Including energy, additional materials and packaging	Diesel (crane): 5 minutes Steel: 5 grams Polypropylene Hessian Sacks: 300 micrograms All Packaging Waste: 0.36 kg Calculated using Pasquill procurement data.

B1-B7: Use Stage (excluding potential savings)

The use stage, related to the building fabric includes:

B1, Use (or application of the installed product)
This model represents any emissions to the environment of the installed product. Emissions to the environment are not attributable to the roof truss.

B2, Maintenance; B3, Repair; B4, Replacement; B5, Refurbishment
Timber roof trusses in construction are assumed a product working life of 60 years (as the building lifespan). The engineered timber roof truss are designed in accordance with BS5268-3:2006 or EC5 and with a life span of 60 years to conform with NHBC requirements [24]. Once installation is complete, no actions or technical operations are required during the use stage until the end-of-life stage. Therefore, these products have no impact on these modules. The length of RSL would not affect the modelling of these modules.

B6, Operational energy use; B7, Operational water use
Roof trusses are not related to any electricity or water use during the operation of the building. Therefore, no impact derives from these modules, but it was considered in the study.

C1-C4: End of Life Stage

The end-of-life scenario for the Pasquill Treated Roof Trusses was developed based on government statistics for 2022 and Saint-Gobain's own knowledge and confirmation of customers for the deconstruction and demolition of the product from the building (C1). Technical information on the percentage split of how wastes are treated in the UK can be found in UK Waste statistics [25] as produced by the Department for Environmental, Food & Rural Affairs in 2022 [26], this was the main source of information to develop calculations.

C1, Deconstruction and demolition
The deconstruction and/or dismantling process of Pasquill Treated Roof Trusses is assumed to be deconstructed as part of the entire building. These processes mainly use energy for mechanical operations. In our case, a small amount of energy is considered 0.0437 MJ/kg / 22.8 MJ/m^3.

C2, Transport
As there is no data for the transport of waste after its use phase, the default distance of 100 km of an average truck used at 85% capacity was assumed.

C3, Waste processing
Through UK government waste statistics [25], Saint-Gobain's own knowledge, and customer confirmation we have calculated that 56% of the timber waste is recycled. As specified in EN 16485 [9], sorting and crushing of timber was included in modelling C3 for timber.
Additionally, ~100% of the steel is recycled and recovered. Note: during the waste processing incineration with energy recovery is not modelled.

C4, Disposal
In accordance with the UK waste statistics [25], we have calculated that 44% of the timber is incinerated without energy recovery and 0.005% is sent to landfill. Although the vast majority of steel has been modelled as recycled there is a small amount (0.0002%) that is sent to landfill, which was calculated using government statistics.

Description of the scenarios and additional technical information for the end of life:

PARAMETER	VALUE/DESCRIPTION
Collection process specified by type	100% collected with mixed deconstruction and demolition waste sent to landfill
Disposal specified by type	Timber: - ~56% recycled waste - ~44% incineration without energy recovery - ~0.005% landfill waste Steel: - ~100% recycled waste - ~0.0002% landfill waste
Assumptions for scenario development (e.g. transportation)	Waste is transported 100 km by truck from deconstruction/demolition sites to landfill

D: Reuse/Recovery/Recycling Potential

Module D describes the net benefits related to exported energy and secondary materials, secondary fuels or secondary products resulting from reuse, recycling and energy recovery that take place beyond the system boundary for both products and buildings.

Input materials for the manufacturing of Pasquill Roof Trusses (Treated) do not include nor assume any secondary materials or secondary fuels. However, the main components of the product, timber and steel, are highly recyclable (as stated in Module C). The loads and benefits from recycling steel were modelled to represent the manufacturing of electric arc furnace steel and avoiding the manufacture of blast furnace steel. The loads and benefits of timber were not modelled due to its multiple reuse/recycle possibilities depending on the timber's condition.

LCA Results

As specified in EN 15804:2012+A2:2019/AC:2021 and the Product-Category Rules, the environmental impacts are declared and reported using the baseline characterisation factors from the ILCD. Specific data has been supplied by the plant, and generic data come from Sphera and ecoinvent databases.

All emissions to air, water, and soil, and all materials and energy used have been included.

The estimated impact results are only relative statements that do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins, or risks.

All figures refer to a declared unit of 1 m^3 of Pasquill Treated Roof Trusses.

The following results correspond to a single product, produced at multiple manufacturing sites: Bodmin, Chorley, Inverness, Redhill, Stoney Stanton, and Uddingston. The environmental impact results represent the weighted average, according to production volumes, of impacts incurred by the individual sites.

Environmental Impacts

The following tables presents results of 1 m^3 of Pasquill Roof Trusses (Treated)

Environmental Indicators	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				REUSE, RECOVERY RECYCLING
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Climate change [kg CO_2 eq.]	-5.35E+02	8.93E+00	1.05E+00	0	0	0	0	0	0	0	2.23E-01	4.56E+00	5.07E+02	3.92E+02	-2.71E+01
Climate change (fossil) [kg CO_2 eq.]	3.31E+02	8.98E+00	5.48E-01	0	0	0	0	0	0	0	2.22E-01	4.59E+00	1.54E+01	5.89E+00	-6.74E+01
Climate change (biogenic) [kg CO_2 eq.]	-8.67E+02	-1.33E-01	5.04E-01	0	0	0	0	0	0	0	7.14E-05	-6.81E-02	4.91E+02	3.86E+02	4.08E+01
Climate change (land use change) [kg CO_2 eq.]	7.24E-01	8.32E-02	9.98E-05	0	0	0	0	0	0	0	2.00E-05	4.26E-02	4.17E-02	8.22E-04	-5.69E-01
Ozone depletion [kg CFC-11 eq.]	2.53E-05	7.87E-13	8.52E-09	0	0	0	0	0	0	0	3.95E-09	4.03E-13	2.23E-07	8.56E-09	-4.59E-07
Acidification terrestrial and freshwater [Mole of H+ eq.]	2.13E+00	5.94E-02	2.90E-03	0	0	0	0	0	0	0	1.25E-03	2.82E-02	8.91E-02	5.95E-02	-3.05E-01
Eutrophication freshwater [kg P eq.]	6.76E-02	3.28E-05	2.04E-05	0	0	0	0	0	0	0	6.74E-06	1.68E-05	3.02E-03	1.37E-05	-1.50E-02
Eutrophication marine [kg N eq.]	5.81E-01	2.93E-02	1.59E-03	0	0	0	0	0	0	0	5.88E-04	1.38E-02	3.19E-02	2.04E-02	-1.07E-01
Eutrophication terrestrial [Mole of N eq.]	6.91E+00	3.24E-01	1.44E-02	0	0	0	0	0	0	0	6.37E-03	1.53E-01	3.38E-01	2.83E-01	-1.14E+00
Photochemical ozone formation - human health [kg NMVOC eq.]	1.91E+00	5.51E-02	4.70E-03	0	0	0	0	0	0	0	2.01E-03	2.60E-02	1.07E-01	5.30E-02	-4.45E-01
Resource use, mineral and metals [kg Sb eq.][1]	1.07E-02	5.84E-07	1.66E-07	0	0	0	0	0	0	0	7.18E-08	2.99E-07	3.65E-05	8.61E-07	-6.03E-05
Resource use, energy carriers [MJ][1]	4.94E+03	1.22E+02	5.92E+00	0	0	0	0	0	0	0	2.46E+00	6.25E+01	2.29E+02	8.74E+01	-7.38E+02
Water deprivation potential [m^3 world equiv.][1]	1.09E+02	1.04E-01	1.67E-02	0	0	0	0	0	0	0	7.97E-03	5.30E-02	2.36E+00	4.34E+01	-9.09E+00

[1] 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 experienced with the indicator.The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Resources Use

Resources Use Indicators	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				D REUSE, RECOVERY, RECYCLING
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Use of renewable primary energy (PERE) [MJ]	1.22E+04	8.65E+00	8.93E-02	0	0	0	0	0	0	0	1.78E-02	4.43E+00	1.02E+01	2.01E+01	-1.35E+04
Primary energy resources used as raw materials (PERM) [MJ]	9.84E+03	0	0	0	0	0	0	0	0	0	0	0	-5.23E+03	0	4.51E+03
Total use of renewable primary energy resources (PERT) [MJ]	2.20E+04	8.65E+00	8.93E-02	0	0	0	0	0	0	0	1.78E-02	4.43E+00	-5.22E+03	2.01E+01	-9.01E+03
Use of non-renewable primary energy (PENRE) [MJ]	4.94E+03	1.23E+02	5.92E+00	0	0	0	0	0	0	0	2.46E+00	6.27E+01	2.29E+02	8.75E+01	-7.42E+02
Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	1.90E+01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	4.96E+03	1.23E+02	5.92E+00	0	0	0	0	0	0	0	2.46E+00	6.27E+01	2.30E+02	8.75E+01	-7.43E+02
Input of secondary material (SM) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels (RSF) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels (NRSF) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water (FW) [m^3]	2.83E+00	9.53E-03	4.52E-04	0	0	0	0	0	0	0	1.86E-04	4.88E-03	5.50E-02	1.02E+00	-2.25E-01

Waste Category & Output flows

	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				D REUSE, RECOVERY, RECYCLING
Waste Category & Output Flows	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (HWD) [kg]	1.60E-02	4.53E-10	3.49E-05	0	0	0	0	0	0	0	1.62E-05	2.32E-10	1.10E-03	1.05E-06	-1.18E+01
Non-hazardous waste disposed (NHWD) [kg]	2.11E+02	1.77E-02	3.47E-01	0	0	0	0	0	0	0	1.62E-02	9.04E-03	1.40E+01	6.02E+00	0
Radioactive waste disposed (RWD) [kg]	1.08E-01	1.58E-04	6.17E-06	0	0	0	0	0	0	0	4.00E-07	8.11E-05	2.27E-04	5.13E-03	0
Components for re-use (CRU) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	2.97E+02	0	0
Materials for recycling (MFR) [kg]	1.70E+00	0	0	0	0	0	0	0	0	0	0	0	2.56E+01	0	0
Material for energy recovery (MER) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported electrical energy (EEE) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported thermal energy (EET) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Optional Indicators

	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				D REUSE, RECOVERY, RECYCLING
Optional Indicators	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Respiratory inorganics [Disease incidences]	1.42E-04	3.55E-07	5.94E-08	0	0	0	0	0	0	0	2.66E-08	1.66E-07	1.44E-06	2.96E-07	-1.54E-05
Ionising radiation - human health [kBq U235 eq.][2]	2.88E+01	2.29E-02	5.01E-03	0	0	0	0	0	0	0	1.69E-03	1.17E-02	9.15E-01	8.44E-01	-4.30E+00
Ecotoxicity freshwater [CTUe][3]	9.29E+04	8.61E+01	3.25E+00	0	0	0	0	0	0	0	1.04E+00	4.40E+01	1.27E+02	3.32E+01	-2.39E+02
Cancer human health effects [CTUh][3]	7.54E-07	1.74E-09	7.05E-10	0	0	0	0	0	0	0	3.31E-10	8.90E-10	1.04E-08	2.63E-09	-1.04E-07
Non-cancer human health effects [CTUh][3]	3.86E-06	7.67E-08	4.01E-09	0	0	0	0	0	0	0	8.12E-10	3.92E-08	1.67E-07	4.18E-08	-3.64E-07
Land use [Pt]	1.79E+05	5.10E+01	4.07E-01	0	0	0	0	0	0	0	1.58E-01	2.61E+01	1.27E+02	2.73E+01	-5.11E+04

[2] The ionising radiation category deals mainly with the eventual impact of low-dose ionising radiation on the human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, or radioactive waste disposal in underground facilities. Potential ionising radiation from the soil, radon and some construction materials is also not measured by this indicator.

[3] 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.

Additional Voluntary Indicators from EN 15804 (according to ISO 21930:2017)

	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				REUSE, RECOVERY RECYCLING
Environmental Indicators	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Climate change [kg CO_2 eq.][4]	3.32E+02	9.06E+00	5.49E-01	0	0	0	0	0	0	0	2.22E-01	4.63E+00	1.55E+01	5.89E+00	-6.80E+01

[4] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013. But other LCA rules (system boundaries, allocation etc.) are according to EN 15804:2012+A2:2019/AC:2021.

PASQUILL
SAINT-GOBAIN

Information on Biogenic Carbon Content

Biogenic Carbon Content	Pasquill Roof Trusses (Treated)
Biogenic carbon content in product [kg]	**239 kg C eq.**
Biogenic carbon content in packaging [kg]	**0 kg C eq.**

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

The product contains biogenic carbon content from the timber. However, the packaging contains no biogenic carbon content.

LCA Interpretation

[1] This indicator corresponds to the abiotic depletion potential of fossil resources (Resource use, energy carriers MJ/FU).
[2] This indicator corresponds to the total use of primary energy.
[3] This indicator corresponds to the use of net fresh water.
[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

Climate Change (total)
The figure above demonstrates a breakdown of the associated GWP of Pasquill Treated Roof Trusses across the Saint-Gobain Pasquill sites from modules A1-D. The breakdown of modules into clear categories highlights the modules which cause the largest environmental impact.

Across the life cycle of Treated Roof Trusses, the majority of the climate change impact is associated with the EoL, accounting for 904 kg CO_2eq./m^3 of the total climate change impact. This is mostly due to the biogenic carbon content stored in the product being released back into the environment. A3 is the second largest impact contributor across the product life cycle (56 kg CO_2eq./m^3). We can associate this with the manufacturing energy inputs required to produce the product. Pasquill sites use a combination of Diesel, LPG, Kerosene, and Bio-LPG in the manufacturing process. Modules A4-A5 have a small climate change impact of 8.93 kg CO_2eq./m^3. Modules B1-B7 have no climate change impact. Modules A1-A2 combined have a climate change impact of -591 kg CO_2eq./m^3 due to carbon sequestration during the growth of trees, storing biogenic carbon content within the timber. Treated Roof Trusses have a higher climate change impact than Untreated roof trusses due to the extra processing of the timber.

Non-renewable Resources Consumptions

The consumption of non-renewable resources has the highest value during the Raw Material and Transport stages (Modules A1-A2) equalling 4 870 MJ/m^3 for Treated Roof Trusses. We can associate the majority of this impact with the extraction/generation and processing of raw materials, materials such as steel requiring a large amount of energy to manufacture. Treated Roof Trusses use more non-renewable energy than untreated timber due to the extra processing the timber goes through during treatment. Modules A3-A5 contribute a small amount to the total non-renewable resource consumption (214 MJ/m^3 combined). This can be attributed to the fossil fuels consumed during, product manufacture, the transport of the product, and the installation process. During EoL (Module C) the energy consumption totals 382 MJ/m^3, which mainly stemmed from transporting, sorting and disposing of the product.

Energy Consumption

Energy consumption combines both the total use of renewable primary energy resources and the total use of non-renewable primary energy resources. Figure 4 illustrates that the product stage (A1-A3) contributes the largest energy consumption for Treated Roof Trusses. The majority of that impact derives from A1-A2 (26 900 MJ/m^3) due to the energy required to extract, process, and transport raw materials. Modules A3-A5 have a small impact on the total (233 MJ/m^3). However, during the EoL the energy consumption has a positive impact (-4 820 MJ/m^3) due to recycling of materials. This is due to primary energy used as raw material is "returned" and available for another product and/or system.

Water Consumption

Water consumption is the use of freshwater throughout the product's life cycle. For the Treated Roof Trusses the highest contributor is during raw material extraction and transport (Modules A1-A2) accounting for 2.84 m^3/m^3 of the total water consumption across the life cycle. We can attribute this to the processes required to extract and process raw materials, particularly the timber treatment process. The EoL contributes a total of 1.08 m^3/m^3 to the total water consumption, deriving from the incineration of the timber. In addition, Modules A3-A5 contribute < 0.1% to the total water consumption, as the manufacturing and installation processes require no water.

Waste Production

Waste production includes all hazardous, non-hazardous, and radioactive waste disposed of. The product stage (Module A1-A3) produces the largest amount of waste across the product's life cycle (211 kg/m^3) for Treated Roof Trusses. This can be associated with the production of steel and timber in Module A1 (209 kg/m^3), more specifically waste arising from treating timber. The EoL produces the second largest amount of waste, a total of 20.1 kg. Due to the disposal methods of timber and steel, the total waste produced at the EoL is small in comparison to the waste disposed during A1. Modules A4-A5 have less than a 1.0% contribution to the total waste produced.

Additional Information

Electricity Information

TYPE OF INFORMATION	DESCRIPTION
Electricity Purchaser	Saint-Gobain Building Distribution (incl Saint-Gobain Pasquill)
Electricity Provider	Smartest Energy Ltd
Electricity Mix	Wind – 36.67% Thermal – 31.57% Solar PV – 29.85% Hydro – 0.91%
Reference year	2021-2022
Type of dataset	Sphera Database 2023.1, all datasets reference 2022 emissions Hydro - “GB: Electricity from hydro power Sphera” 2019 Solar PV - “GB: Electricity from photovoltaic Sphera” 2019 Wind - “GB: Electricity from wind power Sphera” 2019 Thermal - “GB: Electricity from biogas Sphera” 2019
CO_2 emission kg CO_2 eq. / kWh (GWP-GHG)	Certificate issue = 0 kgCO_2/kWh Modelled impact = 0.0062 kgCO_2/kWh

Data Quality

Inventory data quality is judged by geographical, temporal, and technological representativeness. To cover these requirements and to ensure reliable results, first-hand industry data crossed with LCA background datasets were used. The data was collected from internal records and reporting documents from Saint-Gobain Pasquill. After evaluating the inventory, according to the defined ranking in the LCA report, the assessment reflects good inventory data quality.

Environmental Impacts According to EN 15804:2012 + A1

The following tables presents results of 1 m^3 of Pasquill Roof Trusses (Treated).

	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				REUSE, RECOVERY, RECYCLING
Environmental Impacts	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Global Warming Potential (GWP) [kg CO_2eq.]	-5.42E+02	8.80E+00	9.78E-01	0	0	0	0	0	0	0	2.20E-01	4.49E+00	5.06E+02	3.92E+02	-2.61E+01
Ozone depletion (ODP) [kg CFC 11eq.]	2.57E-05	9.27E-13	6.92E-09	0	0	0	0	0	0	0	3.21E-09	4.74E-13	1.89E-07	6.80E-09	-3.90E-07
Acidification potential (AP) [kg SO2eq.]	1.62E+00	4.03E-02	2.05E-03	0	0	0	0	0	0	0	8.81E-04	1.92E-02	6.73E-02	3.91E-02	-2.31E-01
Eutrophication potential (EP) [kg $(PO_4)^3$-eq.]	5.90E-01	1.03E-02	1.21E-03	0	0	0	0	0	0	0	2.24E-04	4.87E-03	2.08E-02	1.61E-02	-1.01E-01
Photochemical ozone creation (POCP) - [kg Ethylene eq.]	1.92E-01	-1.75E-02	4.76E-04	0	0	0	0	0	0	0	1.66E-04	-8.25E-03	8.65E-03	3.36E-03	-6.66E-02
Abiotic depletion potential for non-fossil resources (ADP-elements) [kg Sb eq.]	1.07E-02	5.81E-07	1.66E-07	0	0	0	0	0	0	0	7.18E-08	2.97E-07	3.65E-05	8.93E-07	-6.05E-05
Abiotic depletion potential for fossil resources (ADP-fossil fuels) [MJ]	4.40E+03	1.21E+02	5.83E+00	0	0	0	0	0	0	0	2.44E+00	6.17E+01	2.14E+02	7.40E+01	-6.63E+02

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