EPD - ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

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ENERGY MIX APPROACH	MARKET BASED APPROACH

Glulam spruce or larch
Huter & Söhne GmbH

Table of content of the EPD

1 General information

Product name Glulam spruce or larch	**Declared Product / Declared Unit** 1 m³ glulam spruce or larch Huter & Söhne **Number of datasets in EPD Document:** 1 **Range of validity** The Environmental Product Declaration applies to glued laminate timber (glulam) in spruce or larch from Huter & Söhne GmbH. The product is produced at the company location A-6020 Innsbruck, Austria. Glulam is declared as a standard product (rectangular glulam without CNC milling). The EPD was prepared in accordance with the requirements of EN 15804+A2. In the following, the standard is simplified labeled as EN 15804. **Goal of the study** This life cycle assessment serves as the basis for issuing an environmental product declaration (EPD). The results are intended to be published in an EPD. The data is intended for an EPD for 'business-to-business' (B2B) communication.
Declaration number BAU-EPD-HuterSoehne-2025-1-ecoinvent	
Declaration data ☒ Specific data ☐ Average data	
Declaration based on: MS-HB Version 7-0-0 dated 25.02.2025: Name of PCR: solid wood products A2 PCR-Code: 2.11.1 Version: 17.0 dated 25.02.2025 (PCR tested and approved by the independent expert committee = PKR-Gremium) Version of EPD-Format-Template M-Dok 14A2: 9.0 dated 25.02.2025 The owner of the declaration is liable for the underlying information and evidence; Bau EPD GmbH is not liable with respect to manufacturer information, life cycle assessment data and evidence.	
Type of Declaration as per EN 15804 cradle to the grave (A+B+C+D) LCA method: Cut-off by classification	**Database, Software, Version** Ecoinvent v3.10, SimaPro 9.6.0.1 **Version Characterisation Factors:** Joint Research Center, EF 3.1
Author of the Life Cycle Assessment Dipl.-Ing. Stefan Fritz Fritz Consulting GmbH & Co KG Allgäuer Straße 33 6600 Reutte Austria	**The CEN standard EN 15804:2012+A2:2019+AC:2021 serves as the core-PCR.** The c-PCR of CEN EN 16485:2014-05-01 has been applied. **Independent verification of the declaration according to ISO 14025:2010** ☐ internally ☒ externally **Verifier 1:** Dr. Nikolay Minkov **Verifier 2:** Dr. Florian Gschösser
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Note: EPDs from similar product groups from different programme operators might not be comparable.

2 Product

2.1 General product description

The company Huter & Söhne GmbH produces glulam in the wood species spruce/fir or larch. Glulam is a solid, rod-shaped timber component made of at least two boards or board lamellas glued together parallel to the fibres. Due to the strength grading of the raw material and the homogenization through the layered structure, glulam has a higher load-bearing capacity than conventional construction timber. Glulam is a very dimensionally stable and largely crack-minimized building material due to its manufacturing process. Glulam is produced either in visible quality or in industrial quality.
Huter & Söhne glulam is available as a standard product, as well as in curved form and in special dimensions. Glulam can also be used as a ceiling element, if it is installed horizontal. Huter & Söhne glulam is manufactured in accordance with EN 14080.
Huter & Söhne operates one production facility which is located directly at the company site in Innsbruck, Austria.
The product is mainly sold regionally, i.e. in Tyrol, Bavaria and South Tyrol.
Regulation (EU) No. 305/2011 (CPR) applies to the placing on the market of the product in the EU. The product requires a declaration of performance in accordance with EN 14080:2013-09 - Timber structures - Glued laminated timber and glued solid timber - Requirements and CE marking.
The respective national regulations apply for use.

2.2 Application field

The product Huter & Söhne glulam is used in the structural area of modern timber construction. Residential, industrial and bridge-constructions are among the areas of application. Generally, it can be used in service classes 1 to 3 in accordance with EN 1995-1-1. For service class 3, spruce or larch lamellas with a thickness of ≤ 35 mm are used.

2.3 Standards, guidelines and regulations relevant for the product

Product-relevant standards and regulations for glulam are listed below:

Table 1: Product specific standards

Standard	Title
EN 1995-1-1	Eurocode 5: Design of timber structures - Part 1-1: General - General rules and rules for building construction (EN 1995-1-1:2004 + AC:2006 + A1:2008).
EN 14080	ÖNORM EN 14080:2013, Timber structures - Glued laminated timber and glued laminated timber - Requirements
EN 1912	ÖNORM EN 1912:2013, Structural timber - Strength classes - Assignment of visual grades and species
EN 13183-1	ÖNORM EN 131831:2004, Moisture content of a piece of sawn timber - Part 1: Determination by kiln drying method
EN 15804	ÖNORM EN 15804+A2:2020, Sustainability of construction works - Environmental product declarations - Basic rules for the product category construction products
EN 16485	OENORM EN 16485:2014, Round and sawn timber Environmental product declarations Product category rules for wood and wood-based materials in construction
EN 16485	DIN EN 16516:2020, Construction products: Evaluation of the release of hazardous substances Determination of emissions to indoor air
EN 16449	DIN EN 16449:2014, Wood and wood products - Calculation of biogenic carbon content in wood and conversion to carbon dioxide
ISO 10456	ÖNORM EN ISO 10456:2010, Building materials and products - Thermal and moisture performance - Tabulated design values and methods for determining the thermal insulation rating and design values

2.4 Technical data

Technical data for the glulam is listed below:

Table 2: technical data of the declared construction product

Characterization	Value	Unit
Wood species by trade name according to ÖNORM B 3012	Spruce/Fir Larch	-
Wood moisture according to ÖNORM EN 13183-1 or -2	11 ± 2	%
Use of wood preservative (the test rating of the wood preservative in accordance with ÖNORM B 3802-2 must be specified)	-	-
Compressive strength parallel according to EN 14080	21.5 - 30	N/mm²
Compressive strength at right angles according to EN 14080	2.5	N/mm²
Parallel tensile strength according to EN 14080	17 - 24	N/mm²
Tensile strength at right angles according to EN 14080	0,5	N/mm²
Modulus of elasticity according to EN 14080	11,000 - 13,600	N/mm²
Shear strength according to EN 14080	3.5	N/mm²
Shear modulus according to EN 14080	650	N/mm²
Dimensional deviation	Width: +/ 2 mm; Heights (< 400 mm): + 4 mm / 2 mm Heights (> 400 mm): 1 % / 0.5 %; Lengths (< 2 m): +/ 2 mm; Lengths (> 2 m /< 20m): +/ 0.1 %; Lengths (> 20 m): +/20 mm	mm, %
Length (min. - max.) Standard Length (min. - max.) Special construction	up to 16 up to 41.5	m
Width (min. - max.) Standard Width (min. - max.) Special construction	60 - 260 up to 4000 (block bonding)	mm
Height (min. - max.) Standard Height (min. - max.) Special construction	60 – 2,000 up to 4,000	mm
Bulk density of load-bearing components according to ÖNORM EN 338, non-load-bearing components according to ÖNORM B 3012	470 (spruce) 590 (larch)	kg/m³
Surface quality	Non-visible (NSI) Visible (SI)	-
Thermal conductivity according to ÖNORM EN ISO 10456	0.13	W/(mK)
Specific heat capacity according to ÖNORM EN ISO 10456	1,600	J/kgK
Water vapor diffusion equivalent air layer thickness according to ÖNORM EN ISO 10456	μ = 50 (dry) to 20 (wet)	m
Adhesive strength according to EN 301 or EN 15425	Adhesive type I	-
Natural durability against fungal attack	Durability class 5	-
Fire behavior according to EN 14080:2013, Annex ZA 1	D-s2,d0	-
Formaldehyde emission class according to EN 14080:2013, Annex ZA 1	E1	-

2.5 Basic/auxiliary materials

The basic materials of the glulam are listed below:

Table 3: Basic and auxiliary materials in mass percentage

Components	Function	Mass fraction in percent
Softwood	Load-bearing component	approx. 87
Water	Water bound in the wood	approx. 11
Adhesive	Adhesive for finger-jointing and surface bonding	approx. 2

The glulam is supplied in either spruce or larch. A fictitious product consisting of 73.94 % spruce and 26.06 % larch was used for the balancing. The percentage breakdown corresponds to the respective quantities of spruce and larch supplied.

2.6 Production stage

1. General
Glued laminated timber (glulam) from Huter & Söhne GmbH is produced in accordance with the European standard EN 14080, which regulates the requirements for the quality, strength and use of glulam. The glues used comply with the standard EN 301 for waterproof adhesives according to class D4, which offer high resistance to moisture. The product is available in various wood species such as spruce/fir and larch and meets the requirements of EN 14080 in terms of strength and deformation properties. On request, the wood can also be wrapped in a film that provides UV and moisture protection.
This production description summarizes the main steps and requirements of the manufacturing process.

2. Material and wood quality
The wood species spruce/fir and larch are used as raw materials for the glulam production. These are checked for quality before processing, taking into account wood moisture, rot, cracks and other defects. According to EN 14080 the wood must have a moisture content of 6-15 % and the wood temperature must be at least 20°C. The raw lamellas are visually graded according to ÖNORM DIN 4074-1 into the grading classes S10 and S13. Defects are recognized and sorted out.

3. Wood drying and moisture monitoring
Huter & Söhne GmbH controls the wood moisture more strictly than required by the relevant product standard. Wood with a moisture content of more than 13 % is not accepted and must be re-dried by the supplier. The target moisture content is approx. 11 %. The moisture content of the lamellas is monitored with measuring devices to ensure, that it fulfills the specific requirements.

4. Adhesive selection and application
A special MUF adhesive (type I according to ÖN EN 301) that meets the requirements of the standards is used to bond the glulam lamellas. The adhesive is applied to the finger joints and to the lamella surfaces. The finger joints are milled by machine and the adhesive is applied using glue rollers.

5. Finger jointing and pressing
The slats are pressed together with a pressure of 5-10 N/mm² for at least one second. This guarantees a stable and permanent bond between the slats. The slats are then planed and the adhesive is applied for surface bonding. This is done using a glue curtain under which the slats are passed. Once the slats have been positioned in the press, the pressing process takes place. This is done under controlled climatic conditions (at least 20°C, 40-75 % humidity).

6. Planing and dimensional check
After pressing and curing the adhesive, the beams are planed parallel to ensure dimensional accuracy. The thickness tolerances are checked continuously.

7. Finishing and labeling
The end products are cut to size and prepared for shipping. All finished beams are clearly labeled, including the CE mark, the strength class and the materials used (e.g. type of wood and type of adhesive).

8. Production control
The production processes are continuously monitored. Regular sampling and tests are carried out to ensure the adhesive strength of the finger joints, the quality of the adhesive joints and the compliance with technical standards. All tests and results are documented and recorded in the production logbook.

9. Safety and quality management
Detailed work instructions exist for each stage of the production process to ensure that all requirements are met. Regular training of the employees and inspections of the machines and measuring equipment guarantee the consistently high quality of the glulam.

10. Environmental and health management during production
Throughout the entire production process, great importance is placed on protecting the environment and the health of employees. All relevant legal requirements and standards in the area of environmental protection and health protection are strictly adhered to and in many cases even undercut.
In addition, all machines are regularly serviced to minimize noise and dust emissions. Waste generated during the production process is separated and recycled in an environmentally friendly manner.

11. Product processing and installation
The glulam beams from Huter & Söhne GmbH can be easily processed using standard solid wood processing tools such as circular saws, milling machines and drilling machines. Processing is similar to conventional solid wood, although the stable structure enables more precise processing.
The applicable health and safety regulations must be observed during installation and assembly. This includes wearing safety goggles, hearing protection, dust masks and suitable protective clothing. Sufficient ventilation should be ensured, especially when using machines that generate sawdust and dust. Mechanical aids and correct lifting techniques are also required when lifting and transporting heavy beams in order to avoid accidents and injuries.

2.7 Packaging

The raw materials are delivered by the supplier without film packaging.
If the customer wishes, the glulam beams can be wrapped in foil after production (finished product packaging). This foil provides additional moisture protection and UV protection during transportation and storage.
The packaging film (film web and wrapping film) is made of polyethylene (PE). PET strapping and PP edge protection are also used. After use, the packaging materials (film, strapping and edge protectors) are thermally recycled.

2.8 Conditions of delivery

Huter & Söhne glulam is usually supplied as standard beams. Special processing (CNC) is possible on request. The glulam is supplied smoothly planed on 4 sides with a chamfer.
Protective coatings or other coats of paint are not part of the declared product.

Dimensions:
Width: 60 to 260 mm
Height: 60 to 2,000 mm
Length: up to 16 m
Special dimensions possible

2.9 Transport to site

The finished goods are either collected by the customer themselves or Huter & Söhne organizes the transport. Transport is usually carried out by road using appropriate trucks. As the sales radius of Huter & Söhne is more regional, transportation by rail or ship is not economical and therefore not common. The glulam beams are usually loaded onto open or closed semi-trailers (maximum permissible total weight 38 tons). Smaller trucks (motor vehicles) are used to a lesser extent.

2.10 Construction product stage

The product Huter & Söhne glulam can be processed with the usual tools suitable for woodworking. Please observe the health and safety instructions during processing and assembly.

2.11 Use stage

If used as intended, no material changes in composition are expected during the utilization phase. During use, around 221.86 kg of carbon is bound in the product. This corresponds to 813.49 kg CO_2 in case of complete oxidation.
Note:
The high values for the biogenic carbon content and the biogenic carbon dioxide content can be explained by the high average density of the glulam (spruce and larch).

2.12 Reference service life (RSL)

If installed correctly and used as intended, no premature end to the durability of the glulam is known or expected. The average service life of the product is therefore the service life of the building.
As the product standard EN 14080 does not specify any precise data on the service life and no RSL in accordance with EN 15804 A2 Annex A could be determined, the service life catalog of Bau-EPD GmbH was used here to determine the RSL (BAU-EPD-M-DOKUMENT-20). A reference service life of 100 years can then be assumed. There are no known or expected influences on product ageing when used according to the rules of technology.

Table 4: Reference service life (RSL)

Characterization	Value	Unit
Glued laminated timber	100	years

2.13 End of life stage

After selective dismantling, the product can generally be reused or recycled without any problems. Alternatively, the material can also be sent for thermal utilisation for energy recovery.
Landfilling of waste wood is not permitted.
Waste code according to the European Waste Catalogue: EWC waste code number 170201.

2.14 Further information

Further information and documents such as technical data sheets, certificates, etc. are available on www.huter.soehne.at

3 LCA: Calculation rules

3.1 Declared unit/ Functional unit

Table 5: Declared unit

Characterization	Value	Unit
Declared unit: Glulam	1	m^3
Wood moisture on delivery	11	%
Raw density	501.27	kg/m^3

For the density, a weighted average of the material used in spruce and larch was calculated based on the quantities produced.

3.2 System boundary

This EPD is a cradle-to-grave analysis (A+B+C+D). It includes the following life cycle phases:

Table 6: Declared life cycle stages

PRODUCTION STAGE			CON-STRUCTION PROCESS STAGE		USE STAGE							END-OF-LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Construction, installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction, demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

X = included in LCA; ND = Not declared

A1-A3: Production stage:
The manufacturing phase includes the production of all components of the declared product (wooden slats and adhesive) including the respective upstream chains through to raw material extraction (A1). Transportation (A2) from the location of raw material extraction to the production site is also taken into account. Within the plant boundaries, all expenses for the production of the glulam are taken into account (A3). As the raw material is delivered without packaging film, there is no significant waste in production. The finished product (glulam) is supplied with or without packaging film, depending on customer requirements. The proportionate packaging (film, strapping and edge protection) is accounted for in this phase.

A4-A5: Construction stage:
At this stage, transportation from the manufacturing plant to the construction site (A4) and the expenses of installing the glued laminated timber elements in the building (A5) are included. In addition, the thermal recycling of the packaging materials included in the balance is also taken into account in module A5.

B1-B7: Utilization stage:
This stage deals with the utilization phase of the product. However, if the product is used properly, no environmentally relevant processes occur over the period of use.

C1-C4: Disposal stage:
The disposal stage includes dismantling (C1), transportation of the dismantled product, which is therefore waste, to the waste treatment plant (C2) and its thermal recovery (C3). For the present case, no environmentally relevant processes were balanced in C4 (disposal).

D: Benefits and loads outside the system boundaries:
The benefits and burdens for the thermal recycling of packaging waste (from A5) and the product itself (from C3) are considered.

3.3 Flow chart of processes/stages in the life cycle

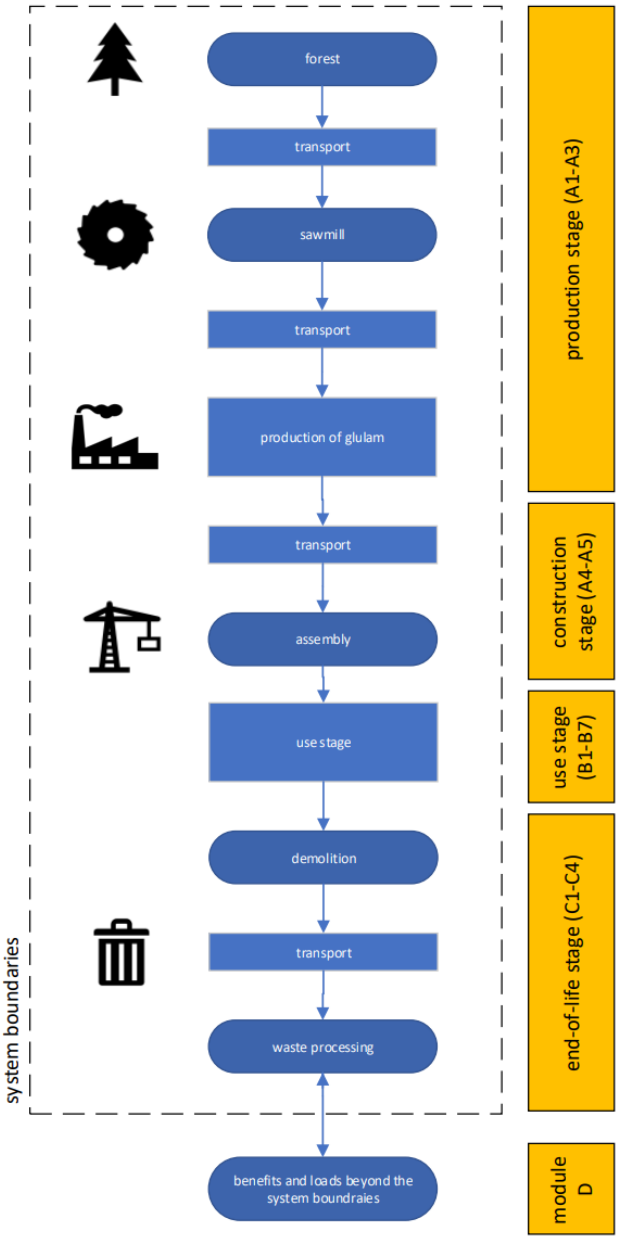

Figure 1: flow diagram

3.4 Estimations and assumptions

The following estimations and assumptions were made:

- The specified values for the gross density were measured on the basis of random samples and compared with values from literature. As around 26 % of the beams sold were produced in larch, the average density is with 501.27 kg/m³ higher than for pure glulam made of spruce.

- To determine the amount of energy required for dismantling, it was assumed that the same type of crane performs the dismantling as the assembly. As dismantling is faster, only 25 % of the time or diesel consumption was used.
- For the calculation of PERM, the calorific heat value of wood was assumed with 19.1 MJ/kg for dry wood (source: ecoinvent report No. 6 Teil IX – Holzenergie; Data v 2.0; 2007 - table 4.4) and corrected for moisture.
- A value of 14.65 MJ/kg was assumed for the calorific heat value of the melamine resin (adhesive). The value comes from the ecoinvent database for the data set melamine urea formaldehyde adhesive GLO.
- The following scenario was assumed for the thermal utilization of the wood: Energy recovery with an efficiency for electricity of 11.61 % and an efficiency for heat of 29.34 % according to CEWEP (2013). The overall efficiency is 40.95 % (11.61 % + 29.34 %). The breakdown is therefore 28.35% for electricity and 71.65% for heat.
- As the calculation with the software SimaPro sometimes produces incorrect results, the following calculations were corrected manually:
    - GWP biogenic (see calculation in the appendix)
    - Primary energy: The values have been adjusted accordingly
    - Secondary materials and secondary energy: SimaPro contributes to the use of secondary materials and secondary energy in the various modules. These originate from upstream processes (e.g. production by the harvester). As they are not directly related to the declared product, the values were set to 0.

3.5 Cut-off criteria

All inputs and outputs, for which data is available and which are expected to make a significant contribution, are in the LCA model. Only data with a mass input of less than 1 % of all inputs in A1-A3 were cut off. The omission of this data is justified by the insignificance of the expected impact. This means that no processes, materials or emissions were neglected, which are expected to make a significant contribution to the environmental impact of the product. It can be assumed that the data was recorded in full and that the total sum of the neglected input flows does not exceed 5% of the energy and mass input.

3.6 Allocation

The relevant allocations were calculated as follows:

General:
The inherent material properties of the product (biogenic carbon and the primary energy it contains) are assigned according to the physical criterion of mass.

Module A1-A3:
The upstream chains of the respective input materials are mapped using generic data sets. Allocation rules in these datasets can be found in the dataset documentation.
The flows/burdens associated with the wood lamellas (raw material) were modeled as standard using economic allocation.
According to the manufacturer, the following co-products are created during the manufacture of the declared product:

- Wood shavings
- Finger joint waste

The allocation was carried out using economic allocation.
The difference between the prices of co-products and the main product is far more than 25%. The method of economic allocation is therefore necessary.
The glulam plant of Huter & Söhne GmbH produces glulam exclusively.

Modules A5 & C3:
The thermal recycling of the packaging waste (A5) and the product itself (C3) takes place in a waste incineration plant (WIP). The associated loads are declared in the respective modules. The waste incineration plant is a multi-input process. An energy efficiency of more than 60 % was assumed for incineration, as all waste incineration plants in Austria meet this requirement. The relevant allocation is made via the selected background data sets - details can be found in the respective dataset documentation.

Module D
Packaging waste and the declared product itself are thermally recycled. The benefits through the substitution of primary energy sources are presented in Module D. The breakdown of electrical and thermal energy can be found in the corresponding documentation CEWEP (Results of Specific Data for Energy, R1 Plant Efficiency Factor and NCV of 314 European Waste-to-Energy (WtE) Plants).

3.7 Comparability

In principle, a comparison or evaluation of EPD data is only possible if all data sets to be compared were created in the same version in accordance with EN 15804, the same program-specific PCR or any additional rules and the same background database was used and the building context or product-specific performance characteristics are also taken into account.

4 LCA: Scenarios and additional technical information

4.1 A1-A3 product stage

According to EN 15804, for modules A1-A3 no technical scenario information is required because the balancing of these modules is the responsibility of the manufacturer and may not be changed by the creator of the LCA.

4.2 A4-A5 Construction process stage

Transportation is divided between two types of vehicles. 75 % of the transport is carried out with semi-trailers (maximum permissible total weight 38 t). The remainder is transported by a smaller type of truck.

Table 7: Description of the scenario „Transport to building site (A4)" – truck > 32 to (75% of the transports)

Parameters to describe the transportation to the building site (A4)	Value	Unit
Average transportation distance	145.55	km
Vehicle type according to Commission Directive 2007/37/EC (European emission standard)	trucks > 32 t, EURO 6	-
Fuel type and average consumption of vehicle (Fuel type: diesel)	0.962	l/(100 km*m³)
Maximum transport mass	15.96	t
Capacity utilisation (including empty returns)	50	%
Bulk density of transported products	501.27	kg /m3
Volume utilization factor (factor: =1 or <1 or ≥ 1 for packed in boxes products or compressed products	1	-

Table 8: Description of the scenario „Transport to building site (A4)" – truck 16 - 32 to (25% of the transports)

Parameters to describe the transportation to the building site (A4)	Value	Unit
Average transportation distance	145.55	km
Vehicle type according to Commission Directive 2007/37/EC (European emission standard)	trucks 16-32 t, EURO 6	-
Fuel type and average consumption of vehicle (Fuel type: diesel)	1.837	l/(100 km*m³)
Maximum transport mass	5.79	t
Capacity utilisation (including empty returns)	50	%
Bulk density of transported products	501.27	kg /m3
Volume utilization factor (factor: =1 or <1 or ≥ 1 for packed in boxes products or compressed products	1	-

Table 9: Description of the scenario „Installation of the product in the building (A5)

Parameters to describe the installation of the product in the building (A5)	Value	Unit
Ancillary materials for installation (specified by material);	-	kg/t t/t l/t
Ancillary materials for installation (specified by type);	crane	-
Water use	-	m^3/t l/t
Other resource use	-	kg/t t/t l/t
Electricity demand	-	kWh
Other energy carrier(s): diesel consumption for crane operation	4	l/h
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	3	%
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	Wood waste 15 PE film: 0.634 PET strap: 0.0398 PE edge: 0.0043	kg/m^3
Direct emissions to ambient air (such as dust, VOC), soil and water	-	kg/t

4.3 B1-B7 Use stage

If used as intended, no material changes in the composition are expected during the use phase. During use, around 221.86 kg of carbon is bound in the product. This corresponds to approx. 813.49 kg CO_2 in case of complete oxidation.
The reference service life is 100 years.
If installed correctly and used as intended, no premature end to the durability of glulam is known or to be expected. The average service life of the product is therefore of the same order of magnitude as the service life of the building.
As the product standard EN 14080 does not specify any precise data on the service life and no RSL in accordance with EN 15804 A2 Annex A could be determined, the service life catalogue of Bau-EPD GmbH (BAU-EPD-M-DOKUMENT-20-Referenznutzungsdauer) was used here to determine the RSL.

4.4 C1-C4 End-of-Life stage

If no further use is made of the glulam, the material is sent for thermal utilization for energy recovery.

Module C1 - Deconstruction:
The glulam is dismantled with the aid of a crane. To determine the amount of energy required for dismantling, it was assumed that the same type of crane is used for dismantling as for assembly. As dismantling is faster, 25 % of the diesel consumption was applied.

Module C2 - Transportation:
The dismantled glulam is transported to the nearest waste incineration plant. An average distance of 150 km was assumed for transportation.

Module C3 - Waste management:
Waste collection and treatment processes for thermal recovery within the product system are classified in C3 or C4, if the end of waste has not been reached. In this case, if the recovery rate is >60% (see calculation of R in EN 16485), all treatment and recovery facilities are to be counted in C3. As all waste incineration plants in Austria fulfill this quota, waste management is accounted in C3. Credits for the electricity and heat-quantities can be calculated in D.

Table 10: Description of the scenario „Disposal of the product (C1 to C4)“

Parameters for the end-of-life stage (C1-C4)	Value	Unit
Collection procedure, specified by type	501.27	kg separate
	0	kg mixed
Recovery system specified by type	501.27	kg energy recovery
Landfill, specified by type	not allowed	kg landfill
Assumptions for scenario development, e.g. for transportation	150 kg radius	km

4.5 D Potential of reuse and recycling

The product reaches the end of its waste life after removal from the building, transportation for processing and chipping of the product. Thermal utilization is assumed for the end of life of Huter & Söhne glulam.
In general, it is not assumed that the glulam will be reused or recycled in any other way.
At the end of the product's life, a comparable equilibrium moisture content to the moisture content on delivery is assumed. This value can fluctuate greatly depending on the storage of the product prior to energy recovery.
The energy recovered by incineration in the waste incineration plant is declared as a credit in information module D.

Table 11: Description of the scenario „reuse, recovery and recycling potential (module D)”

Parameters for the module (D)	Value	Unit
Materials for reuse or recycling from A4-A5 (offcuts)	-	-
Energy recovery or secondary fuels from A4-A5	102.44	MJ/m³
Materials for reuse or recycling from C1-C4	-	-
Energy recovery or secondary fuels from C1-C4	3,414.64	MJ/m³

5 Information on data quality and data selection in accordance with EN 15941

5.1 Principles for the description of data quality

The foreground data was collected using a data collection form adapted to the declared product. This data collection form was discussed in detail during a factory visit. Queries were clarified in an iterative process in writing via e-mail, by telephone or in person. As a result of the intensive discussion to ensure that the material and energy flows were mapped as realistically as possible, it can be assumed that the quality of the foreground data collected was high. When selecting the background data, attention was paid to the technological, geographical and time-related representativeness of the data basis. In the absence of specific data, generic data sets or a representative average were used. The ecoinvent background data sets used are the currently available data sets.
The origins of individual data records are older than 10 years. According to the database documentation, these are mostly data records that have been updated accordingly or extrapolated to current conditions. The time period of each dataset does not represent an expiry date, but the period of the original data collection or the period to which the dataset was extrapolated.

5.2 Description of the temporal, geographical and technological representativeness of the product data

Temporal representativeness:

- The data collection period corresponds to the year 2023. All specific data are from this year.
- There is no deviation from the reporting year 2023 in the collection of specific data.
- The generic data was taken from the ecoinvent database (version 3.10). Some of this data deviates significantly from the reporting year.

Geographical representativeness:

- The glulam in spruce and larch is produced exclusively at the company site in Innsbruck, Austria. The product is mainly sold and installed in the surrounding area. The majority of the products are used in construction projects in Austria, Germany and Italy. There may be occasional deliveries outside these countries, but this is negligible in terms of quantity. The product is disposed

of in the immediate vicinity of its use, as the glulam is not transported unnecessarily over long distances due to its volume and mass.

Technological representativeness:

- The production of glulam in Innsbruck is state of the art. The relevant production facilities are for the most part quite new and very well coordinated, and they are comparable with other production facilities.
- There are other production facilities at the Innsbruck site (door production, special timber construction, structural and civil engineering). However, glulam production is completely separate and independent in all areas. There is no overlap with other departments when collecting data.

Geographical and technological representativeness for EPDs covering an industry:

- The production volumes are rather low for a glulam plant (market share in Austria in the single-digit percentage range). Huter & Söhne sets very high quality-standards here. The combination of spruce and larch also tends to appeal to customers in the higher price segment. The producer therefore focuses on quality rather than quantity. Regardless of the sales volumes, production is very efficient and comparable with other factories.
- As just glulam is produced at the plant, the data collected also corresponds exactly to the data in the EPD.

5.3 Explanation of the averaging process

Two different types of wood are considered in this EPD. The company Huter & Söhne uses spruce/fir and larch for the production of glulam beams. In order to be able to cover both types of wood in this EPD, average data for the wood density was used in the balance. As the exact quantities and distribution of the wood species are known, an average density can be calculated. This average density (501.27 kg/m³) is then the basis for all further calculations.

5.4 Assessment of the data quality of the Life Cycle Inventory data

The data set for sawn timber is a generic data set from ecoinvent. This was originally published in 2011 and was last updated in 2019. It applies to Europe and to spruce wood with a density of 440 kg. It should be noted that the temporal representativeness could be better and only spruce wood with a lower density is taken into account. The sawn timber has a very massive impact on the LCA as it is the main raw material for the glulam.
The adhesive was also modelled using a generic data set from ecoinvent. This was originally published in 2009 and was last updated in 2018. GLO is specified as the geographical representativeness. The technical representativeness corresponds to the intended use, namely the bonding of structural wood products. The temporal and geographical representativeness of this data set can therefore be rated as poor. The adhesive has a very significant share in the life cycle assessment, as it accounts for the largest proportion of glulam by mass alongside sawn timber and the manufacturing costs of the upstream processes are very high compared to wood.

6 LCA: results

The following tables contain the life cycle assessment results for 1m³ of glulam. The density is 501.27 kg/m³.

Table 12: Parameters to describe the environmental impact

Parameters	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	C1-C4	A-C	D
GWP total	kg CO_2 equiv	-6.71E+02	9.13E+00	8.82E+00	0	3.60E-01	1.43E+01	8.20E+02	0	8.35E+02	1.81E+02	-1.30E+02
GWP fossil fuels	kg CO_2 equiv	1.41E+02	9.13E+00	8.79E+00	0	3.60E-01	1.43E+01	6.60E+00	0	2.12E+01	1.80E+02	-1.30E+02
GWP biogenic	kg CO_2 equiv	-8.13E+02	0	0	0	0	0	8.13E+02	0	8.13E+02	0	0
GWP luluc	kg CO_2 equiv	1.03E+00	3.16E-03	3.14E-02	0	3.13E-05	4.75E-03	1.07E-03	0	5.85E-03	1.07E+00	-8.46E-02
ODP	kg CFC-11 equiv	5.63E-06	1.87E-07	2.11E-07	0	5.51E-09	2.84E-07	9.20E-08	0	3.82E-07	6.41E-06	-5.53E-06
AP	mol H^+ equiv	8.89E-01	2.06E-02	4.40E-02	0	3.25E-03	2.97E-02	7.71E-02	0	1.10E-01	1.06E+00	-2.13E-01
EP freshwater	kg P equiv	5.11E-02	6.34E-04	1.71E-03	0	1.05E-05	9.67E-04	2.39E-03	0	3.37E-03	5.68E-02	-6.05E-02
EP marine	kg N equiv	2.97E-01	5.24E-03	1.68E-02	0	1.51E-03	7.15E-03	4.20E-02	0	5.07E-02	3.70E-01	-6.25E-02
EP terrestrial	mol N equiv	3.32E+00	5.67E-02	1.84E-01	0	1.65E-02	7.71E-02	4.02E-01	0	4.96E-01	4.06E+00	-5.66E-01
POCP	kg NMVOC equiv	1.25E+00	3.52E-02	6.34E-02	0	4.92E-03	4.94E-02	1.01E-01	0	1.55E-01	1.50E+00	-2.77E-01
ADPE	kg Sb equiv	7.89E-04	2.71E-05	2.73E-05	0	1.25E-07	4.64E-05	1.05E-05	0	5.70E-05	9.01E-04	-1.96E-04
ADPF	MJ H_u	2.20E+03	1.34E+02	9.89E+01	0	4.71E+00	2.01E+02	5.37E+01	0	2.59E+02	2.70E+03	-2.07E+03
WDP	m3 world equiv .	7.84E+01	7.96E-01	2.63E+00	0	1.38E-02	1.13E+00	4.40E+00	0	5.54E+00	8.74E+01	-4.66E+01
Legend		GWP = Global warming potential; luluc = land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, cumulative exceedance; EP = Eutrophication potential; POCP = Formation potential for tropospheric ozone; ADPE = potential for abiotic depletion of non-fossil resources; ADPF = potential for abiotic depletion of fossil fuels; WDP = water removal potential (user)										

Table 13: Additional environmental impact indicators

Parameters	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	C1-C4	A-C	D
PM	Occurrence of diseases	4.55E-05	8.07E-07	1.82E-06	0	9.23E-08	1.05E-06	8.41E-07	0	1.98E-06	5.01E-05	-1.09E-06
IRP	kBq U235 equiv	1.61E+01	1.67E-01	5.12E-01	0	2.11E-03	2.61E-01	1.03E-01	0	3.66E-01	1.72E+01	-1.54E+01
http-fw	CTUe	1.06E+03	3.34E+01	4.10E+01	0	6.68E-01	5.47E+01	8.74E+01	0	1.43E+02	1.28E+03	-2.66E+02
HTP-c	CTUh	1.60E-06	6.09E-08	6.38E-08	0	1.41E-09	1.01E-07	1.27E-07	0	2.29E-07	1.96E-06	-2.90E-07
HTP-nc	CTUh	1.95E-06	8.76E-08	9.50E-08	0	6.39E-10	1.30E-07	8.07E-07	0	9.37E-07	3.07E-06	-5.40E-07
SQP	dimensionless	1.04E+05	1.15E+02	3.13E+03	0	3.30E-01	1.21E+02	1.38E+01	0	1.36E+02	1.08E+05	-3.13E+02
Legend		PM = Potential occurrence of diseases due to particulate matter emissions; IRP = Potential effect of human exposure to U235; ETP-fw = Potential Toxicity Comparison Unit for ecosystems; HTP-c = Potential Toxicity Comparison Unit for humans - carcinogenic effect; HTP-nc = Potential toxicity comparison unit for humans - non-carcinogenic effect; SQP = Potential soil quality index										

Table 14 presents disclaimers which shall be declared in the project report and in the EPD with regard to the declaration of relevant core and additional environmental impact indicators according to the following classification. That can be declared in a footnote in the EPD.

Table 14: Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD-classification	Indicator	disclaimer
ILCD-Type 1	Global warming potential (GWP)	none
	Depletion potential of the stratospheric ozone layer (ODP)	none
	Potential incidence of disease due to PM emissions (PM)	none
ILCD-Type 2	Acidification potential, Accumulated Exceedance (AP)	none
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	none
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	none
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	none
	Formation potential of tropospheric ozone (POCP)	none
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD-Type 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 – 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 from some construction materials is also not measured by this indicator.		
Disclaimer 2 – 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.		

Table 15: Parameters to describe the use of resources

Parameters	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	C1-C4	A-C	D
PERE	MJ H_u	1.13E+04	2.19E+00	5.94E+02	0	2.88E-02	3.45E+00	8.50E+03	0	8.50E+03	2.04E+04	-8.03E+02
PERM	MJ H_u	8.50E+03	0	0	0	0	0	-8.50E+03	0	-8.50E+03	0	0
PERT	MJ H_u	1.98E+04	2.19E+00	5.94E+02	0	2.88E-02	3.45E+00	1.85E+00	0	5.33E+00	2.04E+04	-8.03E+02
PENRE	MJ H_u	2.04E+03	1.34E+02	1.31E+02	0	4.71E+00	2.01E+02	1.81E+02	0	3.87E+02	2.70E+03	-2.07E+03
PENRM	MJ H_u	1.60E+02	0	-3.25E+01	0	0	0	-1.28E+02	0	-1.28E+02	0	0
PENRT	MJ H_u	2.21E+03	1.34E+02	9.89E+01	0	4.71E+00	2.01E+02	5.37E+01	0	2.59E+02	2.70E+03	-2.07E+03
SM	kg	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ H_u	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ H_u	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	2.08E+00	1.95E-02	6.90E-02	0	3.37E-04	2.79E-02	1.03E-01	0	1.32E-01	2.30E+00	-1.69E+00
Legend		PERE = Renewable primary energy as an energy source; PERM = Renewable primary energy for material use; PERT = Total renewable primary energy; PENRE = Non-renewable primary energy as energy source; PENRM = Non-renewable primary energy for material use; PENRT = Total non-renewable primary energy; SM = Use of secondary materials; RSF = Renewable secondary fuels; NRSF = Non-renewable secondary fuels; FW = Use of freshwater resources										

Table 16: Parameters describing LCA-output flows and waste categories

Parameters	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	C1-C4	A-C	D
HWD	kg	7.49E+00	1.95E-01	3.47E-01	0	5.26E-03	2.93E-01	2.38E+00	0	2.68E+00	1.07E+01	-2.69E+00
NHWD	kg	4.89E+02	3.98E+00	3.17E+01	0	7.19E-02	6.19E+00	5.21E+02	0	5.27E+02	1.05E+03	-3.03E+02
RWD	kg	4.11E-03	4.13E-05	1.30E-04	0	5.17E-07	6.48E-05	2.57E-05	0	9.10E-05	4.37E-03	-3.97E-03
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	2.17E+01	0	0	0	7.24E+02	0	7.24E+02	7.46E+02	0
EET	MJ	0	0	5.49E+01	0	0	0	1.83E+03	0	1.83E+03	1.89E+03	0
Legend			HWD = Hazardous waste to landfill; NHWD = Non-hazardous waste disposed of; RWD = Radioactive waste disposed of; CRU = components for reuse; MFR = materials for recycling; MER = materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy									

Table 17: Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit
Biogenic carbon in the product	221.86 kg C/m³
Biogenic carbon in the associated packaging	0,00 kg C/m³
Note: 1 kg biogenic carbon corresponds to 44/12 kg CO2	

7 LCA: Interpretation

Production (phases A1-A3) accounts for the largest contribution to the overall system (> 80 % for most indicators) by far. The contribution of the remaining life cycle phases is divided almost equally between the remaining 20 %.

A closer look at production phases A1-A3 reveals that the environmental impact of the two product components (wood and adhesive) is the dominant factor for most indicators. One exception is the depletion potential of the stratospheric ozone layer (ODP), where packaging makes a very significant contribution.
The biogenic GWP (and therefore also the total GWP) shows a very strong negative contribution. As well known, this is due to the carbon stored in the wood. Due to the use of spruce and larch, the average wood density is relatively high, which is also reflected in a higher biogenic GWP value compared to pure spruce glulam. This contribution to the GWP is booked out again in module C3.
Sawn timber makes the largest contribution to GWP fossil with 48.7 %, followed by adhesives (20.5 %) and transport (17.8 %).
The GWP luluc is dominated by sawn timber (95.1%).

Almost 56 % of the stratospheric ozone depletion potential (ODP) is determined by the PE packaging film.
As expected, the adhesive makes a high contribution to the potential for abiotic depletion of non-fossil resources (ADPE).
For all other indicators, the product components (wood and adhesive) make by far the largest contribution to the system (> 75 %).
Wood provides 97.2 % of the renewable primary energy (PERT). In the case of non-renewable primary energy (PENRT) the contribution is split 50.8 % between sawn timber, 19.8 % between adhesive and 17.1 % between transport (the remaining shares are less than 3 %).

Compared to other solid wood EPDs, the high biogenic GWP is striking. This is due to the use of spruce and larch wood. The company Huter & Söhne GmbH produces approx. 26 % of the glulam beams in larch wood. As larch has a higher density than spruce, this also results in a higher weighted average density. This leads to a comparatively high value in the calculation of the biogenic GWP.

8 Literature

EN ISO 14025:2006-07 Environmental labels and declarations - Type III environmental declarations - Principles and procedures

EN ISO 14040:2006+A1:2020 Environmental management - Life cycle assessment - Principles and framework

EN ISO 14044:2006+A1:2017+A2:2020 Environmental management - Life cycle assessment - Requirements and guidance

EN 15804:2012+A2:2019+AC:2021 Sustainability of construction works - Environmental product declarations - Basic rules for the product category construction products

EN 15941:2024 Sustainability of construction works - Data quality for the assessment of environmental quality of products and construction works - Selection and application of data

Management system manual incl. applicable documents of Bau EPD GmbH

CEWEP Energy Report: Results of Specific Data for Energy, R1 Plant Efficiency Factor and NCV of 314 European Waste-to-Energy (WtE) Plants

ecoinvent report Nr. 6 Teil IX - Holzenergie (Data v2.0; 2007)

ecoinvent report Nr. 9 - Life Cycle Inventories of Wood as Fuel and Construction Material (Data v2.0; 2007)

BAU-EPD-M-DOC-20: Service life catalog of Bau-EPD GmbH for the preparation of EPDs

BAU-EPD-PKR-B-2.22.5: PKR-Anleitungstexte für Bauprodukte Teil B: Anforderung an die EPD für NAWARO-Dämmstoffe

General Principles and Guidelines = MS-HB and applicable M-Docs of Bau-EPD GmbH, in the current version

9 Directory and Glossary

9.1 List of figures

9.2 List of tables

9.3 Abbreviations

9.3.1 Abbreviations as per EN 15804

EPD	environmental product declaration
PCR	product category rules
LCA	life cycle assessment
LCI	life cycle inventory analysis
LCIA	life cycle impact assessment
RSL	reference service life
GWP	global warming potential
ODP	depletion potential of the stratospheric ozone layer
AP	acidification potential of soil and water
EP	eutrophication potential
POCP	formation potential of tropospheric ozone
ADP	abiotic depletion potential

9.3.2 Abbreviations as per corresponding PCR

CE-mark	french: Communauté Européenne or Conformité Européenne = EC certificate of conformity
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals

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