Statement of Verification

BREG EN EPD No.: 000727 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Nuneaton Roof Truss Ltd

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

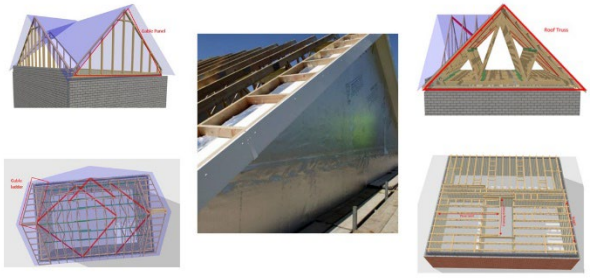
BRE Global Scheme Document SD207

This declaration is for:

The manufacture and delivery of a complete roof system (8.2m x 5.6m x 3m, weight 2,524kg) by Nuneaton Roof Truss

Company Address

Nuneaton Roof Truss Ltd
Units 1 & 2 Weddington Terrace
Nuneaton
CV10 0AG



Signed for BRE Global Ltd	Hayley Thomson Operator	10 October 2025 Date of this Issue
10 October 2025 Date of First Issue		09 October 2030 Expiry Date

Environmental Product Declaration

EPD Number: 000727

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+A2 PN 514 Rev 3.1 (30.11.2023)
Commissioner of LCA study	**LCA consultant/Tool**
Nuneaton Roof Truss Ltd Units 1 & 2 Weddington Terrace Nuneaton CV10 0AG	LCA Tool: OpenLCA v2.0 Valpak Consultancy Unit 4, Montague House Stratford-upon-Avon Business and Technology Park Banbury Road, Stratford-upon-Avon Warwickshire CV37 7GW
Declared/Functional Unit	**Applicability/Coverage**
The manufacture and delivery of a complete roof system (8.2m x 5.6m x 3m, weight 2,524kg) by Nuneaton Roof Truss	Other (please specify) Project specific. The components within the roof system are representative of the structural roof products manufactured by Nuneaton Roof Truss. The intended audience is B2B. While this EPD may inform Level 1 & Level 2 impacts in buildings models, alternative structures must be comparable.
EPD Type	**Background database**
Cradle to Gate with options	Ecoinvent 3.9.1 (30.11.2022) via GreenDelta's Add-on V2 for EN 15804+A2 compliant LCAs.
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: Bala Subramanian	
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+A2:2019. 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+A2:2019 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)

Nuneaton Roof Truss
Units 1 & 2 Weddington Terrace
Nuneaton
CV10 0AG

Construction Product:

Product Description

The dimensions of the designed complete roof system are 8.2m (L) x 5.6m (W) x 3m (H). The weight of the complete roof system is 2,524 kg, of which timber accounts for ~80%. The average density (average moisture content=16%) of the timber as calculated for the specific components in the design used is 457 kg/m^3.

The complete roof system includes all specified trusses, beams, joists, panels, valleys and flooring and is made up from the following components:

- Bracing timbers
- DUO standard roof trusses
- Floor joists
- Framing timbers
- Gable ladders
- Gable panels
- Spandrel panels
- Valleys

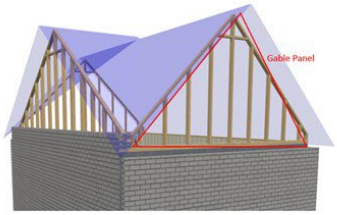
Technical Information

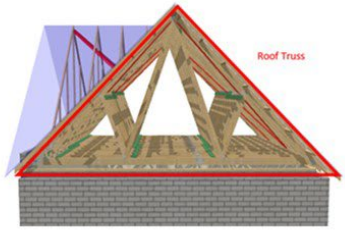
Engineered timber is the main material used in the roof system (~80% of the product by weight). NRT's manufacturing site meets the requirements of the PEFC ST2002:2020 Chain of Custody Certification[1], and the requirements of the BM TRADA Q-Mark Trussed Rafter scheme in accordance with BS EN 14250:2010[2]. Further technical details for the engineered timber are shown below. The Fermacell (gypsum) board used

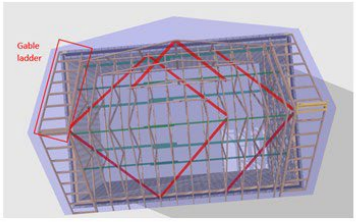
[1] *NRT BMT PEFC-2023.pdf*
[2] *NRT BMTRADA-CERT-2023.pdf*

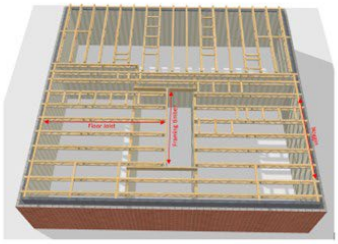
(~15% of the product by weight) fulfils the standards of the Eco-INSTITUT[3]. The metal nail plates used (~6% of the product by weight) are in accordance with EN14545[4,5].

Property	Value, Unit
Timber grade	TR26, in accordance with EN14081-1[6]
Strength, stiffness	C24 or C16, according to EN 338[2]
Durability	4, according to EN 350-2[2]
Reaction to fire	D-S2, d0 according to EN 14081-1, Table C.1[2]
Moisture content (@average mc=16%)	Average 16%[7]
Density	457[8]
Release of dangerous substances	No dangerous substance to be declared[6]









Main Product Contents

The values provided in the table below are the percentages of total raw material input per complete roof (excluding packaging) as supplied to the customer.

Material/Chemical Input	%
Timber	78.8
Fermacell (gypsum)	15.0
Steel	6.0

[3] *..\Background Information\Eco-Institute-Certificate - Fermacell.PDF*
[4] *for reference in LCA\DoPM20_180218.pdf*
[5] ..\Supporting information shared by NRT\for reference in LCA\DoPBEV90_180218.pdf
[6] *for reference in LCA\DoP Sodra SE All mills.pdf*
[7] Sourced from EPD S-P-02657 Swedish sawn and planed wood product www.environdec.com
[8] *Calculated average for the specific sized timber pieces used in the designed roof system specified in this LCA.*

Material/Chemical Input	%
OSB	0.2
Polypropylene (TF200 damp proof membrane)	.03

Manufacturing Process

Manufacturing takes place on one site that has adjacent buildings. The manufacturing process for the roof system is as below:

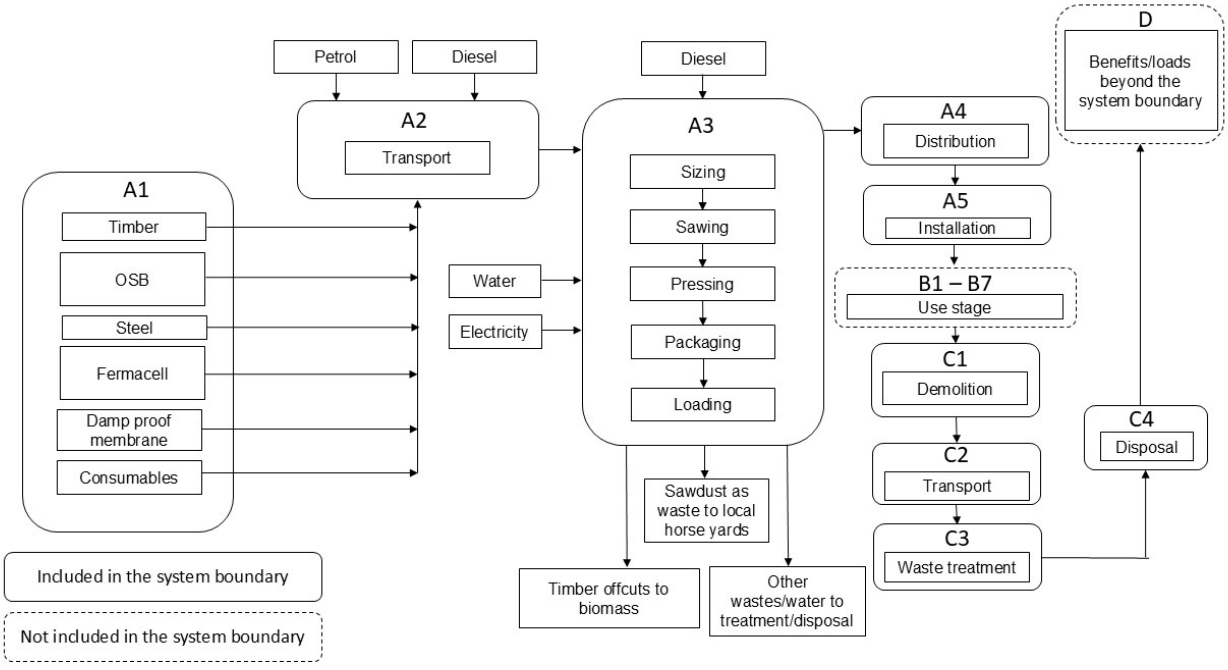
1. Raw Material Handling - The raw materials for timber components[9] are received in bulk quantities and stored in storage areas (inside and outside) at the Nuneaton Roof Truss' manufacturing site.

2. Sizing/sawing – Timber for the roof system is cut to the desired lengths, waste off cuts are used in the on-site biomass burner, excess wood chips are transported and used by a biomass company, sawdust is collected by local horse yards. Fermacell (gypsum) board is cut to size and off cuts are landfilled.

3. Pressing – Cut timbers are positioned within a jig and metal plate fasteners are accurately positioned at each joint, then metal plates are fully pressed into the timber to form each joint.

4. Loading – Once constructed, roof system components are applied with lifting straps/metal strapping and lifted onto the lorry for transport to customer sites.

Process flow diagram



[9] Metal parts (e.g. nail plates, nails, screws, staples), damp proof membrane, lifting straps, and ancillary materials are also supplied to Nuneaton Roof truss. Note framing timber and bracing timber are sourced by Nuneaton Roof Truss to design specifications and delivered to the customer site as received (there is no sizing/sawing or addition of nails etc).

Construction Installation

There is minimal installation waste and overall installation impacts are assumed negligible. However, the packaging is considered as waste during the product installation (A5), and these packaging waste impacts are included in A5 in this EPD.

Use Information

The intended audience is B2B. The use stage of the life cycle of the roofing system is not included as is it assumed there is no or negligible environmental impacts. While this EPD may be used to inform Level 1 & Level 2 impacts in buildings models, alternative structures must be comparable.

End of Life

Scenarios for the waste management of the roof system's components at EoL are developed using BRE PCR PN 514 Rev 3.1 Appendix D.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

The manufacture and delivery of a complete roof system (8.2m x 5.6m x 3m, weight 2,524 kg) by Nuneaton Roof Truss

System boundary

The PCR for this EPD is BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804+A2 PN 514 Rev 3.1.

The system boundary is cradle-to-gate with options. Module A4 is included to cover the transport of the complete roof system to the customer site, A5 includes packaging waste on the shipped product, Module C the EoL impacts, and Module D the potential benefits/loads beyond the system boundary. Excluded are B1-B7.

Data sources, quality and allocation

Data sources
Comprehensive process specific input data of high quality and granularity has been provided by Nuneaton Roof Truss regarding the manufacturing processes for the roof system and its components, the supply chains for all raw materials, energy, water, ancillary materials and packaging.

Background LCI processes selected to model the environmental impacts are from (Ecoinvent 3.9.1 released in 2022) and sourced from version 2 of GreenDelta's EN15804 add-on database which has been produced for compliance with the EN15804+A2:2019 standard. The data within it has been critically reviewed and verified by experts to be compliant with EN15804.

The software used to model the LCA is OpenLCA v2.0. OpenLCA Nexus provides version 2 of GreenDelta's EN15804 add-on (modified from the Ecoinvent 3.9.1 database released in December 2022) for producing EPDs compliant with the EN15804+A2:2019 standard. The EN15804 add-on database follows the method 'allocation, cut-off by classification' which is fully compliant with the requirements of the EN15804 + A2 standard for construction products and the BRE PCR EN15804+A2 PN514 rev 3.1. The environmental data within the EN15804 add-on has been critically reviewed and verified by LCA experts to be fully compliant with EN15804

The impacts of waste management of the roof system at EoL (Module C) are based on scenario data sourced from the BRE Global PCR For Type III EPD of Construction Products to EN 15804+A2 PN 514 Rev 3.1 Appendix D.

Data Quality
The inputs for the complete roof system's usage of materials, energy, fuels and water (and wastewater) are based on averages of one year of production data and usage from Nuneaton Roof Truss' manufacturing site.

The manufacturing information used covers a 1 year period from August 2021- September 2022, it is recent and highly representative of actual processes used. It is therefore described as Very good since there are only 1-2 years between the LCI reference year and the time period for which the LCA was undertaken.

The locations of the small number of dedicated materials and component suppliers are known, as are the transport methods used, so the geographical representativeness of the primary dataset is judged to be Very good. The production technology is regarded as modern i.e. the cutting machine is guided by computer-aided design and driven to optimise usage of raw materials and minimise wastes in the assembly process, and the biomass burner (fuelled by timber offcuts instead of natural gas) used for heating the premises is efficient. The technological data relate specifically to the processes of the products in focus for this LCA and are therefore regarded as Very good.

The assessment of the quality of background datasets is summarised as follows by module:

(A1) Regarding timeliness the quality level is described as Very good since there are only 1-2 years between the LCI reference year and the time period for which the LCA was undertaken. In terms of geographical representation, the selection of these processes in the LCA modelling is to 'best match' the known supplier locations and material types. Data quality levels relating to geographical representativeness is Fair, technical representativeness is Good.

(A2) Processes are selected as the 'best available match' to the known vehicle/vessel types, fuel types, and supplier locations. Timeliness and technological representativeness are Very good, geographical representativeness is Fair.

(A3) The process selected to provide the environmental impacts of electricity usage is Very good for timeliness and technological representativeness and Good for geographical representativeness. For water usage during the production process, the data quality of the selected process is Very good for time representativeness, Fair for geographical representativeness, and Very good for technical representativeness. LCI processes selected for packaging materials are Very good for timeliness and technological representativeness and Good for geographical representativeness. Processes selected to provide impacts for production wastes (packaging and water) are Very good in terms of time representativeness and technology and Fair in terms of geographical representativeness. The impacts of operating the on-site forklift truck on-site are represented by an LCI process for a small diesel car hence the quality indicator for technological representativeness is Fair.

(A4) The quality of the processes selected for transport are as above in A2.

(A5) The quality of the processes selected for recycling and landfill of packaging materials is as above in A3.

(C2) LCI process quality is assessed above in A2.

(C3) The data quality of the LCI processes selected to provide the impacts of recycling (steel, wood) are Very good for time and technological representativeness and Fair' for geographical representativeness. Due to a lack of better data, a Swiss LCI process is used for gypsum recycling which has quality levels of Very good for timeliness and technical representativeness and Very poor for geography. For PP incineration quality levels are Very good for time and technological representativeness and Fair for geographical representativeness.

(C4) Data quality for the landfill (steel, gypsum) processes selected is Very good for time and technical representativeness, and Fair for geographical representativeness.

(D) Data quality for the selected production processes (steel, gypsum, wood chips) is Very good for timeliness, Fair for geographical representativeness and Very good or Good for technological representativeness. The electricity dataset used is assessed as above I A3.

It is acknowledged these processes vary in terms of their data quality levels. Overall, the data is judged to be of reasonably high quality and an acceptable representation (in terms of timeliness, geography and technology) for all processes used to develop this EPD for the complete roof system. Data and data quality is deemed appropriate within the context of the scope and the system boundary.

Allocation
No additional products are manufactured on site, only the roof system components, therefore the actual quantities used for production has been used for the modelling. Wood and Fermacell (gypsum) offcuts/dust are wastes with negligible economic value compared to the value of the complete roof system.
Timber co-products to on-site biomass boiler and to local stables were allocated by mass. There are no other co-products.

Other comments on data
Journey distances are approximations because the specific routes taken on delivery journeys between suppliers and production sites, and production sites and waste sites etc are not available. A proxy dataset is used to model the operation of the on-site forklift in manufacturing.

Secondary materials are embodied in the steel parts (e.g. metal plates, nails, screws and staples) and the lifting straps used in the complete roof system. The assumed average recycled content for the specific steel

parts used in this EPD is 29.5% (global average figure from the World Steel Association[10]). It is acknowledged that this assumption creates uncertainty around the calculated environmental impacts relating to; the zero burden attributed to the use of recycled content in products (module A1), and the (net) virgin steel attributable to potential benefits beyond the system boundary (module D). The environmental impacts (of steel) may be overestimated to the extent that the average recycled content assumed is too low. However, steel accounts for around 5% the complete roof system by weight and a similar proportion of the overall impacts so while alternative assumptions will impact the contribution of steel, the impact on the overall impacts are less pronounced.

Compared to the EoL waste management scenario, if it were the case that actual practices reflected higher (than 55%) timber recycling rates and lower (than 45%) rates of incineration with energy recovery the environmental impacts in module C would be overestimated.

The on-site forklift truck used during the production of the roof system is powered by diesel but there isn't a process to represent the environmental impacts of a forklift in Ecoinvent 3.9.1 or the EN15804 add-on database. The LCA model (Module A3 – manufacturing) assumes that the impacts of the forklift are similar to a small diesel-fuelled car and such a process has been selected to provide the modelled impacts. It is acknowledged here that the impacts, though small (~0.2% in terms of the overall carbon footprint of the roof system), are uncertain.

Electricity has been modelled using consumption mix only[11]. The 2019 UK national grid consumption mix is used. The dataset used is 'market for electricity, low voltage | electricity, low voltage | EN15804 - GB', electricity consumed in the manufacturing process in this EPD equates to 0.303 kgCO2eq/kWh.

Cut-off criteria

All process flows have been quantified in terms of their environmental impacts. No cut-offs are applied to any inventory data. There are no direct emissions to air, land or water caused by the process of manufacturing the complete roof system at Nuneaton Roof Truss' production site. Excluded from the system boundary are the environmental impacts of buildings and infrastructure, plant, machinery and equipment, and repair/maintenance of the latter at NRT's manufacturing site. Any environmental impacts from staff commuting are also excluded.

[10] According to the World Steel Association the average recycled content in global steel production is 29.5% (this figure is based on 71% BOF steel produced with average recycled content at 12.5%, and 29% EAF steel produced with average recycled content at 71%). https://worldsteel.org/about-steel/steel-facts/

[11] Guarantees of Origin (GoOs) or carbon offsets have not been included in the quantification of this EPD. There is no renewable electricity sourced/used at the Nuneaton Roof Truss manufacturing site.

LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	-2.59E+03	1083	-3.68E+03	5.7	2.08E-05	6.66E+00	5.00E-01
	Transport	A2	212	2.12E+02	0.00E+00	1.11E-01	4.60E-06	1.28E+00	1.45E-02
	Manufacturing	A3	491	-3.65E+01	5.25E+02	2.37E+00	1.78E-05	2.57E+00	1.29E-01
	Total (Consumption grid)	A1-3	-1.88E+03	1.26E+03	-3.15E+03	8.21E+00	4.32E-05	1.05E+01	6.44E-01
Construction process stage	Transport	A4	33	3.25E+01	0.00E+00	1.59E-02	7.38E-07	8.05E-02	2.40E-03
	Construction	A5	0.28	2.81E-01	0.00E+00	3.07E-05	7.84E-10	2.64E-04	7.50E-06
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.90E+00	1.90E+00	0.00E+00	9.25E-04	4.30E-08	4.69E-03	1.40E-04
	Waste processing	C3	3.21E+03	6.25E+01	3152	1.45E-01	9.15E-07	4.12E-01	1.71E-02
	Disposal	C4	4.45E+00	4.45E+00	0.00E+00	3.53E-03	9.95E-08	1.01E+01	8.81E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.53E+03	-1.53E+03	0.00E+00	-2.50E+00	-1.02E-04	-5.65E+00	-3.69E-01

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			EP-marine	EP-terrestrial	POCP	ADP-mineral &metal	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	2.04E+00	2.14E+01	7.74E+00	2.65E-02	1.53E+04	4.10E+02	2.98E-04
	Transport	A2	3.28E-01	3.54E+00	1.35E+00	5.61E-04	3.15E+03	1.53E+01	1.87E-05
	Manufacturing	A3	8.06E-01	4.17E+00	1.01E+00	3.38E-03	1.91E+03	1.56E+02	1.92E-05
	Total (Consumption grid)	A1-3	3.18E+00	2.91E+01	1.01E+01	3.05E-02	2.04E+04	5.80E+02	3.35E-04
Construction process stage	Transport	A4	2.19E-02	2.25E-01	1.31E-01	9.32E-05	4.97E+02	2.55E+00	3.22E-06
	Construction	A5	1.04E-03	9.29E-04	3.80E-04	4.69E-07	6.98E-01	4.89E-03	5.16E-09
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.28E-03	1.31E-02	7.66E-03	5.43E-06	2.90E+01	1.49E-01	1.88E-07
	Waste processing	C3	1.59E-01	1.62E+00	4.77E-01	3.73E-04	7.93E+02	6.05E+01	6.49E-06
	Disposal	C4	1.09E-02	1.16E-01	6.63E-01	1.02E-05	9.28E+01	6.83E-01	8.22E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.26E+00	-1.35E+01	-3.72E+00	-1.84E-02	-7.72E+03	-3.94E+02	-4.01E-05

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	1.61E+02	9.04E+03	2.85E-06	1.76E-05	5.14E+05
	Transport	A2	3.74E+00	1.51E+03	9.41E-08	2.10E-06	2.77E+03
	Manufacturing	A3	1.43E+02	2.71E+03	1.82E-07	5.75E-06	7.75E+03
	Total (Consumption grid)	A1-3	3.09E+02	1.33E+04	3.13E-06	2.55E-05	5.24E+05
Construction process stage	Transport	A4	6.23E-01	2.37E+02	1.45E-08	3.56E-07	5.01E+02
	Construction	A5	1.56E-03	5.06E-01	2.67E-11	1.08E-09	1.42E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	3.63E-02	1.38E+01	8.46E-10	2.07E-08	2.92E+01
	Waste processing	C3	3.46E+00	4.96E+02	6.93E-08	2.28E-06	5.27E+02
	Disposal	C4	3.02E-01	8.04E+01	1.01E-08	4.63E-07	1.88E+02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.20E+03	-2.81E+02	-1.73E-06	-7.68E-05	-1.65E+03

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing resource use, primary energy								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	8.84E+04	0.00E+00	8.84E+04	1.47E+04	6.30E+02	1.53E+04
	Transport	A2	4.37E+01	0.00E+00	4.37E+01	2.88E+03	2.75E+02	3.15E+03
	Manufacturing	A3	2.15E+03	0.00E+00	2.15E+03	1.77E+03	1.48E+02	1.92E+03
	Total (Consumption grid)	A1-3	9.06E+04	0.00E+00	9.06E+04	1.93E+04	1.05E+03	2.04E+04
Construction process stage	Transport	A4	7.22E+00	0.00E+00	7.22E+00	4.54E+02	4.32E+01	4.97E+02
	Construction	A5	2.47E-02	0.00E+00	2.47E-02	6.41E-01	5.70E-02	6.98E-01
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	4.21E-01	0.00E+00	4.21E-01	2.65E+01	2.51E+00	2.90E+01
	Waste processing	C3	4.25E+01	0.00E+00	4.25E+01	7.44E+02	4.90E+01	7.93E+02
	Disposal	C4	3.07E+00	0.00E+00	3.07E+00	8.55E+01	7.27E+00	9.28E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-4.69E+03	-7.26E+03	-1.20E+04	-2.32E+04	-1.79E+04	-4.11E+04

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)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

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	2.78E+02	4.10E+01	7.20E+01	7.37E+00
	Transport	A2	3.07E+00	7.31E-01	1.68E+00	3.92E-01
	Manufacturing	A3	2.54E+02	5.77E+00	2.69E+01	1.20E+00
	Total (Consumption grid)	A1-3	5.35E+02	4.75E+01	1.01E+02	8.96E+00
Construction process stage	Transport	A4	4.98E-01	1.21E-01	2.52E-01	6.64E-02
	Construction	A5	2.51E-01	2.99E-04	5.68E-04	5.98E-04
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.90E-02	7.07E-03	1.47E-02	3.87E-03
	Waste processing	C3	1.09E+03	6.33E-01	1.26E+00	1.12E-02
	Disposal	C4	2.28E-01	1.01E-01	3.65E-01	9.00E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.59E+01	-1.16E+01	-5.17E+01	-9.34E+00

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

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.38E+02	2.06E+02	4.11E-02
	Transport	A2	2.96E+00	2.35E+02	9.03E-04
	Manufacturing	A3	1.10E+01	1.84E+02	3.19E-02
	Total (Consumption grid)	A1-3	1.52E+02	6.26E+02	7.39E-02
Construction process stage	Transport	A4	4.66E-01	4.28E+01	1.50E-04
	Construction	A5	1.17E-03	2.13E+00	3.85E-07
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.72E-02	2.49E+00	8.77E-06
	Waste processing	C3	5.86E+00	3.79E+01	8.62E-04
	Disposal	C4	4.94E-01	3.24E+02	7.57E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.89E+03	-1.13E+02	-9.72E+00

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

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	1.14E+02	0.00E+00	0.00E+00	-1.00E+03	0.00E+00
	Transport	A2	0.00E+00	2.67E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	3.28E+01	0.00E+00	0.00E+00	1.43E+02	0.00E+00
	Total (Consumption grid)	A1-3	0.00E+00	1.49E+02	0.00E+00	0.00E+00	-8.60E+02	0.00E+00
Construction process stage	Transport	A4	0.00E+00	4.29E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	7.74E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	2.50E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	1.69E+00	0.00E+00	0.00E+00	8.60E+02	0.00E+00
	Disposal	C4	0.00E+00	1.95E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	-4.73E+01	0.00E+00	0.00E+00	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	A distance of 128.6 km by road is used for transport from the manufacturing site to the customer site.		
	Fuel type - Diesel	litres/t.km	0.023
	Road transport - lorry > 32 tonne, EURO6	km	128.6
	Bulk density of transported products	kg/m^3	457
A5 – Installation	There is minimal installation waste and overall installation impacts are assumed negligible. Energy used for the roof system installation is not included However, packaging is considered as waste during the product installation (A5), and included in A5 in this EPD.		
	Packaging waste	kg	2.37
End of Life	Module C accounts for the environmental impacts of the complete roof system at the End of Life stage (EoL). The total weight of the materials in the complete roof system at EoL is 2,524 kg. A 100% recovery rate and the current market scenario (parameters sourced from BRE Global PCR For Type III EPD of Construction Products to EN 15804+A2 PN 514 Rev 3.1 Appendix D) has been used for the EOL treatment.		
C1 - Deconstruction	It is assumed that in Module C1 there are no EoL environmental impacts associated with the removal (i.e. demolition/de-construction) of the complete roof system from buildings at the customer site. The assumption means that there are no included impacts from the disassembly of the complete roof structure. In essence this means hand tools and manual methods are used (no power tools or heavy machinery). It is noted that there is no information on the demolition/de-construction of a complete roof system from Nuneaton Roof Truss or Persimmon Homes because (to date) no complete roof structure of this type supplied by NRT has *actually* been deconstructed or disassembled.		
C2 - Transport	In Module C2 it is assumed that the EoL transport to the waste treatment site from the demolition/de-construction site is, on average, a journey of 7.5 km by diesel lorry (see below).		
	Fuel type - Diesel	litres/t.km	0.023
	Road transport - lorry > 32 tonne, EURO6	km	7.5
	Bulk density of transported products	kg/m^3	457

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C3 - Waste treatment	The scenario for the management of materials from the complete roof system at EoL is sourced from BRE Global PCR For Type III EPD of Construction Products to EN 15804+A2 PN 514 Rev 3.1 Appendix D. It is assumed 100% of materials are recovered from the deconstruction site. Below shows the % amounts of materials recovered and the weight (kg) of materials from the complete roof system included in module C3. The recycling rates used are: 55% for wood (timber and OSB), 95% for steel, and 17% for gypsum. It is assumed the recycling is in the UK. UK recycling systems for wood, metal and gypsum are well established. Treatment processes in C3 reflect current practices in achievement of 'end of waste'. In addition, markets for these materials are well established and functioning, governed by regulations and technical specifications for the materials, and with existing market demand for the secondary products that fulfil limit values for SHVCs. The % amounts to incineration with energy recovery in the UK are wood (timber and OSB) 45% and damp proof membrane (polypropylene) 100%. The wood weights in the LCA model for C3 are adjusted to remove the average moisture content of 16%.		
	Waste timber to recycling - 55%	kg	943
	Waste OSB to recycling - 55%	kg	3
	Waste timber to incineration - 45%	kg	772
	Waste OSB to incineration - 45%	kg	2
	Waste steel to recycling - 95%	kg	143
	Waste steel to incineration - 0%	kg	0
	Waste gypsum to recycling - 17%	kg	64
	Waste gypsum to incineration - 0%	kg	0
	Waste damp proof membrane to recycling - 0%	kg	0
	Waste damp proof membrane to incineration - 100%	kg	1
C4 - Waste disposal	It is assumed 100% of materials are recovered from the deconstruction site. The % amounts to landfill in the UK are according to the BRE PCR PN 514 Rev 3.1. Below shows the amounts of materials recovered and the weights (kg) included in module C4 sent to landfill. 5% of the steel and 83% of the gypsum (Fermacell) offcuts is sent to landfill.		
	Waste timber to landfill - 0%	kg	0
	Waste OSB to landfill - 0%	kg	0
	Waste steel to landfill - 5%	kg	8
	Waste gypsum to landfill - 83%	kg	314
	Waste damp proof membrane to landfill - 0%	kg	0

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
Module D	Module D includes the potential environmental benefits beyond the system boundary. For NRT's complete roof system the EoL main benefits arise from the recycling of timber, OSB, the metal (steel) parts of components used, and gypsum. Timber and OSB recycling (wood chipping) is assumed to avoid production of wood chips, recycling steel is assumed to offset the production of virgin steel, and gypsum recycling avoids the production of gypsum. It is assumed these substitutions are representative of actual current practices and that the quality and function of the secondary material is suitable. The recycled contents assumed are: steel 29.5%, timber 0%, OSB 0% and gypsum 10%. In the EoL scenario, 55% of waste wood, 95% of steel and 17% of gypsum is recycled in the UK. The datasets used are 'wood chips production, softwood, at sawmill | wood chips, wet, measured as dry mass | EN15804 - Europe without Switzerland', 'market for steel, low-alloyed | steel, low-alloyed | EN15804 - GLO', and 'gypsum plasterboard production | gypsum plasterboard | EN15804 - ROW'. In the EoL scenario, 45% is of waste wood is incinerated in the UK. Module D includes an estimated 'benefit' from the potentially avoided electricity from waste wood incineration (i.e. incineration of the timber, and the OSB). The UK national grid electricity mix is used. The dataset 'market for electricity, low voltage | electricity, low voltage | EN15804 - GB' is used to calculate the impacts of potentially avoided electricity from wood incineration. It is assumed incineration of 1 kg wood equates to 5.28 kWh of electricity.		
	Timber recycling	kg	943
	OSB recycling	kg	3
	Steel recycling	kg	101
	Gypsum recycling	kg	58
	Timber incineration	kg	772
	OSB incineration	kg	2

Summary, comments and additional information

Interpretation

The results of the environmental impact assessment of the complete roofing system manufactured by Nuneaton Roof Truss are summarised below. It is important to note that the reported results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The carbon footprint of the manufacture and delivery of the complete roof system (8.2m x 5.6m x 3m, weight 2,524 kg) manufactured by Nuneaton Roof Truss is 1,369 kg CO2eq per roof system. Figure 1 shows the contributions to the overall carbon footprint at each of the lifecycle stages

At the raw materials acquisition stage A1 biogenic carbon is sequestered during the growth stage of the softwood and stored in the wood used for the structural timbers that form the roof system. The A1 biogenic GWP of the wood is -3,677 kg CO2eq per roof system, the fossil GWP is 1,083 kg CO2eq and the GWP from land use and land use change around 6 kg CO2eq per roof system.

The manufacturing stage A3 contributes 491 kg CO2eq per roof system to the overall carbon footprint. For comparison the impacts of transport are A2 materials transport at 212 kg CO2eq per roof system and distribution transport A4 at 33 kg CO2eq per roof system. Included in A3 are the impacts of burning timber offcuts (production waste) in an onsite biomass burner with the heat generated used in the factory. In this EPD the heat impacts – assumed to otherwise have been generated by natural gas – are counted as an offset against other impacts in A3.

In this EPD A5 is included for consideration of the packaging. Otherwise, installation impacts are negligible and there is minimal installation waste.

At end of life, C3 makes the largest positive contribution to the overall carbon footprint of the roof system accounting for 3,214 kg CO2eq per roof system (mostly) as a result of the sequestered biogenic carbon in the roof system is released during end of life processing. Across all stages of the lifecycle the contribution of biogenic carbon to the overall carbon footprint of the roof system is balanced to zero.

Module D includes the potential benefits beyond the system boundary. For NRT's complete roof system the main potential benefits arise from; the electricity recovered by the incineration of wood, and; the recycling of wood, steel and gypsum. Wood recycling (wood chipping) is assumed to avoid production of wood chips, recycling steel is assumed to offset the production of virgin steel, and gypsum recycling the production of gypsum. Together, these represent a total potential avoided carbon (a benefit) of 1,535 kg CO2eq per roof system.

Comments

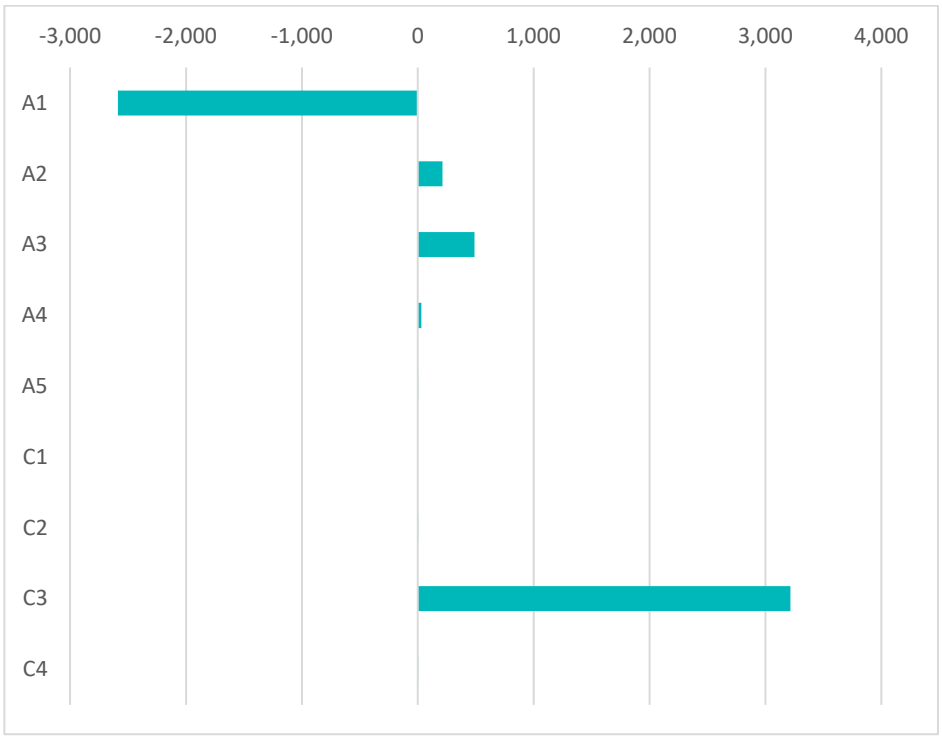


Figure 1 Contributions to the Carbon Footprint by Life Cycle Stage for the Complete Roof System, Climate change, GWP100, kgCO2eq. per roof system.

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