Timber Frame – Open Panel System

Key Information

General Process Description	1 m^2 of an open panel timber frame system in the UK
Reference Flow/Declared Unit	1 m^2 of an open panel timber frame system consisting of vertical and horizontal softwood beams and softwood structural noggins secured with hot dip galvanised steel fixings.
Reference Year	2013

Methodological Approach

This generic dataset has been developed with reference to CEN/TR 15941:2010 *Environmental product declarations — Methodology for selection and use of generic data* and has made use of data from existing databases and EPD, compensated with data from UK industry and national statistics for the specific situation related to UK consumption of timber products. With regard to methodology, the datasets are in line with the core Product Category Rules given in EN 15804+A1: 2013 *Environmental product declarations — Core rules for the product category of construction products*, and further detailed in FprEN 16485:2013 *Round and sawn timber — Environmental Product Declarations — Product category rules for wood and wood-based products for use in construction* and the draft EN 16449, *Wood and wood-based products — Calculation of sequestration of atmospheric carbon dioxide*.

The generic dataset is intended for use as upstream data for UK consumed timber products within EPDs and building level LCA assessments to EN 15978:2011 *Assessment of environmental performance of buildings — Calculation method.*

Modelling & Assumptions

An open panel timber frame consists of vertical and horizontal softwood structural beams with horizontal structural noggins used to give additional stability to the system. The beams and noggins are secured with hot dip galvanised steel fixings. Open panel systems designed to form part of the external wall are usually supplied with OSB and breather membranes and have insulation and plasterboard fitted to them on-site.

In this study, the modelled product is 1 m^2 simple open panel timber frame system for internal use; no OSB, insulation or plasterboard has been considered. The panel has been modelled based on an internal wall with a height of 2100 mm and a stud width of 600 mm, using information from High Castle Ltd [High Castle 2014]. Both the timber studs and timber structural noggins are assumed to have dimensions of 95mm x 45mm. Fixings are based on Strong-Tie SDW structural wood screws [Simpson 2014]. The mass of the system is 9.85 kg/m^2 of which timber accounts for 9.57 kg/m^2 and the fixings account for 0.29 kg/m^2.

The dataset is designed to provide an indicative value for a typical timber open panel system and can therefore be used as a first approximation of the impact of similar panel systems. Users wishing to understand the impact of significantly different panel systems may wish to create their own results through scaling of the individual datasets created as part of this project (kiln dried softwood, galvanised steel, OSB/plywood for sheathing).

The kiln-dried sawn spruce used in the open panel system is modelled using the same assumptions about forestry practices, sawmilling, kiln drying, transport, end-of-life and softwood country of origin as those in the "Kiln dried sawn softwood" dataset also produced as part of this project [Wood First 2014].

Fixings are modelled as being manufactured from hot dip galvanised steel screws using data from the GaBi life cycle database developed by PE International [PE International 2013]. Transport of the screws to the building site is modelled as having an average haul of 170 km based upon Department for Transport statistics for steel castings [DfT 2005]. The end-of-life of the steel screws is also modelled with the same three indicative scenarios used for timber: 100% recycling, 100% incineration with energy recovery and 100% landfill. The benefit of steel recycling and the burdens of remelting have been modelled based on the "value of scrap" approach used by the World Steel Association [worldsteel 2011]. As steel does not burn in waste to energy incinerators, no impacts associated with this option have been modelled. Steel in landfill has been modelled using models for inert material in landfill.

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Environmental Parameters Derived from the LCA

Production & Distribution (Cradle-to-Site)

Parameters describing environmental impacts	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Global Warming Potential	kg CO2 eq.	-12.5	0.393
Ozone Depletion Potential	kg CFC11 eq.	8.44E-11	1.34E-12
Acidification Potential	kg SO2 eq.	0.0151	0.00381
Eutrophication Potential	kg PO4 eq.	0.00237	0.000539
Photochemical Ozone Creation Potential	kg Ethene eq.	0.00126	-0.000280
Abiotic Depletion Potential (Elements)	kg Sb eq.	0.0000560	1.10E-08
Abiotic Depletion Potential (Fossil)	MJ	37.5	5.23

Parameters describing primary energy	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	17.7	0.115
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	160	0
Total use of renewable primary energy resources	MJ, net calorific value	178	0.115
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	43.6	5.25
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0	0
Total use of non-renewable primary energy resources	MJ, net calorific value	43.6	5.25
Use of secondary material	kg	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0
Net use of fresh water	m^3	0.0132	9.13E-05

Other environmental information describing waste categories	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Hazardous waste disposed	kg	0.00416	8.92E-06
Non-hazardous waste disposed	kg	0.0528	0.000366
Radioactive waste disposed	kg	0.00353	6.23E-06

Other environmental information describing output flows	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Components for re-use	kg	0	0
Materials for recycling	kg	0	0
Materials for energy recovery	kg	0	0
Exported energy	MJ per energy carrier	0	0

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Environmental Parameters Derived from the LCA

End-of-Life

Parameters describing environmental impacts	Units	100% Recycling		100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Global Warming Potential	kg CO2 eq.	15.9	-0.652	16.0	-11.2	18.6	-1.58
Ozone Depletion Potential	kg CFC11 eq.	4.84E-12	-2.80E-12	4.86E-12	-4.80E-10	7.12E-12	-9.40E-11
Acidification Potential	kg SO2 eq.	0.000885	-0.00275	0.0155	-0.0291	0.0302	-0.00541
Eutrophication Potential	kg PO4 eq.	0.000144	-0.000340	0.00305	-0.00259	0.00211	-0.000450
Photochemical Ozone Creation Potential	kg Ethene eq.	3.68E-05	-0.000300	0.00155	-0.00180	0.00455	-0.000310
Abiotic Depletion Potential (Elements)	kg Sb eq.	7.47E-09	-1.30E-08	7.84E-09	-2.70E-07	1.32E-07	-4.60E-08
Abiotic Depletion Potential (Fossil)	MJ	5.25	-6.87	5.71	-156	13.8	-20.2

Parameters describing environmental impacts	Units	100% Recycling		100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	0.0873	-0.0106	160	-7.42	0.450	-1.46
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	-160	0	-160	0	0	0
Total use of renewable primary energy resources	MJ, net calorific value	-160	-0.0106	0.0877	-7.42	0.450	-1.46
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	5.51	-6.93	5.98	-184	14.2	-25.6
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0	0	0
Total use of non-renewable primary energy resources	MJ, net calorific value	5.51	-6.93	5.98	-184	14.2	-25.6
Use of secondary material	kg	0	9.85	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0	0	0
Net use of fresh water	m^3	0.000446	-0.000590	0.0102	-0.0308	-0.00911	-0.00603

Parameters describing environmental impacts	Units	100% Recycling		100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Hazardous waste disposed	kg	0.000115	0.000156	0.000116	-0.0121	0.000316	-0.00231
Non-hazardous waste disposed	kg	9.44E-04	-0.00889	0.000946	-0.0456	4.18	-0.00738
Radioactive waste disposed	kg	0.000111	-3.40E-05	0.000111	-0.0116	0.00015	-0.00223

Parameters describing environmental impacts	Units	100% Recycling		100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Components for re-use	kg	0	0	0	0	0	0
Materials for recycling	kg	9.85	0	0	0	0	0
Materials for energy recovery	kg	0	0	0	0	0	0
Exported energy from Electricity	MJ	0	0	53.0	0	10.2	0
Exported energy from Thermal Energy	MJ	0	0	53.0	0	0	0

***Represents use of secondary material in next product system**

References

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worldsteel 2011	World Steel Association, 2011. *World Steel Association Life Cycle Inventory Study for Steel Products*. World Steel Association (worldsteel), Brussels, Belgium