Forest Industries Ireland
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Guide to the Application of Environmental Product Declarations for Irish Timber

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1. Background

On 23 May 2023, three new Environmental Product Declarations (EPDs) for Irish-produced sawn timber were published by Forest Industries Ireland, which can be downloaded from IBEC's website. This guidance document will help you learn about the concept of an EPD, the meaning of each element covered in an EPD, and how these new EPDs can be applied in your timber construction projects.

2. What is an EPD?

An EPD is an independently verified document for a product that outlines its environmental performance under a number of different parameters and stages in its life cycle, while it also includes necessary technical information for the product. EPDs typically form the primary data sources for the life cycle assessment (LCA) of construction projects. LCA is an important method for quantifying the environmental performance of such projects, including the calculation of embodied carbon emissions, which supports whole life carbon reporting for buildings. The general LCA procedure is defined by the international standard ISO 14040; an EPD can be considered as a product-level LCA.

3. Why are EPDs important?

The need to quantify the embodied carbon emissions associated with construction materials is being driven by the national Climate Action and Low Carbon Development (Amendment) Act 2021, the associated Climate Action Plan, and EU legislation. It is expected that embodied carbon emissions of buildings will be regulated in the next five years, as Ireland aims to achieve net zero carbon emissions by 2050. As construction products are a significant contributor to the environmental impact of the built environment, EPDs play an essential role in quantifying and reducing this impact.

4. What EPDs have we produced?

The EPDs published by FII are customised for three types of sawn timber produced in Ireland, including green sawn timber, green treated timber and kiln dried timber; the latter two products are the results of additional processing of the former. These EPDs are based on the sector averages across the island of Ireland, rather than a specific manufacturer. The manufacturers involved are Balcas Timber Ltd, Coolrain Sawmills, ECC Timber Products, Glennon Brothers Cork Ltd., GP Wood Ltd, Laois Sawmills, Murray Timber Group, and Woodfab Timber Ltd.

Link to EPDs: Forest Industries Ireland - IBEC

5. General Summary of Main EPD Contents

EN 15804 defines the content that an EPD must declare, which is divided into general information, technical information and LCA information. General information usually refers to the introduction of manufacturers, product identification, aligned EPD programme etc. In terms of technical information, the manufacturing process, physical properties etc. should be included. The required LCA information is briefly summarised in the following sections. In addition, corresponding contents in the new EPDs for Irish timber are explained.

5.1 Functional unit

The functional unit is a unit in which the product's functions and environmental performances are quantified. In the new Irish timber EPDs, all the information is standardised for 1 m^3 of timber, which helps comparison between different products.

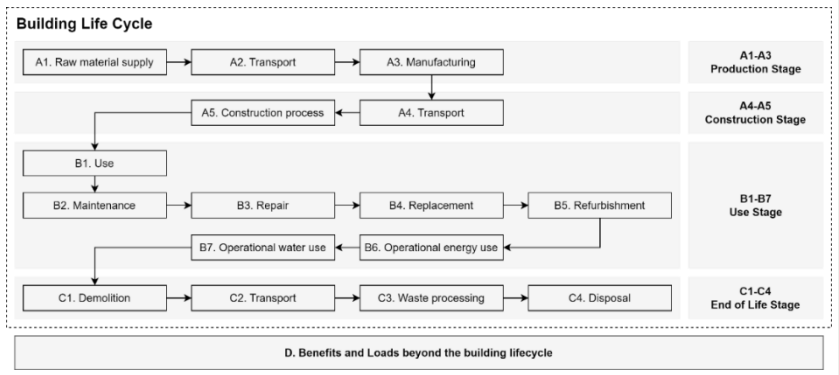


Figure 1. LCA modules defined in EN 15978

5.2 System boundary

The system boundary indicates the LCA scope of EPDs. As defined in EN 15978, a whole lifecycle assessment for building projects contains a series of stages from product manufacturing to the end of a building's service life (*Figure 1*). For product EPDs, modules A1-A3 are most frequently adopted, which also form the system boundary declared in the new EPDs for Irish sawn timber, referred to as a "cradle-to-gate" EPD. These stages begin with wood harvesting at the forest, followed by transit from forests to the factory, the manufacturing process, and finally ending at the stage of the product output i.e. when the finished timber product is ready to leave the sawmill.

5.3 Lifecycle Inventory Data

Life Cycle Inventory (LCI) data in product EPDs includes two categories: processing data and environmental data; the former relates to inputs and outputs of energy and materials during manufacturing and the latter is environmental information for these inputs and outputs. The processing data in these new EPDs is collected for the 2021 level and environmental data is derived from the EcoInvent database. In addition, the LCI data has been allocated to the main product (i.e., sawn timber) and by-products (e.g., chips) through physical allocation. Therefore, the LCA results for sawn timber have excluded impacts from by-products. Moreover, since the data is collected from multiple sawmills, there is a 5-10% variance from the average for different manufacturers.

5.4 LCA indicators

For a product EPD, four categories of LCA indicators are required, including environmental impacts, resource use, waste generated, and output flows; the first category is typically of most interest and is introduced here. Seven environmental impact indicators are included in new EPDs for Irish sawn timber, which are core indicators defined in EN 15804. The Global Warming Potential (GWP) indicator is typically reported in $kgCO_2$ equivalent as a measure of embodied carbon emissions. If the user wishes to exclude the impact of biogenic carbon from GWP, EN 16449 should be used for the calculation of biogenic carbon.

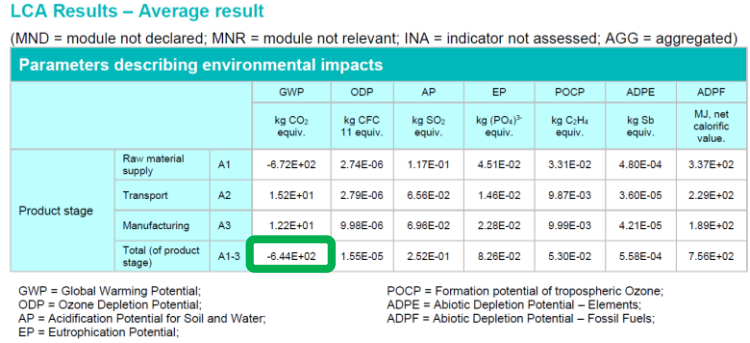
6. EPD Application Methodology

To apply these EPDs for Irish timber, follow these steps:

- Select the appropriate product EPD.
- Calculate the volume of timber used in the given application in m^3. Note, this can be done at both the product and building levels.
- Finally, the environmental impacts of your sawn timber can be assessed by simply multiplying the product volume by the LCA results data (e.g. GWP value) from the appropriate EPD.

Following this process, Table 1 below presents an example calculation for kiln dried sawn timber used in floor joists in a typical residential building.

Figure 2 illustrates the selection of the appropriate Total A1-A3 GWP indicator value from page 8 of BREG EN EPD No. 000492 for kiln dried sawn timber.



LCA Results – Average result

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

Parameters describing environmental impacts

			GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO_2 equiv.	kg CFC 11 equiv.	kg SO_2 equiv.	kg $(PO_4)^{3-}$ equiv.	kg C_2H_4 equiv.	kg Sb equiv.	MJ, net calorific value.
Product stage	Raw material supply	A1	-6.72E+02	2.74E-06	1.17E-01	4.51E-02	3.31E-02	4.80E-04	3.37E+02
	Transport	A2	1.52E+01	2.79E-06	6.56E-02	1.46E-02	9.87E-03	3.60E-05	2.29E+02
	Manufacturing	A3	1.22E+01	9.98E-06	6.96E-02	2.28E-02	9.99E-03	4.21E-05	1.89E+02
	Total (of product stage)	A1-3	-6.44E+02	1.55E-05	2.52E-01	8.26E-02	5.30E-02	5.58E-04	7.56E+02

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

Figure 2. Selection of GWP indicator value from EPD for the product stage (A1-A3) [*page 8 of BREG EN EPD No.* 000492]

(i) For illustrative purposes, the final column of Table 1 assumes that there is a total volume of 6 m^3 of floor joists in a reference 125 m^2 building – this volume will vary depending on the building type, design, number of openings etc.

(ii) Table 1 values are based on the average level for Irish sawn timber and can be adjusted by ±5-10% if desired to account for uncertainty.

(iii) Negative kg CO_2equiv. values in Table 1 indicate that the net result is carbon storage rather than emission, thereby reducing the environmental impact of the building.

Example Product Application	**Cross section** ***[b × h]*** **(mm)**	**Product Length** ***L*** **(m)**	**Product Volume** ***[b × h × L]*** **(m^3)**	**GWP per m^3** **($kg\ CO_2equiv$)** ***from EPD***	**GWP per product** **[Product Volume × GWP per m^3]** **($kg\ CO_2equiv.$)**	**Total product GWP for typical residential building** **[6 m^3 × GWP per m^3]** **($kg\ CO_2equiv.$)**
Kiln dried sawn timber: floor joist	44 × 225	4.0	0.0396	-644	-25.502	-3,864

Table 1 : Example calculation of the embodied carbon (GWP) in a timber component using an EPD (BREG EN EPD No. 000492)

7. EPD Application Example

The calculation approach in Table 1 can be extended to all timber components in a typical 125 m^2 timber frame home to include structural, non-structural and timber based sheathing material.

Structural Timber Components	**Typical Dimensions mm**	**Typical Volume m^3**	**EPD Reference No.**	**GWP per m^3 (kg CO_2equiv.)**	**Total GWP for building (kg CO_2equiv.)**
Joists	44 x 225	5.47	492	-644	-3,522.68
Trusses	Varies	2.53	492	-644	-1,629.32
Wall Stud	38 x 89	5.11	492	-644	-3,290.84
Wall Stud	38 x 140	4.78	492	-644	-3,078.32
Battens SR82	22 x 47	0.71	492	-644	-457.24
Service Batten	47 x 35	1.9	492	-644	-1,223.60
Backing Board	Varies	0.25	492	-644	-161.00
Bracing	22 x 100	0.36	492	-644	-231.84
Bracing	35 x 75	0.24	492	-644	-154.56
Fire Stop	44 x 47	0.39	492	-644	-251.16
Valley Board	35 x 125	0.07	492	-644	-45.08
Total		**21.81**			**-14,045.64**
Structural Sheathing	**Typical Dimensions mm**	**Volume m^3**	**EPD Reference No.**	**GWP per m^3 (kg CO_2equiv.)**	**Total GWP for building (kg CO_2equiv.)**
Smartply OSB 3 Sheathing	9 mm	1.5	EPDIE-19-17	-816	-1,225.30
Smartply OSB 3 Sheathing	18 mm	1.13	EPDIE-19-17	-780	-877.50
Total		**2.63**			**-2,102.80**
Non Structural Components	**Typical Dimensions mm**	**Typical Volume m^3**	**EPD Reference No.**	**GWP per m^3 (kg CO_2equiv.)**	**Total GWP for building (kg CO_2equiv.)**
Decking (25 m^2)	22 x 150	0.55	491	-1210	-665.50
Deck Supports	38 x 140	0.33	491	-1210	-399.30
Fencing	Varies	1	491	-1210	-1,210.00
Skirtings	12 x 125	0.2	492	-644	-128.80
Total		**2.08**			**-2,403.60**

Table 2 : Example calculation of the embodied carbon (GWP) in Typical 125 m^2 timber frame home using EPDs. For illustrative purposes only. Actual Volumes will vary depending on the building type and design

Based on the example in Table 2, this timber frame home has a net carbon saving of over 16 tonnes of CO_2 equivalent for the structural timber and panel sheathing components alone. When the additional non-structural components and sheathing material are included this figure rises to over 18 tonnes of CO_2 equivalent.

8. EPD Application Example

The calculation approach in Table 2 can be extended to compare a timber frame home against a concrete masonry block equivalent construction for a typical inner leaf wall in a residential house. Considering the structural materials alone i.e. timber and concrete block sourced locally, the timber frame wall can achieve net carbon savings of -330% compared to the concrete block wall, equating to -31 kg CO_2equiv. per m^2 of wall. This value may vary depending on the building type and design but indicates the significance of the savings that may be made by choosing timber as the structural material. Figure 3 highlights the key timber and wood based panel product components of a timber frame home.

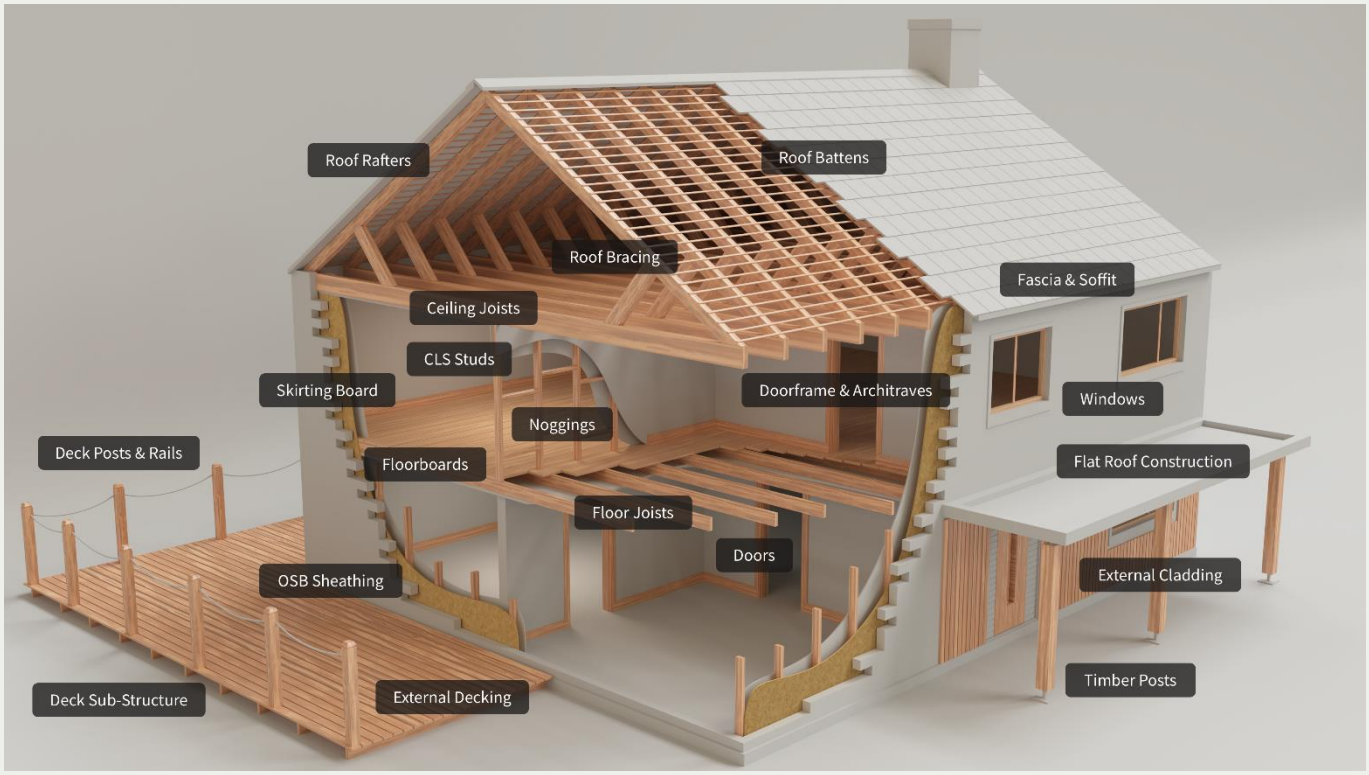


Figure 3. Key timber and wood based panel components in a timber frame home