

Focus on flooring: Tŷ Unnos and Welsh timber

The Tŷ Unnos development on the Royal Welsh Agricultural Showground in Llanelwedd, Powys, showcases a number of timber flooring options, as Tabitha Binding of Coed Cymru explains.

The name Tŷ Unnos, which means ‘a house in one night’ owes its origins to the tradition of erecting a house overnight on vacant land and claiming it as a home. This was common practice in Wales until the end of the 19th Century.

Back in 2006, a feasibility study looked at the possibility of building sustainable, affordable energy efficient homes using home-grown Sitka spruce, the most readily available softwood resource in Wales. Simple substitution of imported material commonly used for timber frame systems was not deemed possible, due to the greater stability and superior strength of slow grown softwoods available from drier, cooler climates. The study therefore proposed a radical departure from current practice in the form of a whole house construction system using engineered home-grown timber components.



The new Coed Cymru Pavilion. Photo: Coed Cymru

The proposals attracted great interest from all parts of the industry and a multi-disciplinary team of experts formed to prototype, test and develop the Tŷ Unnos concept.

To date, over 30 Tŷ Unnos have been constructed – affordable housing, offices and classrooms. The Tŷ Unnos project has won a number of awards including the TRADA 75th anniversary competition.

The first Tŷ Unnos, ‘The Smithsonian’ is a single-storey, three bay, portal frame building. It was exhibited in Washington, USA and Cardiff before finding a home as the Coed Cymru show stand on the Royal Welsh Agricultural Showground (RWAS) in 2010. However, in 2014 project funding became available to redevelop the Smithsonian. Davies Sutton Architects and Maxiom Construction collaborated with Coed Cymru to design, source materials and build the Welsh timber stand – work was completed in July 2015.

Deconstruction and reuse

To test the theory of deconstruction and re-use The Smithsonian was deconstructed, turned through 90 degrees, the portal box beam frames re-erected, the wall and roof panels shortened and re-used. A new floor deck was created to homogenise the partially open display building with the terrace linking it to the new Pavilion.

The new Coed Cymru Pavilion is a contemporary 1.5 storey building, featuring the original Tŷ Unnos box beam timber frame system. Fully compliant with current building regulations, it incorporates factory-made structural panels which were insulated off site by PYC.

The Tŷ Unnos frame, complete with wall, roof and floor panels, was erected in a single day and fully wrapped in a breathable membrane to make it watertight, then windows and doors were inserted, followed by a steel roof and Welsh timber cladding.

With vaulted ceilings, mezzanine floor and glazed curtain walls the building offers features that would normally only >>

be seen in Oak frame post and beam structures. The system is designed to use the whole Welsh timber supply chain and makes modern architectural features accessible in new Welsh timber frame buildings.

Welsh timber from eight sawmills was used throughout: Sitka spruce – box beam frame, structural panels and joists; Douglas fir – staircase and balustrades; Larch – windows, doors, cladding, ovalgrain board flooring and scorched external cobbles; Scots pine – decking; Western red cedar – cladding; Oak – flooring. Further timber species were used by the five Welsh designer/makers that furnished the buildings.

The show stand also incorporates Welsh wool, slate, trees and a number of designer-made Welsh wooden items from businesses across Wales.

Wood flooring features

Sawdust and shavings are a by-product of the Tŷ Unnos manufacturing process and are typically used to heat the buildings in which manufacture takes place. Most of the Tŷ Unnos built so far, have been built on suspended timber floors and include little or no dense materials (i.e. thermal mass). However, the Coed Cymru team wondered if using Woodcrete tiles, would not only add value to wood waste but also create a thermal store, potentially buffering internal temperatures.

Specialist Precast Products (SPP) of Caerphilly was commissioned to create tiles using wood waste from the processing of the Tŷ Unnos box beams and cladding profiles. SPP manufactured 540mm x 300mm tiles in 25mm and 50mm thicknesses which were laid at the fully glazed gable end of the Pavilion. The tiles, known as *Eco-Element™* incorporate the following features:

- **Water absorption properties** – similar to those of standard concrete, the tiles can be treated in the same way as standard concrete flooring and the same sealants applied.
- **Freeze characteristics** – the material exhibits low amounts of fracturing when subjected to a freeze/thaw environment, because of the ability of the wood fibres to absorb the compressive forces of the frozen water within the concrete structure.
- **Compression strength** - The typical compression strength of Portland cement is 20–40MPa and the compression strength of *Eco-Element™* tiles is in a similar range (23–30MPa). However, the tiles at Tŷ Unnos have a density that is around half of that of Portland cement, and therefore give an equivalent compressive strength in a much lighter flooring product.



Woodcrete tiles at the Tŷ Unnos building. Photo: Coed Cymru

The performance of the tiles is being monitored in an ongoing study with Bath University, with the results due late 2015.

The Endgrain project

Experimentation and work by Endgrain project manager Dylan Jones has produced new and interesting research, leading to innovative products which have been incorporated into the Tŷ Unnos Pavilion.

The research has been driven with the aim of developing a commercial resource from small-diameter logs arising from managing Welsh woodland which would otherwise be of little commercial value apart from firewood. In developing new product lines from otherwise low-grade material the work has the potential to add value and diversify the outputs.

The following products are a result of this project.

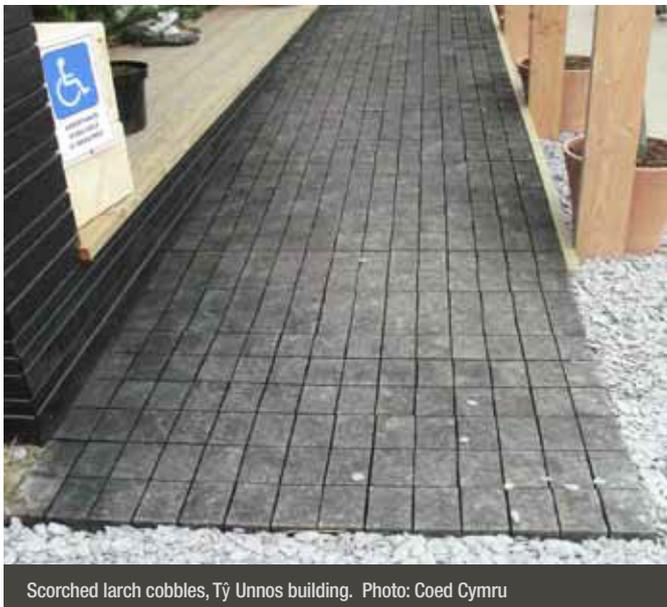
External charred larch cobbles

A range of small diameter 100x100mm cobbles were laid externally at Coed Cymru's offices in Wales, and it was noticed that the charred cobbles appeared to be considerably less slippery. This knowledge led to research into slip resistance in collaboration with BM TRADA.

A report by Peter Kaczmar, June 2015 Ref: TCT/F15043 stated "The process of surface charring can bring about demonstrable >>

and marked reductions in slip potential compared with uncharred material when tested in accordance with BS 7976 Part 2. Under wet conditions the results, in some cases, were found to lead to improvements in the slip resistance of the surface which resulted in classification 'upgrades' of the slip potential rating as defined under the HSE slip potential system of classification."

To further demonstrate, assess and monitor the findings, the disabled access ramp to the Pavilion has been constructed from scorched Larch cobbles. The cobbles, supplied by Wentwood Timber Centre, are 75mm x 90mm x 70mm thick and are bonded onto Larch substrate with bitumen and screws.



Scorched larch cobbles, Tŷ Unnos building. Photo: Coed Cymru

Ovalgrain Board

Small diameter logs when cut at an acute angle can produce a short board, 300mm to 450mm in length. The length of the board means that no special jigs are necessary when machining, therefore most planers or moulders can be used for processing. The face of the board exposes the endgrain which radiates out in an oval shape from the pith.

Coed Cymru commissioned BM TRADA to conduct comparative trials to evaluate the viability of using obliquely cut timber converted from small logs for use as a decorative floorcovering. In doing so the requirement to assess the comparative surface abrasion resistance of obliquely cut wood relative to that of side-grained or end-grain material is of fundamental importance. The test work was considered particularly important given the fact that little or no information on abrasion resistance is available in published literature sources for obliquely cut material.

The results from the Taber Rotary Abrasion testing revealed that the surface is not as hard and wear resistant as endgrain tiles

cut at 90 degrees to the grain, but better than a standard side-grain board. Therefore a viable attractive flooring product can be achieved from small diameter timber.

A demonstration floor, machined with tongue and groove edging by Sanderson's using Welsh Larch supplied by JM & EA Jones has been laid in a traditional herringbone parquet pattern in the pavilion. ■



Larch ovalgrain board at the Tŷ Unnos building. Photo: Coed Cymru

About the author

Tabitha Binding is the Supply Chain Project Manager at Coed Cymru. With a background in business and Welsh softwood, Tabitha was engaged in 2010 to run the 'Improving the Supply chain for Low Value Welsh Timber' project. The project was funded through the Rural Development Plan for Wales 2007-2013 which is funded by the Welsh Government and the European Agricultural Fund for Rural Development.



Tabitha Binding
Supply Chain Project Manager
Coed Cymru

Further information

'Ty Unnos – a house in one night', *In Touch with Timber*, Issue 3 (Winter 2010), available from www.trada.co.uk/publications

- Further information is available at www.coedcymru.org.uk, www.endgrain.org.uk and www.tyunnos.co.uk
- Specialist Precast Products (SPP): www.specialistprecast.co.uk

Related TRADA publications: *TRADA WIS 2/3-67 Specifying British-grown timbers, 2013*