

Local timber for local homes and buildings

A new initiative in Wales, named after an ancient phrase - Ty Unnos, promotes and encourages the use of home grown Welsh timber. It has the potential to add value to the local timber supply chain, offer job and training opportunities for the timber and construction industries in rural areas, as well as providing affordable, energy-efficient homes as its end product. Olwyn Pritchard reports ...

"The low carbon option is the only viable future to pursue"
- Jane Davidson, director of the newly formed sustainability organization INSPIRE, based at the University of Wales, Trinity, St David.

Davidson's recent remarks referred to an innovative Welsh construction initiative which aims to be not only low carbon but also to create jobs for locals, using local resources to provide affordable homes, simultaneously tackling climate change, fuel poverty, homelessness and unemployment.

Ty Unnos began in 2006 when the Countryside Council for Wales (CCW) instigated a feasibility study to investigate the possibility of using timber from Welsh forestry plantations in affordable construction, especially the most common softwood species grown in Wales, Sitka spruce, using simple techniques within the capability of local manufacturers of any skill level. Coed Cymru collaborated with the Research Unit Wales at the Welsh School of Architecture, Bangor University, and experienced members of the construction industry.

The name, Ty Unnos, 'a house in one night', which was adopted for the locally sourced, potentially fast and adaptable building system which resulted, 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.

Wales has 150,000 hectares of coniferous plantations, which produce around a million tonnes of softwood, in the round, per annum. Over 70% of current production is Sitka spruce, a native of the Pacific coast of North America, which grows well in Wales' mild, wet climate and peaty upland soils.

In its native home, in a colder and drier climate, the trees grow slowly and achieve great size and strength,



producing strong and stable timber, ideally suited to construction. Historically all of the modern timber frame manufacturers in Wales (and the UK) have used this kind of imported softwood.

The Welsh spruce grows much faster but produces timber of lower density, with heavier branching and larger knots. It is usually processed for a number of markets, including fencing, wood fuel, chipboard and pallets; but the most important commodity produced is carcassing timber.

Welsh spruce has poorer structural properties than imported softwoods, but this can be compensated for by using more of it. A greater problem is its tendency to twist during drying which has, until now, prevented timber frame manufacturers from using it.

As David Jenkins of Coed Cymru explained; "Innovative methods of timber construction are common in Scandinavia, where there is an abundance of high quality timber. There are numerous timber prefabricated construction systems available that utilise Scandinavian and Baltic softwoods. Most use prefabricated structural panels. The panels are mechanically manoeuvred and fixed together on-site to form a structural shell with insulation, services and exterior



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cladding applied to the external wall surfaces.”

He continued; “Such prefabricated timber systems are beginning to impact on the UK market due to increasing government drivers towards off site construction. However, all these systems use only imported softwoods rather than locally sourced timber.”

So, in 2006, CCW and Wood Knowledge Wales sponsored Coed Cymru, the Welsh School of Architecture in Cardiff and the University of Wales Bangor to develop a system of high performance affordable housing based on the properties of home-grown timber. Although spruce, being the commonest tree, was originally proposed, the system could use various grades and species of timber.

The Ty Unnos system, which resulted, is a highly adaptable modular system that can create a range of house types and sizes based on four standard modules. The system is based on a simplified, standardised kit of parts based on a 600mm basic layout grid. By re-engineering standard sizes

The legend of Ty Unnos

This name, meaning ‘house in a night’, is given to an old Welsh tradition, which has parallels in other folk traditions across the British Isles.

Going back to the seventeenth century, it was believed by some, that if a person could build a house on common land in one night, then the land belonged to them as a freehold. Other variations on this tradition were that the test was to have a fire burning in the hearth by the following morning. The squatter could then extend the land around by the distance they could throw an axe from the four corners of the house.

Although Ty Unnos had no status in the English Common Law of the time, there is some tradition of legal discussion about the point at which land occupied by squatters, without title, may be regarded as a legitimate possession. This legendary belief may bear some relation to genuine folk customs and actual practices by squatters encroaching on common or wasteland. The tradition may have provided squatters with a sense that their actions enjoyed some legitimacy conferred by an older code of laws, more in tune with values of social justice. Localities in Wales have houses which may be identified as a one night house in local folklore. One such building is Ty Hyll, (the ‘ugly house’) in Snowdonia.

Far from ugly!

Though the true origins of Ty Hyll remain shrouded in mystery, legend tells us that it was a crude house built in the 15th century by two outlaw brothers. It was a ‘Ty Unnos’ - or house built overnight. Under ancient law, he who built a house between sunset and sunrise, with walls, roof and smoking chimney, could claim the freehold. However, Ty Hyll was probably built in the mid-nineteenth century as a ‘picturesque’ cottage that would appeal to the growing tourist trade.



In the early 19th century, navvies working on Telford’s new road and the bridge by Ty Hyll may have taken over the cottage. They may have added a loft and new windows before abandoning the house when it was no longer near enough to their place of work. By the mid 19th century, Ty Hyll is included in ‘A Tourist Guide to Wales’ as a ‘quaint cottage’. Its reputation grew so that more than a 100 years later visitors are still charmed by the old building. Ty Hyll has recently been fully renovated as a tea room by the Snodonia Society. www.snowdonia-society.org.uk



The Larch House, or 'Welsh Passive House' at Ebbw Vale is a certified Passivhaus, satisfying UK standards ENE 1,2 & 7. It achieved Code 6 of the Code for Sustainable Homes.

cut by local sawmills into strong, stable components, like box beams and ladder trusses, the researchers found it was possible to extend the range of structural uses for the home grown timber in composite beams, wall studs and floor joists.

The proposals attracted interest from the construction industry and a multi-disciplinary team of experts came together to prototype, test, and develop home grown and fabricated timber components in combination with a number of commercial partners.

The system, as it currently stands, consists of two simply assembled engineered timber components; a hollow box section beam and a small section ladder beam. When combined with frame connectors and oriented strand board-based infill panels, the components form a whole building construction system.

The design team have followed the Eurocodes convention in prototyping and testing engineered components. The box beam can be used as a load bearing element and can span up to 4.8 metres. The ladder beam can be used as a floor joist with spans of up to 3 metres and as a non load bearing wall stud.

Both components can be used together in an integrated build system or independently, and by combining these basic elements the system can be used to create anything from affordable housing in its modular form, to a one off studio or cabin suitable for smaller sized plots. Several

successful prototype buildings have been constructed using the Ty Unnos system.

The Environmental Resource Centre (ERC) at 'The Works' regeneration site at Ebbw Vale was the first commercial completed project - the brainchild of the Design Research Unit Wales at the Welsh School of Architecture, Cardiff. The simple, rectangular, green building combines locally sourced timber components, high levels of insulation, and solar thermal water heating to provide an environmentally friendly and sustainable building, using an estimated 60% less energy than a 'traditional' building of similar size. An air source heat pump provides space heating, in combination with mechanical heat recovery ventilation, plus manually operated trickle vents for extra summer cooling.

Full height windows along the west side and roof lights maximise natural lighting, while an oversailing roof and shutters prevent overheating by cutting down on solar gain during the summer. Located in a rich habitat next to the former pumphouse cooling ponds, the centre will provide educational facilities to allow local school children and the community to explore the heritage and ecology of the former steelworks site.

Even greener is the 'Welsh Passive House' also at Ebbw Vale, constructed following a successful entry into the Future Works Housing Competition 2009. This design

was also generated by Design Research Unit Wales. The competition called for the industry to create the 'Welsh Passive House', adapting the originally German method to Welsh resources, climate and geography.

Designed as a dwelling, but initially constructed as a visitor centre for the Ebbw Vale development, the building is currently being retrofitted as a two bedroom house. The design of the house is based on the traditional longhouse, which suits the properties of the Ty Unnos system well, allowing an optimum configuration of Sitka Spruce frames to create a linear 'tube'.

The frame sits on an insulated concrete raft, Ty Unnos portals and ladder beams, with OSB sheathing form walls filled with recycled paper insulation. Airtightness is ensured by an Intello membrane. All walls and the roof achieved a U-value of 0.11W/m²K.

Sadly, despite meeting the U-value and airtightness requirements and using an MVHR system, the house does not meet the space heating demand target of 15kWh/(m²a). This could be due to several factors; the overall size and proportion of the house, which is less compact than many PassivHaus dwellings; the length of the north elevation; the U-value of the windows not being as high as a similar German system; and insufficient thermal bridging data. Nevertheless, when conversion into a dwelling with additional features, including solar panels, is complete the building is expected to meet Code for Sustainable Homes, level 5.

Finally, a small development of four, 3 bedroomed semi detached houses, built to provide affordable housing for local people, have been constructed on Forestry

Commission land in the Snowdonia National Park.

The project makes full use of the modular system to provide low cost local needs housing. Each dwelling comprises two complete modules, one for each floor. The modules were constructed off site under factory conditions, including the installation of internal finishes, windows and doors, bathrooms and all electrical services and appliances prior to transportation to site, where assembly was completed in a matter of hours on preformed foundations. Once in position, external finishes were applied to walls and roof along with external landscaping. The entire project should, ideally, be finished within 6 to 8 weeks. The houses were designed to reach Code for Sustainable Homes, level 4, and include a built-in heat recovery system with solar thermal panels on the roof to supplement water heating, which along with generous insulation, reduces energy consumption by at least 44% over that stipulated in 2006 Building Regulations.

Currently, several commercial enterprises have taken up production of the Ty Unnos system. Elements Europe, based in Oswestry, are using the locally sourced components to make standardized modules for volume housebuilding. More specialist, small projects such as the Passivhaus at Ebbw Vale, are catered for by Woods of Wales, while larger one off buildings, like the Ebbw Vale classroom, are available from Cowley Timberwork.

So has the Ty Unnos project been a success? David Jenkins thinks it has. "The original brief from CCW was for low density rural housing but as the engineers began to explore the performance of the components, we realised that we had a lot more. Ty Unnos is a very versatile building system. It works for small informal buildings and it works for wider spans but we still see its main application in high performance housing".

Olwyn Pritchard

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