Team ESTEEM

Innovation towards a more sustainable Scotland

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Team ESTEEM is a multidisciplinary group of students from Heriot Watt University designing a self-sufficient house which promotes a low carbon message by reducing energy and CO_2 emissions. As such, the team decided to engage in the Cross Laminated Timber (CLT) 'revolution'.

Team ESTEEM's entry to the Solar Decathlon Competition places the contribution of utilising homegrown timber onto a global platform. Projects such as the ESTEEM house are proof of concept and delivery that defies perception in the marketplace and drives forward innovation.

Every industry has to engage in the movement towards a sustainable future and with a few minor changes, the construction industry's polluting problem can turn into a solution. This can be achieved by selecting materials that are local and that sequester (lock in), rather than release carbon. Locally sourced CLT became an essential element of the Team ESTEEM house project because of the nature of insulation, reduction of heat gain and its structural properties. As wellness and wellbeing of the residents was a major consideration during the design process, timber with its nontoxic nature and sound absorbing properties suited the project well. Timber houses have been constructed for thousands of years and there are many reasons why this should not change now.

Changing perception

When designing and selecting materials, it has never been more important to holistically address full lifecycle, taking into consideration material availability, production, transportation, 'buildability' and flexibility as well as design, fire properties, material composition, minimising waste and eventual disposal. More than ever, designers and professionals can positively engage with these considerations to address the sustainability goals that society and the construction industry aims to achieve.

The benefits of timber are well known, however, perceived challenges mean these benefits are often overlooked. Selection of material should come at the start of the designing process as the building can be designed with the properties of the material in mind.

Building design can minimise the risk to timber's combustibility and rot due to prolonged uncontrolled exposure to moisture. A useful property of timber, when exposed to fire, is that it doesn't release as harmful toxins into the atmosphere as many artificial materials do. Thick timber walls burn through slowly giving occupants enough time to escape and leave the building. In comparison to steel structures, the reaction of timber to fire is predictable and it retains its characteristic strength. For these reasons, fire properties of timber should not discourage designers to use it as the main construction material.

Choose local

To be truly sustainable, we need to build more with less, we need to learn to use and design in function of the resources available rather than source materials from all over the world. Timber is readily available in Scotland, grows here and in this process locks carbon from the atmosphere throughout its life. Timber is light to transport and is flexible to build with as it can be pre-cut and/or adjusted on site. It is a non-toxic material that can be reused, recycled or disposed of without harming the environment.

Design catering for homegrown timber

When opting to consider homegrown timber, it is essential that in early project stages, the design plays to the strengths of homegrown timber. In applications such as the ESTEEM house, a one-storey residence, the raw timber does not need to be C24 strength grade but instead will use C16+. Furthermore, in alternative ventures where applications are favoured, a combination of C24 and C16+ hybrids can be

used efficiently. Timber can be used in many applications but showcasing skill and resourcefulness contributes to that overall value which is locked into the timber throughout its lifecycle.

Team ESTEEM's ambition to use homegrown timber was initiated from the original design conception in March 2019. Now, utilization of supply chains and manufacturing capabilities in Scotland in partnership with the UK's only representative in the Solar Decathlon competition have brought project goals and aspirations to reality. The contribution and performance of the homegrown, home-made CLT will be placed under scrutiny and testing with a series of objective and subjective criteria. In response to the challenge, the active residence and showcase ESTEEM House elevates innovation, sustainability, mobility and future possibilities.

Scottish innovation on global stage

Through spring and summer of 2021, the house will be built in Edinburgh before being disassembled and reassembled in Dubai. The very nature of the capability to move the house and placing it within a different environment will be a huge feat even before entering the competition phase across November 2021. From the intelligent and capable designers at Heriot Watt, through to project completion, the homegrown timber will undertake a journey unlike no other in its place; from Edinburgh to Dubai, to the future.

The panel format of CLT is ideal for design, manufacture, and assembly processes. By using CLT, Team ESTEEM are meeting the requirement of a very short build period for the Solar Decathlon Middle East competition and promoting the use of homegrown mass timber products. As pioneers of a new generation of sustainability, they are setting the standards of how efficient the use of CLT can be for more innovative housing, but it does not have to stop there. We are seeing an increase of projects using CLT all over the UK, which is inspiring others to join the revolution.

Why CLT? Leading novel solutions

Sustainability, strength, fire performance, safety, noise reduction, aesthetics as well as its non-harmful nature are just some of the reasons why we are using CLT. CLT is known as a new material of construction in the world and Team ESTEEM's project is a leading example. CLT in construction facilitates overcoming traditional design barriers, and instead encourages designers to be more creative and innovate. Other universities such as Edinburgh Napier have the Institute for Sustainable Construction in which constant research is being undertaken regarding timber construction and engineering. Finally, since CLT is manufactured offsite, Team ESTEEM are moving forward on the goal for net-zero carbon due to the lowered carbon footprint, speed and ease of construction, reduction in waste, practicality and ecological benefits. Over time, the prevalence of innovation is opening new doors for CLT in larger-scale projects with homegrown timber.

> CLT sits at the centre of our vision for construction. It is a strong mass timber that can feed the local supply chain by being homegrown, improve productivity by being produced offsite and help us reach net-zero carbon through its sustainable sourcing.
> **Ross Muir**

Projects like Team ESTEEM help to showcase the suitability of homegrown timber for construction and highlight the need for better infrastructure to supply this locally. An individual contribution towards sustainability is needed, however the multidisciplinary nature and size of the team will help the change in the future industry with the potential of far greater impact overall. Team ESTEEM is now a part of the movement towards improving this infrastructure through working with a number of professionals and industry partners such as Construction Scotland Innovation Centre and ECOSystems Technologies.

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