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Beyond modular by Stephen Napper, Director of Modern Engineering Software Solutions

This innovation hub session was about a software system for designing light gauge steel (LGS) for volumetric modular and panelised construction. Modular construction can be a combination of hot rolled steel (HRS) with LGS infill components or entirely LGS.

MMC Category 2 panel systems are either timber or LGS with HRS elements combined with the latter for large-span openings and point loads. Steve explained some of the advantages LGS construction has compared to traditional construction along with the major disadvantage for designers, product variation.

More than 30 manufacturers produce LGS profiles of varying gauges and dimensions used in roof trusses, stud walls, lintels and racking covered by multiple industry standards. Each product has its own specific design parameters.

The MESS design software is a plug-in for Tekla TEDDS and can be used for trusses, frame studs, floor members and lintels for MMC Category 2 construction techniques and MMC Category 1 module fabrication.

The latest development using LGS is a portal frame design with column, rafter, and connection designs. The system uses less material in comparison with a hot rolled steel portal with consequent reduction in embodied carbon.

Details are available on the MESS website and from Stephen Napper.

Download their presentation.

Offsite compliance and optioneering and the Supply Chain Sustainability School

This session was a collaboration by Buildoffsite Industry Advisor, Ken Davie, and Jayne Hall, Head of Quality and Compliance for Hertfordshire Building Control.

There are numerous aspects to Offsite construction and choosing the appropriate system for a project can be something of a challenge. Ken outlined a worked example of a procedure used to determine the potential components or assemblies with the most potential for a major hospital project. The object of the process is not to identify one solution but to identify options with the most significant benefits for further in-depth investigation.

Compliance with the building regulations and various other extant standards is one of the assessment criteria used.

The 2016 Farmer Review was the beginning of a series of initiatives including a White Paper about Fixing Our Broken Housing Market and the launch of the MMC cross-industry working group. A Construction Sector Deal followed aiming to transform productivity along with National Design Guidance introduced into the National Planning Policy.

This has resulted in the rollout of major housing schemes under the Homes England £7.39bn funding initiative to deliver 130,000 affordable homes across London.

Jayne summarised the most recent standards and legislation, which include the Building Safety Act, the Future homes standard, amendments to the Building Regulations and Environmental Products Declarations – EN 15804.

Building regulations compliance for high-rise buildings will be subject to Gateway 2 approval, similar in some ways to the Scottish system with approval required before construction commences. The aim is to deliver compliant, safe, sustainable, accessible, and comfortable homes.

The final part of this hub session was an overview from Ken of the Supply chain sustainability school, how to register to access the free online training material and complete a self-assessment to create a personal learning plan.

Download their presentations.

Can offsite address the UK housing crisis sustainably and effectively?

Chaired by: Ken Davie, Industry Advisor, **Buildoffsite**

The UK seems to have had a housing shortage for an exceptionally long time, which is understandable with an ever-increasing demand from an expanding population. Numerous factors affect the supply of homes, including the time it takes from the inception to occupation of residential developments.

- What are the advantages of Offsite for the residential sector?
- Does design have an impact on accepting offsite delivery for housing?
- Can Offsite designed housing provide net-zero homes?
- Is behavioural change required across the construction industry and in society to accept Offsite?
- Do existing offsite housing solutions and developments for residential and university accommodation prove the point?

The line-up for this session included:

- Matt Cooper, Operations Consulting Associate, **Arup**
- Dave Roberts, PhD Student **Aston University**, and Associate Head of School, **Coventry University**
- John Smith, Technical Director, **Donaldson Timber Systems**
- Dr Rehan Khodabuccus, Operations Director, **Zed Pod**
- Edward Jezeph, Senior Manager, **Home England** (Q&A session only)

Session summary

Matt Cooper started off with an affirmative answer to the main question, but with a few caveats, one of them convincing wider stakeholders of the benefits.

To meet the current estimated demand, it must be the right house type in the right location. Out of approximately 200,000 completions per year, Offsite and MMC deliver around 10%. They cannot plug the estimated 100,000 gap but they can be part of the solution.

Key issues for Offsite to address are:

- Creating a steady pipeline to encourage investment & de-risk the supply chain.
- Training people who are outside the current labour pool to increase pre-manufacturing.
- Standardisation and multi-sourcing of standard house types through collaboration.
- Demonstrating there is more to Offsite than just housing.

In summary, yes, offsite can help but it is only part of the solution. Huge strides are being made and there are opportunities to make a difference and endless opportunities.

Dave Roberts posed a slightly different question – Why is modular housing not being utilised to solve the housing crisis?

Market demand is for low rise single occupation traditionally built houses with high labour requirements. Volumetric modular delivers better quality more sustainable homes faster but the drawbacks are the public and industry perception of “prefab” and a focus on cost rather than value.

So, what is holding us back, is it the dichotomy of increased supply offset by reduced profits? To encourage greater use of Offsite & MMC solutions the industry needs to:

- Find out the true costs.
- Embrace manufacturing principles.
- Train and education our future leaders and innovators.
- Provide appropriate support and control via warranties, insurance, and legislation.

Donaldson Timber has been producing factory-built timber frame homes for many years, with most of the early production in Scotland, where timber frame is around 85% of the market. Recent sector activity has seen some of the major house builders either building their own production facilities or purchasing existing businesses.

The Advanced industrialised methods of construction of homes (AIMCH) project completed in 2022 was a 3-year R&D project set up to transform the way homes are built. John Smith explained how the output has influenced the Donaldson Timber thinking and approach starting with the design stage and looking at standard house designs, with exterior finishes appropriate for distinct locations.

Early design engagement is the key to maximising the benefit of the pre-manufactured system chosen for a project. Use of standard components helps to reduce costs without impacting the quality of the design or end product.

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Sustainability has played a key part with the focus on significantly reducing the 35 tonnes of embodied carbon produced during construction. The future homes standard targeting a 75% reduction in overall emissions will see a greater emphasis on embodied carbon from the construction phase because it will become a greater percentage of whole-life carbon.

Finally, for this session, Dr Rehan Khodabuccus from Zed Pod explained the benefits of MMC solutions, with the caveat “when done right.”

- 50% faster delivery than traditional schemes
- Optimised for digitalization, quality control & zero wastage
- Lower embodied carbon
- Lowest cost buildings to run
- Healthy buildings promoting social well-being

Making use of lands such as car parks and other areas not suited to conventional house building as development sites Zed Pod has delivered a range of pre-manufactured energy-efficient ultra-low carbon and net zero operational carbon homes. An early net-zero prototype was built on a car park in the BRE Watford campus.

- The zero operational carbon strategy for modular homes includes:
- Thick insulation build-ups
- Reduced thermal bridging & approved details
- Airtightness membranes and taping
- Mechanical ventilation
- Natural daylighting
- Water efficacy measures
- A-rated highly energy-efficient appliances
- Roof-mounted photovoltaic panels
- Solar-assisted hot water units
- Mechanical ventilation & heat recovery

All of this helps to achieve an A-rated energy performance certificate and the Zed Pod aims of achieving the U.N. Sustainable development goals.

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The session concluded with a lively Q&A session chaired by BOS industry advisor Ken Davie and joined by Edward Jezeph from Homes England.

Download their presentations.

Can we futureproof offsite by demonstrating a business case?

Chaired by: Nigel Fraser, Industry Advisor, **Buildoffsite**

This session addressed the following questions:

- What can we deliver to industry to demonstrate Offsite is the way forward?
- What business case scenarios will underpin Offsite as a solid and secure investment delivering against long term sustainability goals?

A busy, thought-provoking session with five authoritative speakers:

- John Welch, Deputy Director – Construction, **Crown Commercial Services**
- David Riley, Head of Carbon Neutrality, **Anglian Water**
- David Dexter, Risk Solutions Practice Leader, Casualty and Construction, **QBE Europe**
- Dave Roberts, PhD Student **Aston University**, and Associate Head of School, **Coventry University**
- Edward Jezeph, Senior Manager, **Homes England**

Session summary

John Welch got us going by giving a client perspective, outlining the range of criteria used to evaluate offsite options. Highlighting The Construction Playbook and the need for clients need to give manufacturers earlier sight of pipelines to help identify repeatability to justify investment into innovation and enable continuous improvement, reducing costs and improving quality. Longer term contracting was stated to reduce the procurement costs for both the client and supplier. However, the risk profile is also different. “Capacity and cash flow are managed differently than traditional construction.” Financial stability is a pre-requisite of suppliers. “Too often manufacturers are seen as a second choice or engaged too late to add value.”

Dave Roberts provided insights through his research. Having identified 70 cost variables, his research to date has focused upon the weather and health and safety aspects. By “multiplying the productivity impact with the probability of weather type impact” using “lots of assumptions – such as closest weather station is same as location” and “not taking into account other impact such as other buildings, other topography etc.” which, when applied “to an example cost model gave a potential weather impact of 0.6%”, which is significant when compared with “a net profit margin of in the region of 5%”. One for offsite to exploit. With respect to health and safety, Dave’s research is indicating and additional 0.1-0.5% cost. “Getting close to 1% cost impact – just 2 of the 70+ variables”.

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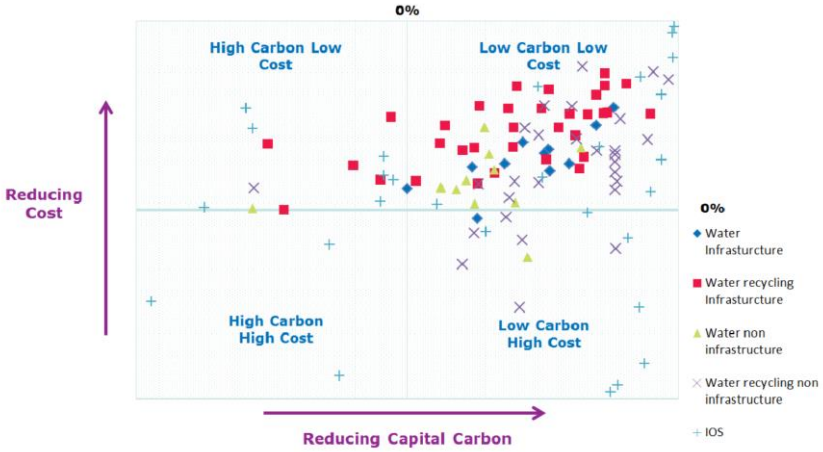
David Riley presented the journey Anglian Water has been on to reduce carbon, and cost. The analysis below demonstrates the extent of this for a range of projects. Their target is a 70% capital carbon reduction from 2010 levels and net zero emissions by 2030. Applying PAS 2080 is central to this. The sampling kiosk and trickling filter standard products were examples of offsite's role in achieving these targets.



Edward Jezeph explained how Homes England is working with social housing suppliers, often using offsite solutions to help ensure that the budget maximises the value that can be provided.

David Dexter provided a framework for evaluating risk when employing offsite and other modern methods of construction, considering both positive and negative aspects.

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What an Insurer will Expect to see.

[Download their presentations.]