

International Conference on Sustainability in Energy and Buildings

Invited Sessions

Title of Session: Smart Offsite Manufacturing for Nearly to Net-Zero Carbon Buildings

Name of Chairs:

Dr John Littlewood
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Description:

At the start of the third decade of the 21st century there is a drive to retrofit and refurbish existing buildings and design, manufacture and construct new buildings so that they very quickly achieve nearly to net-zero carbon standards. This is being enforced through tightening of the Building Codes and Regulations in various countries. For some time Passivhaus (2019) has been a recognised approach to design/construct new buildings or retrofit existing buildings to achieve nearly zero operational carbon. The Energiesprong (2019) approach goes beyond Passivhaus to achieve net zero energy homes, and both standards are centred on operational energy/carbon reduction, but not mandatory embodied carbon reduction.

The focus for this session is to attract papers that address, discuss and present work that highlight how to significantly reduce either or both embodied carbon and operation carbon of existing and new buildings. Yet, with traditional construction and retrofit processes it is unlikely that they can meet the demand or quality control required for nearly to net-zero carbon standards, due to both the well-documented Performance Gap (CIBSE, 2012) and the less-well-documented Safety Gap (Littlewood et al, 2017). It is well documented by Farmer (2016) that the construction industry must modernise or 'die', where there is a considerable skills gap and unintended consequences of construction site practice. This 'gap' affects acoustic, fire and thermal performance and also, in timber systems moisture control.

One solution to mitigate against the skills gap, is to use offsite-manufacturing (OSM) or offsite-construction. OSM's advantages over conventional construction includes quicker completion, greater quality of finish, less defects and better integrated building services. Since 2005, OSM construction systems have been known as modern methods of construction (MMC) or Smart Construction and typically include: panellised units for the exterior building fabric, volumetric construction of modular units in controlled factory conditions, hybrid techniques combining both panellised and volumetric approaches. With the growing interest in quantifying and significantly reducing the embodied carbon of materials used in buildings, then OSM of MMC using natural materials, such as timber, could be seen to be one of the best construction systems available to also achieve nearly to net-zero carbon buildings.

One approach launched in 2019, by the UK Green Building Council to achieve net-zero carbon is to adopt their four pillars: reduce construction impacts, reduce operational energy use, increase renewable energy supply, and offset any remaining carbon – such as reforestation.

Thus we seek short and full papers from the industrial, research and scientific communities to share their knowledge, practice and innovation to increase the performance of buildings to deliver nearly to net-zero embodied carbon buildings, using OSM of MMC. This area comprises (but it is not limited to) industrial applications, research and development, and academic research related to:

Sustainable and Resilient manufacturing processes to reduce carbon emissions and waste in the OSM and MMC to achieve nearly to net-zero carbon new buildings or building retrofit;

Value stream mapping of processes for optimising, cost and waste reduction in design, or manufacturing, or transport, or erection/construction and/or commissioning of nearly to net-zero carbon buildings or building retrofit;

Materials recycling for reuse as part of manufacturing processes in the OSM and MMC to achieve nearly to net-zero carbon new buildings or building retrofit;
Renewable energy generation from and for the manufacturing processes in OSM and MC to achieve nearly to net-zero carbon new buildings or building retrofit;
Embodied carbon analysis of materials used in OSM for MMC to achieve nearly to net-zero carbon new buildings or building retrofit;
OSM MMC Systems and Technologies to achieve nearly to net-zero carbon new buildings or building retrofit;
Current and proposed tools for OSM and MMC to achieve nearly to net-zero carbon new buildings or building retrofit;
Guidance, Legislation and Policy developments for OSM and MMC to achieve nearly to net-zero carbon new buildings or building retrofit.

Website URL (if any):

<https://surbe.org/innovative-construction-offsite-manufacture/>

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