building 4.0 crc

Glossary of MMC Terminology

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3D Printing
A construction method that utilises large scale 3D printers to create buildings layer by layer using cement style materials, sometimes referred to as ‘contour crafting’.

AI (Artificial Intelligence)
The simulation of human intelligence in machines, enabling automated decision-making and analysis in construction processes, enhancing efficiency and accuracy.

Assembly
The process of putting together prefabricated components or modules in factories or in assembly locations near or at the building site prior to final installation in a building.

BIM (Building Information Modelling)
A digital representation of the physical and functional characteristics of a building providing a shared knowledge resource for information about the facility throughout its lifecycle.

Cassette
A panel comprised of several flat layers, forming a thin box-like assembly. This may be used for floors or ceilings, which can be prefabricated with various services integrated into them before being transported to the site.

Circularity
Designing products with the entire lifecycle in mind therefore promoting reuse, recycling, and sustainability. Circularity encourages designers and manufacturers to consider the end-of-life phase during the design process, leading to less waste and more sustainable practices.

CLT (Cross-Laminated Timber)
An engineered wood product made from layers of timber boards with each layer glued together at right angles to the layer below. CLT is used for constructing walls, floors, and roofs, offering strength and sustainability benefits.

Components
Individual elements or sections of a larger system or structure often prefabricated offsite.

Continuous Improvement
An ongoing process aimed at enhancing work practices, products, services or designs through incremental changes over time. A systematic approach that encourages organisations to seek small, regular improvements by routinely reviewing and identifying areas where improvements and efficiency gains can be achieved throughout the life cycle.

Creative Commons License
A type of license that allows creators to share their work legally while specifying how others can use it, often used in the context of open-source designs and documentation in construction.

Demountable
Describes structures designed to be easily disassembled or relocated without significant loss of integrity or functionality.

DfMA (Design for Manufacturing and Assembly)
A design approach focused on simplifying the manufacturing and assembly processes. By considering the ease of assembly during the design phase, companies can reduce production costs and time while improving product quality. DfMA emphases minimising the number of parts and designing parts that are easy to assemble.

DfMAD (Design for Manufacture and Assembly with Disassembly)
An extension of Design for Manufacturing and Assembly (DfMA) design philosophy that facilitates the easy disassembly of building components at the end of their life cycle. This approach supports sustainability and circularity through recycling and reusing materials.

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Digital Twins
3D virtual replicas of physical assets, processes or systems that can be used for simulations, monitoring and analysis to optimise performance and maintenance in buildings.

Fabricate
The process of making building components or materials in a controlled environment, typically offsite.

Flat-pack
A delivery and assembly method where building components are designed to be produced in flat sections for transport. Flat-pack is another term for panelised systems where the elements of walls and ceilings are made of thin panels/cassettes as distinct from volumetric modular systems where a component is a box shaped volume with room like proportions. Flat-pack reduces costs and space requirements during transportation compared to volumetric modular.

Glulam (Glued Laminated Timber)
A type of engineered wood product made by bonding together individual pieces of lumber with durable adhesives. Glulam is used for structural applications due to its high strength-to-weight ratio and is mostly used for constructing beams or columns. Unlike Cross Laminated Timber the layers are glued parallel to their adjacent layers.

Hybrid (Modular Hybrid)
A construction approach that combines flatpack /panelised systems with volumetric modular components to enhance flexibility and efficiency in the building process. For example panelised walls and floors might be combined with volumetric bathroom module assemblies.

Installation
The process of placing and fixing parts / assemblies / modules into the building site to form a complete building.

Kit-of-parts
A collection of pre-manufactured components that can be assembled onsite to create a complete structure. The kit exists prior to project design commencing, allowing a designer to choose the parts to comprise the design from.

Lean Construction
A methodology that focuses on minimising waste and maximising value in construction processes through efficient project management and continuous improvement practices. This is derived from lean manufacturing, often referred to as the Toyota Way. All forms of waste (material, motion, inventory, waiting, over-production, over-processing and transport) are constantly reviewed for improvements.

Mass Timber
Refers to heavy engineered timber products used in construction, including CLT, LVL and glulam. Mass timber is recognised for its sustainability, aesthetic appeal, and structural capabilities. The term heavy is relative to the lightweight nature of traditional timber house framing.

MMC (Modern Methods of Construction)
An umbrella term encompassing various innovative construction techniques aimed at improving efficiency, sustainability, and quality in building projects. MMC includes panelised construction, modular construction, kit-of-parts, prefabrication, and other advanced construction methods.

Modular
Describes a construction method where buildings are created using separate sections or modules that can be easily assembled. Correctly defined, the term is ‘volumetric modular’ and refers specifically to a box-like assembly. The term is often corrupted to refer to all forms of prefabricated systems including panelised systems.

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Modularisation
A construction approach that involves creating pre-engineered sections or modules of a building in a factory setting, which are then transported to the site for assembly.

Offsite
Construction activities conducted away from the final building site, typically in a factory setting. Offsite methods enhance quality control, reduces waste and reduce onsite labour requirements. Offsite can include near site locations, for example adjacent vacant sites used as assembly facilities.

Offsite Manufacturing
Manufacturing focused specifically on the production of building components in a factory setting before transporting them to the construction site.

Onsite Manufacturing
Capability created at the building site to manufacture components that are then lifted into the building structure and installed. There are numerous examples of onsite manufacturing including site assembly of permanent formwork systems, robotics equipment in temporary sheds for making steel or timber elements and 3D printing, where the robotic equipment operates at the building site.

Panelised Systems
A construction technique involving the use of flat panels (such as walls or roofs) that are prefabricated offsite and then assembled onsite. A panel system may incorporate linings, pre-wiring, windows and doors assembled at a factory. This method allows for quick assembly. Panels are flat building elements, typically relatively thin in width. They may be described as Open or Closed depending on whether they are fully enclosed on both sides (closed) or one side has been left off (open) for purposes of inspection, installation access or to allow incorporation of other building works such as electrical services.

Panelised Systems. Continued.
Examples of panelised systems include CLT (Cross Laminated Timber), structural insulated panels (SIP), precast concrete, pre-nailed timber frames and unitised metal framing systems. Panels and cassettes are similar in nature. A cassette is a type of panel that incorporates several layers either side of a void. A panel can consist of a single layer, for example a panel of CLT.

Parametric Design
A design process that uses algorithms to manipulate design variables dynamically, allowing for rapid iterations and customisations based on specific requirements. This may also be referred to as computational design and sometimes as generative design where the algorithms are sufficiently sophisticated to cause part of the design to generate automatically in response to basic inputs.

Part
A simple discrete element of a building such as a beam, door or floor. The terms part and component are interchangeable. This is distinct from a raw building material like timber or plasterboard in that value has been added in the form of shaping, finishing, assembling or otherwise processing raw materials to create the discrete part. The term part further implies that the element can be separated from the rest of the building assembly and therefore made separate from the remainder of the building. This is distinct from, for example, a concrete structure where all of the columns and floors may have been poured as one cohesive mass that cannot be broken into parts.

Pod
Volumetric modules used in construction such as bathroom, kitchen or office pods which are manufactured offsite and installed within the main structure. Pods are typically not loadbearing structures and therefore still require the building to have a structural frame unrelated to the pod.

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Prefabrication
Manufacturing parts offsite before transporting them to the construction site. This approach minimises onsite labour and reduces site based construction time while enabling high-quality standards in more efficient working environments. Key benefits include reduced construction costs through economies of scale and enhanced safety due to limiting onsite environment conditions. Prefabrication is a wide term for many different types of fabrication including basic traditional construction methods (performed offsite) to advanced manufacturing using automated equipment.

Product Platform
A framework or system that allows for the efficient design and production of multiple buildings using a common set of components or modules. This approach enhances standardisation, continuous improvement, compatibility and reusability across different projects. Central is the idea that the building is a product for a defined customer segment and that the platform ensures efficient production and achievement of product goals such as customer satisfaction, quality and value for money.

SIP (Structural Insulated Panel)
A composite building panel made from an insulating foam core sandwiched between two structural facings. SIPs provide insulation and structural integrity while allowing for quick assembly. SIPs are typically loadbearing elements with a capacity to achieve buildings 2-3 storeys in height.

Site Assembly
Site assembly or land assembly is the process of combining two or more small adjacent properties into a single, consolidated parcel.

Stackable
Refers to building components designed to be easily stacked or arranged vertically, facilitating efficient transportation and assembly on site.

Standardisation
The process of establishing uniform specifications and criteria for materials, components, and construction methods to ensure consistency, quality, and efficiency.

System 600
System 600 is being developed by Building 4.0 CRC's research team as part of the Homes NSW MMC Program. It is a standardised design and assembly system used in modular construction that specifies dimensions and configurations for components to ensure compatibility of assembly. System 600 is an open-source, collaborative system comprising of parts supplied by various unrelated suppliers. The "600" of the title references the base 600mm x 600mm grid that coordinates the system's internal planning.

Traditional Construction
A customised building with little to no offsite manufacturing. This construction method is considered the standard for most residential, commercial and industrial builds. Trade skills are required to interpret design intent into highly specific arrangements and to handcraft building materials into the final building configuration.

Transportable
Refers to a building that is entirely manufactured offsite and transported onsite. e.g. a small house that gets transported on the back of a truck.

Quality Control
A systematic process aimed at ensuring that construction outputs meet specified requirements and standards. Quality control involves monitoring all stages of the construction process, from material selection to final inspections.

Volumetric
Modular units that are three-dimensional and often include complete internal fittings (e.g., bathrooms or kitchens). These units are manufactured offsite and assembled onsite to form a complete structure.