Vision Modular Systems UK Ltd

Introduction

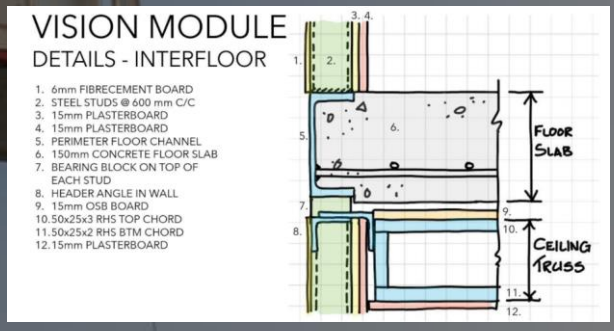
Vision Modular Systems UK Ltd is a leader in the modular construction industry, providing three-dimensional self-supporting structures that are installed and connected to form low, medium, and high-rise buildings. Vision uses a sophisticated factory-automated system to produce volumetric structural modules for various sectors, including hotels, residential apartments, and student accommodation buildings.

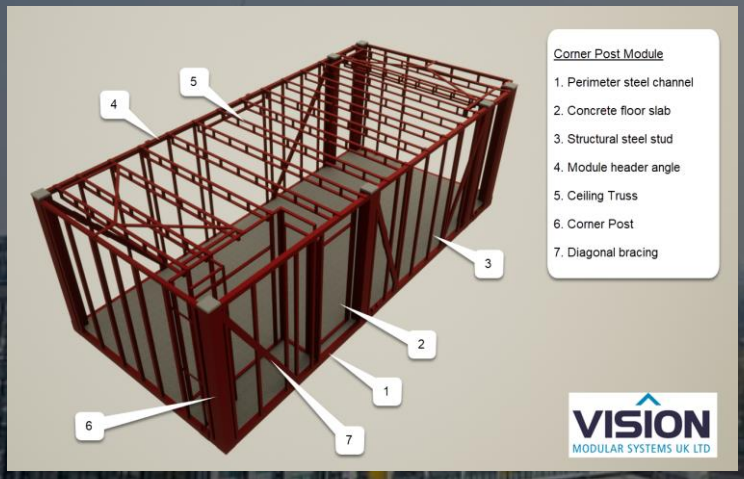
Vision has developed a modular system that can deliver unique buildings, offering several advantages over traditional construction methods. These include faster construction times, reduced waste, reduced embodied carbon, improved safety, and cost savings. Vision prioritises fire safety and has implanted a rigorous approach to structural fire protection, structural fire assessments, stringent passive fire protection quality control, including a substantial amount of elemental and full-scale fire testing.

Module Explaniation

The Vision system is a highly advanced prefabricated volumetric system constructed using reinforced concrete floor slabs, supported by structural steel columns and transfers vertical loads through load-bearing members. Modules are manufactured from a series of 2D elements including floor, ceiling and a variety of walls depending on the complexity of the module. The modules vary in shape from simple rectangular elements to quite complex irregular shapes with splayed corners and stepping of the walls on plan. The walls are the primary load bearing elements of the structure and are therefore designed to bear on the walls of the modules below.

The floor is constructed from reinforced concrete and is structurally independent of the ceiling in the lower module providing excellent acoustic performance. The walls are constructed with structural box sections allowing developments of 50 storeys with potential for higher and offer 120 minutes fire resistance. The ceiling is constructed with a lightweight truss providing a support structure for workers during the erection process and a zone for building services is achieved in the centre of the truss allowing comfortable space for the apartment services.





Several factors may influence the allowable sizes of a module including transportation, site accessibility, weight and factory limitations. For standard production rates the preferred module limitations of width of 4.0m, length of 10.6m and height of 2.8m. Larger sizes are common but not preferred as part of the standard production and must be considered in terms of frequency, transportation, construction difficulty.

Module Design

Vision utilises it in house design teams to develop a close working relationship with the project team at an early stage as it is essential to coordinate all elements of the manufacturing process. Modular construction generally requires early design freeze, and this is aided by rapid resolution of any design issues. Project milestones are identified early in the development stage of the project in order to identify the manufacturing and delivery dates. The Vision Design team apply Building Information (BIM) work practices using both Tekla Structures and Autodesk Revit to fully design and coordinate all projects to exacting manufacturing tolerances.

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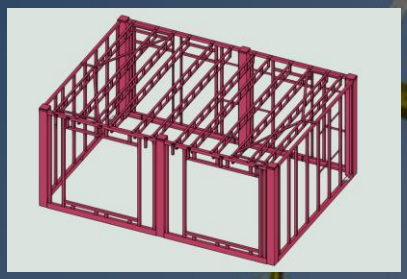
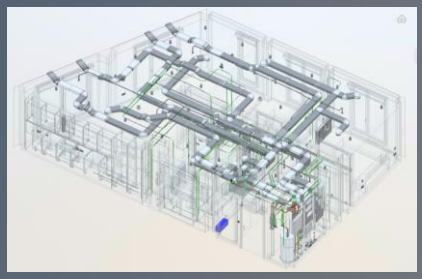
BIM Models

Structural



Architectural

MEP



Modules are engineered for the various stages of construction, including temporary situations such as handling in the factory and on site, transportation, placing, and as part of the permanent structure. The modular system utilizes a variety of connections to suit the building layout and the relative positions of the modules within the building. Loadbearing elements are designed to suit the level of the building at which modules are placed, allowing for all loads above.
The stability of the Vision buildings is achieved using a traditional reinforced concrete core. The concrete module floors are connected together to create a diaphragm at each floor allowing horizontal building loads to be transferred back to the core.

All load bearing walls have been structurally Fire tested to EN 1365-1. The fire performance of walls can be designed to vary from 90 minutes to over 180 minutes or higher if required. The standard load-bearing wall in the system provides 120 minutes fire resistance with services integrated within the wall. All floors within the system are 150mm concrete and are designed to provide 90- or 120-minutes fire resistance to suit building regulations.

Module Manufacture

Modules are assembled in our manufacturing facility in Bedford and involves 18 stages to maintain the continuity in production with many of the processes involving traditional construction methods. The production process for one module takes approximately ten day.

Modules are manufactured in a quality-controlled factory environment, which allows a higher level of finish to be achieved than could normally be expected on site. All 1st and 2nd fix plumbing, electric, carpentry, tiling, painting and installation of kitchen and white goods is done in the factory which allows all work leaving the production facility to be virtually snag free. This high-quality level of finish is a unique benefit of the Vision modular system. The factory is ISO9001, IS014001, ISO 45001 and BS EN 1090-2 certified.

As a result, the process is less affected by skills shortage than traditional construction as permanent, long term jobs are on offer with continuity of work for personnel as opposed to often temporary transient workforces employed on traditional sites.
Completed modules are weather protected and delivered to site or stored for just in time delivery. The modules are loaded onto trailers and transported by road to site. All elements are watertight and finished to a very high standard before transporting resulting in minimal work on site to connect services and complete finishes.

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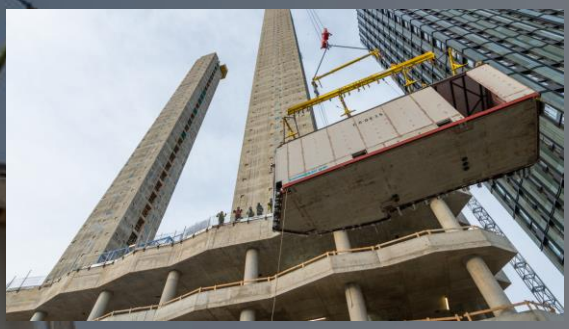
Module Installation

On site, modules are placed on top of a reinforced concrete podium slab, allowing for a different layout the lower levels of buildings below the transfer slab. Each modular level follows the profile of the one below, with the columns aligning vertically throughout the building. The modules are stacked up through the height of the building, connected both vertically and horizontally, and tied back to a traditional reinforced concrete core. Connections transfer forces between the module floors to achieve diaphragm action and transfers the diaphragm forces back to a traditional structure which is generally a reinforced concrete core. Once modules have been installed the central building services are installed, external finishes are applied, module joints and connection pockets are sealed and all remaining fit out items are added. Visions specialist site teams oversee all testing and commissioning of building services and life safety systems.



Quality Control

Vision modules are assembled in a factory-controlled environment, which allows a higher level of quality control than would be normally possible on a construction site. This level of quality control over workmanship together with module assembly details designed to provide airtight construction allow the modules to achieve excellent airtightness, acoustic and thermal performance. Vision utilise a fully digital cloud-based Quality Control application called “Fieldview” that allows the recording of all work processes and inspections performed in both the factory and on site. Additionally, Vision have implemented a rigorous inspection process for all passive firestopping material installation and visual weld inspections as per EN1090-2.

Sustainability

The Vision system has been reviewed by industry and academic experts in relation to Life Cycle Analysis and found to reduce embodied carbon by 41% when compared to traditional constructions methods. This reduction is achieved through efficent design, significant waste reduction and reduced site transportation.

Technical Information

Module Dimensions	Max Length= 10m Max Width= 6m Max height= 3.5m
Typical Module Weight	5-25 Tonnes
Building Height	2-50 Stories
Structural Materials	Steel Concrete Gypsum Plasterboards
Durability	60 Years
Structural Support	RC Transfer Slab and Core
U-Values	External Wall= 0.14 W/m^{2}K Exposed Floor= 0.10 W/m^{2}K Roof=0.10 W/m^{2}K Windows= 1.20 W/m^{2}K G Value=0.4
Watertightness	CWCT Tested
Airtightness	3.0 m^3/(h.m^2)@50Pa 70% betterment on UK Regs
Acoustic Performance	Airbourne : +50dB reduction Impact : +44dB reduction 5dB betterment on UK Building Regs
Window and Door Performance	PAS 24 Secure by Design Fire Rated as pre project requirement
Fire Performance	REI Values 120 minutes
Condensation Risk Analysis	fRSI> 0.75 at 15°C
Vibration	Not susceptible to resonance vibration Fundamental frequency >10hz
Facade Wall	Fully non-combustible
Ventilation System	Mechanical supply & extract ventilation c/w heat recovery
Cladding Preference	Metal clad Rainscreen Traditional Brick Brick Slip Terracotta
Sustainability	41% Reduction in embodied carbon