

WHY MODULAR CONSTRUCTION?

Executive Summary

➤ **Why Modular construction.**

Modular construction shifts a significant portion of on-site activities (*conventional site-built construction*) to off-site manufacturing under a factory environment (*off-site activities / modular construction*). It has the potential to significantly increase the speed of construction while lowering costs.

➤ **Indochine Engineering Vietnam adapts and reframes the off-site construction concept.**

Indochine Engineering Vietnam offers significant experience with major hotel brands and quality hotel experiences. We are continuously adopting our engineering solutions, to provide integrated multidisciplinary engineering services for modular construction in Vietnam and other potential markets, as part of our strategic planning.

✓ **GREENER:**

*Greater Flexibility and Reuse.
Less Material Waste.
ESD Focused Design*

✓ **FASTER:**

*Improved Construction Schedule
Lower Defect Rate
Elimination of Weather Delays.
Customize to Building Code with
Quality Materials.*

✓ **SMARTER:**

*Safer Construction.
Better Engineered Building & BIM.
Limitless Design Opportunities.*

Process

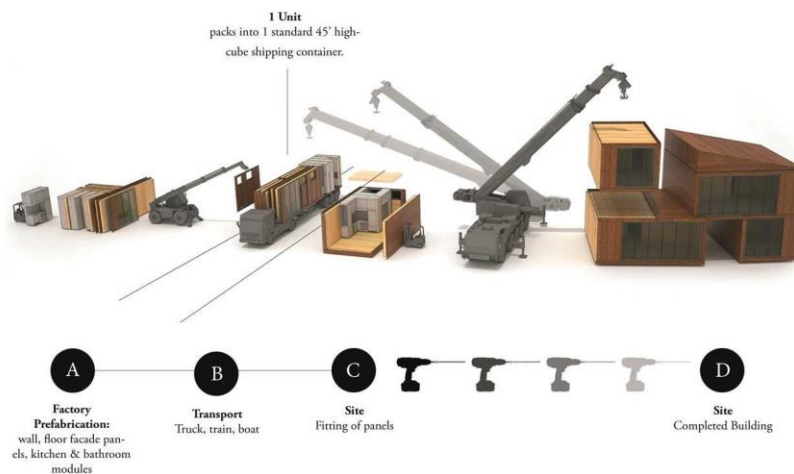
Typical traditional project schedule



Typical modular project schedule



Typical modular structure construction phrases



Typical modular structure assembling process

Discussion

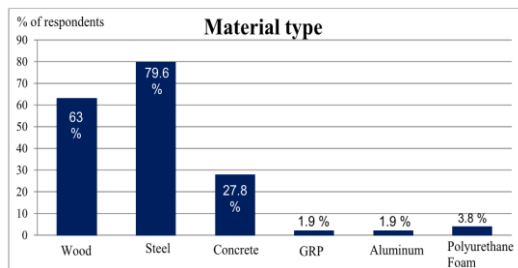
➤ Latest Modular Construction Concept's Development and Separation.

The latest Modular Construction concept design has significantly transformed and developed from prior times, with the latest concepts offering innovative, sustainable construction delivery methods, utilizing offsite, lean manufacturing techniques to prefabricate single or multi-story building solutions in deliverable module sections.

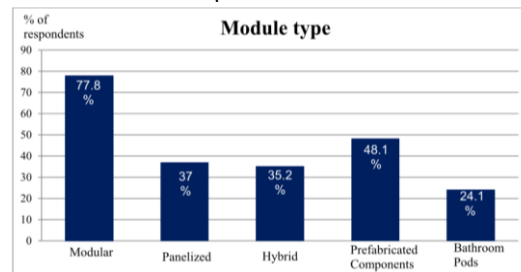
The latest Modular Construction concepts can be integrated into site-built projects or stand alone as a turn-key solution and can be delivered with MEP, furniture fixtures and interior finishes in less time, with less waste, and higher quality control compared to projects utilizing only site-built construction. Recent research has come out supporting the fact that modular construction is an efficient construction process and poised to help the construction industry grow.

➤ Market survey report. (*)

What type of material used in fabrication and production of modular structure?



What types of modular structure are being produced?



- **Typical Modular:** 'Modular construction' is a term used to describe the use of factory-produced pre-engineered building units that are delivered to site and assembled as large volumetric components or as substantial elements of a building.
- **Panelized structure:** Panelized construction is a method of building certain parts of a house in a factory rather than onsite. This construction method is the natural midpoint between a standard site-built structure and a completely modular premanufactured structure.
- **Hybrid structure:** Hybrid structure is typically genuine eco-friendly and versatile solution, which uses shipping containers or containerize steel frame and other recyclable materials for construction. Hybrid structure provides an array of advantages against the conventional building for housing or office or other purposes.
- **Prefabricated Components:** typically likes balconies; atriums; stair modules and certain non-load bearing modules
- **Bathroom pods:** which have another name such as prefabricated bathroom modules, modular bathrooms, prefabricated modular bathrooms, shower cubicles. It is innovative standalone bathrooms with fine quality from factory standard, easy to maintain bathrooms, easy to install bathrooms, easy to clean bathrooms, low cost compared to the installation of a conventional tiled bathroom from scratch.

(*) Market survey report & feedback were referred to recent independent survey result from Concordia University, Department of Building, Civil and Environmental Engineering, in Canada conducting from Apr - Aug 2017. This result had been analyzed nearby 1,000 professionals by online questionnaire survey from different fields and countries from Canada, USA, UK, China, Australia, New Zealand, Brazil, Russia, UAE...etc.

Typical Modular



Panelized structure



Hybrid structure



Prefabricated Components



Bathroom pods



➤ **Positive market feedback about Modular construction concept. (*)**

Architect / Engineer' response:	Contractor 's response:	Owner's response:
1. Schedule reduction	1. Schedule reduction	1. Schedule reduction
2. Cost control	2. Quality assurance	2. Predictable process
3. Quality assurance	3. Predictable process	3. Labour Shortage avoidance
4. Waste reduction	4. Labour Shortage avoidance	4. Quality assurance
5. Weather avoidance	5. Increasing the safe working condition and reduce the lost time injury (LTI),	5. Cost control
6. Predictable process	6. Productivity gains	6. Waste reduction
7. Labour Shortage avoidance	7. Waste reduction	7. Productivity gains
8. Productivity gains	8. Cost control	8. Weather avoidance

➤ **Negative market feedback about Modular construction concept. (*)**

Architect / Engineer' response:	Contractor 's response:	Owner's response:
1. Owner perception and education	1. Owner perception and education	1. Historical issues
2. Historical issues	2. Transpiration limitation / logistics cost	2. Owner perception and knowledge about education.
3. Limited regulatory and statutory code	3. Designer knowledge of modular	3. Limited regulatory and statutory code
4. Design restrictive / aesthetics limitation with cubicle shape	4. Limited regulatory and statutory code	4. Transpiration limitation / logistics cost
5. Transpiration limitation / logistics cost	5. Project budget estimation and financial funding due to limitation of knowledge of modular structure from both contractor and financing bank.	5. Limited selection of experienced contractor and design with modular structure
6. Designer knowledge of modular construction	6. Historical issues.	6. Design restrictive / aesthetics limitation with cubicle shape.
7. Limited selection of modular manufacturer.	7. Insurance issues	7. Designer knowledge of modular
	8. Modular construction not suit with for expansion or renovation work on existing traditionally-built building.	8. Modular construction not suit with for expansion or renovation work on existing traditionally-built building.

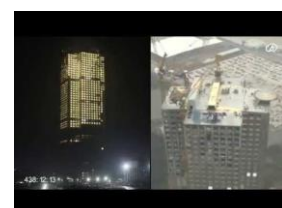
Supporting Information

With a sophisticated R&D; design & engineering and well-organized construction processes with combination of prefabricated structures; panelized structures; bathroom units were put in together for assembling a high-rise building within a very short time.

How the 30-storey building was built in 15 days? *(Click picture)*



How the 57-storey building was built in 19 days? *(Click picture)*



Key Consideration

The following key benefits to the project

- Modular construction savings due to the ability to progress work as a parallel operation in a factory and on a construction site.
- Factory tolerances and workmanship is of a higher quality and consistency to that achieved on site.
- There tends to be less waste.
- Independence working from adverse weather; winter or raining season.
- An alternative means of production where there may be shortages of local skilled labor.
- The factory environment can allow better safety than the construction site.

The following area of concerns to the project.

- Limited road transport maximum widths.
- The need for police escorts for oversize transportation license.
- Height restrictions under flyover bridges.
- Daytime traffic restrictions in city centers.
- Daytime traffic restriction for long range delivery from manufacturer to construction site.
- Limited of crane loading capacities of site craneage and temporary tower crane which may not able to lift and install of large modular unit.
- Additional cost of temporary bracing for transportation and/or lifting or permanent framing to support prefabricated assemblies.
- Additional cost of pre-assembly in the factory prior to dismantling for transport and delivery.
- The conventional site-built assembly requires a higher degree of accuracy than is normally associated with on-site building work to avoid interface problems.
- A potential mistake in the mass production of prefabricated elements ahead of the measurable site work is a serious risk.
- Sustainability is an issue regarding the transportation of the materials to the construction site.

Conclusion

Our involvement in projects has been from concept through design, tender, construction, and operation. In Vietnam it has proven important for the engineering consultant to be involved full cycles of project and now with our core teams and engineering capabilities which we can support Owners and Contractors to enhance the conventional construction concept and achieve with “Greener – Faster – Smarter” construction concepts.