

# Modular Construction – The next big thing in the construction world?

Even as the construction boom phenomenon is spreading fast to more and more places across the world, people are continually looking for advanced and efficient techniques or methodologies for construction of structures. This perpetual pursuit has resulted in new construction techniques that are speedier, more cost-effective, efficient and tailor-made for diverse requirements.

The slipform technique of construction, which has been already discussed in this blog, is one of those that has proven it's immense relevance in the construction of structures like high-rise buildings, silos, chimneys, etc. Evolution didn't end there and more techniques are coming into being even as the construction world is achieving newer heights continually. A major development among them is the rise of the modular construction method which has the potential of becoming the next big thing in the domain of construction.

The realm of modular construction is an uncharted territory for this author when it comes to practical involvement. However, with experience in diverse construction work one can always have a fairly good idea about a new construction technique by doing some reading about the same.

So, what is modular construction? It is a method of construction which involves mostly off-site construction and to some extent on-site construction. Off-site construction work is usually carried out in the controlled environment of a factory or similar enclosed facility. The proportion of off-site and in situ work may vary from project to project. Normally, well over 50% of the entire structure is prefabricated in the form of modules (pre-designed) in an off-site facility which are then transported to site for installation in order to complete the structure.

In some cases, almost the entire structure is prefabricated in the form of modules and shipped to site as per schedule. Often the foundation is constructed at site and the rest of the structure is completed by assembling the modules on it. So, the only major on-site activities are usually the site preparation & the foundation work. This gives the entire process of construction a whole new meaning and no wonder that this methodology of building structures is beginning to make waves in the domain of construction.

In a nutshell, modular system of construction comprises of four basic components – analysis & design, production of modules in an off-site facility, shipping of modules to their final destination and installation of the same to complete the structure.

Modular construction technique can be used for both temporary as well as permanent structures. Temporary modular structures are those that can be relocated and reused as and when required. Even though this method can be applied to varieties of structures, the most popular use of it is seen in the construction of buildings such as apartments, commercial buildings and so on.

Modular construction system is especially good for cases where a number of similar buildings are required to be constructed. That's because a large number of similar modules can be prepared in factory repeatedly, without changing the arrangements and transported to the actual site(s). This makes the construction process even faster and quality, time & cost efficient. Examples are retail outlets, educational buildings, sports villages, industrial townships, apartment blocks, temporary accommodation facilities during industrial project construction, etc. It is also quite useful for ports, deep water construction, healthcare, factory, office, etc buildings as well.

Before opting for modular construction approach it is important to consider certain key aspects. First and foremost whether to go for the modular approach or not is to be decided carefully. This should be determined at the very beginning and the participants of the project such as the owners, planners, designers, project managers, contractors, experts and end users should be involved in the decision making process. A decision in favour of the same can be taken if the requirements of the participants, especially that of the asset owners & the asset users, are concordant with the advantages to be gained from adopting the modular concept in stead of a conventional method of construction. It is also important to decide which modular methodology would be most appropriate for a particular type of project.

Another key consideration is the transport logistics. The supply & service chain of the modular construction method is quite different from that of the conventional ones. This aspect needs to be thoroughly addressed beforehand. Various dimensions like intricacies of transporting logistics, latest available technologies & equipment for handling & transportation of modules, timely delivery of modules must be taken into account in the conceptual stage itself. There could be other challenges as well which need to be identified and an appropriate contingency plan would come in handy.

Consideration like to what extent a structure would be modularised and how much on-site construction would be done must be addressed well in advance. Another important aspect is whether the structure(s) would be permanent or of the type that can be relocated and reused conveniently. While designing the modules, their connections and the structure as a whole, this can play an important role.

Few other areas requiring careful thinking are the modular design process, cost benefits, a team skilled in modular matters, quality production of modules and their efficient installation and a thorough planning of the entire process itself. It also needs to be ensured at the very early stage itself that no changes occur in the design of the structure or in the scope of the project as such changes tend to cast adverse impacts on the cost and time schedules substantially.

Don't be surprised to see someday levitating buildings that not only can float but also would be capable of moving from one location to another with ease. Can't rule out flying buildings either – buildings capable of taking off and fly like airplanes enabling it's dwellers to move to other areas along with them. No doubt such crazy ideas would cost astronomical sums yet never discount the spending power of all those boys out there capable of affording all sorts of astonishing and expensive toys.

Coming back to more realistic matters – let's begin from where we left in the previous part of this article. As already mentioned in Part-I, in pursuit of better time & cost efficient techniques, the avant-garde of the engineering realm too keeps producing fresh ideas from time to time and modular construction technique also is an outcome of such efforts. This piece of writing on this topic will be beneficial especially for those who may not have the first idea of modular construction approach.

Some basic forms of modular construction have been existing for quite sometime. However, it's effective use in the construction of multistoreyed buildings is relatively new which has delivered some spectacular outcomes. A piece of news was once published in this very blog itself about a 15-storeyed building that was erected at the site in just about 2 weeks time using modular construction technique. There are good number of other examples that are even more spectacular.

So, what are the distinct advantages that render the modular approach a growingly sought-after one. The modular construction package comes with a whole lot of concomitant benefits if chosen and implemented properly – that is, if the points discussed in Part-I are taken into account well while opting for and implementing it. That's important as all situation may not suit this approach. Mentioned below are some of the salient takeaways from the modular way of building things:

\* The cardinal benefit comes in the form of reduction in the time schedule of a project. With the quantum of on-site activities getting reduced drastically and replaced by activities in well controlled off-site facilities such as factories, there comes much better control over the time factor. That's primarily because many of the on-site contingencies or disadvantages do not arise in an well managed off-site environment. Besides, site work comprising usually of site development and foundation work only, can progress simultaneously with off-site module making work. This too results in substantial saving of time. A well planned & managed modular approach can squeeze the time schedule to as much as half of that of an in situ construction work for a similar project.

\* Modular construction method requires lesser manpower as compared to conventional on-site construction methods. This, coupled with the reduction of time schedule of a project, leads to reduction in cost and better ROI.

\* Another very important aspect of modular construction technique is that structures of both permanent as well as temporary types can be built with equal ease. While the permanent ones are on a par with any other similar structure built using other methods, the temporary or relocatable buildings can be moved to other locations and reused with ease as and when required. This is an unique advantage and can be of immense benefit in certain situation such as temporary accommodation & office facilities in

industrial and mining projects, retail outlets along roadsides that might have to be removed during road expansion work or for other commercial reasons and so forth. This can save substantial amount of time and money.

\* Modules built in off-site facilities can meet all the architectural and technical requirements as any on-site construction work. Additionally, they are often fortified to render them capable of withstanding transportation & handling related stresses. Stronger products are the end results.

\* Since, most of the construction work is performed in a well controlled off-site environment, better control over quality is possible resulting in products of higher standard.

\* Since, most of the construction work is performed in well controlled off-site facilities, unforeseen events like flood, rain, storm, extreme hot or cold climate, etc have little or no impact on the overall schedule.

\* Considerably lesser wastage of construction materials is possible through proper optimisation of procurement & usage.

\* The requirements of vehicles and equipment at site get reduced considerably.

\* Since, on-site activities are kept to the bare minimum, impacts of a modular project on the surrounding environment such as noise & dust pollution, traffic obstruction, etc are minimal.

\* Modular construction method is excellent for projects involving repetitive construction work, ie construction of multiple structures of similar type. Examples are identical apartment blocks, retail outlets, educational buildings, sector specific office buildings, etc. Since, multiple modules of similar size, shape and design can be built in the factory without many changes to the arrangements, it becomes even more convenient and economic.

\* Can be an excellent option for providing quick and economic accommodation facilities in disaster-struck or even in disaster-prone areas. Such situation often calls for promptly available temporary facilities until better means are available. Once permanent facilities are built or restored, the temporary modular structures can be relocated and reused somewhere else. Thus, the entire process becomes quite effective and economic.

\* As already mentioned, modular approach of construction ensures lesser amount of time, work and labours at site which in turn results in higher degree of safety.

\* Plenty of flexibility is available regarding to what extent a structure or a project would be modularised. Depending on specific conditions one has sufficient leeway to decide whether the entire structure or only a portion of it would be modularised in order to get the best results.

Disadvantages of the modular construction system are few and lie primarily in the choice of the construction technique for a particular project itself. That is, the decision on whether to go for modular approach or not needs to be made carefully and at a very early stage. Otherwise, the cons may outweigh the pros.

The challenges and the intricacies involving transport logistics is another area calling for proper knowledge and planning as the same can be substantially different from those involving conventional building methods. Shortcomings in this aspect can cause considerable damage to the overall schedule of a project.

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