Construction Technologies for Speedy Delivery of Projects



C. A. Prasad, President PSI & Director, Metey Engineering & Consultancy, Hyderabad, discusses the various new construction technologies being adopted by developers and builders in India, and their merits and demerits.



Developers and builders are searching for alternative construction technologies to speed up the work and make timely deliveries to customers. The conventional construction method is labour intensive, uses heavy formwork, is time consuming for shuttering and de-shuttering, and providing accommodation to the labourers at site is also a problem.

Time-saving construction has been happening through advancements in formworks like slip and jump, concrete pumping, lifting technology, and various other plants and machineries used in construction, along with a focus on safety.

Types of construction technologies Modern and Time-Saving

- Shear wall / monolithic construction using aluminum shuttering
- Insulated wall panel construction using shotcreting
- Light gauge steel or cold formed steel construction
- Precast/Prefabricated construction using concrete/steel
- Composite construction

Shear wall / monolithic construction using aluminum shuttering

In this system, the elements like walls, beams and slabs made of RCC are cast together at one go by using aluminum formwork. Panels of 2'(0.6m) wide X 10'(3m), floor height are connected together with connectors.

Advantages: A faster speed of construction can be achieved due to the light weight of the forms, and less labour is required for carrying and erecting the formwork. The quality of finish achieved is good and painting can be done directly without plaster.

The formwork components are durable and can be used for 100 repetitions. 5 to 7 days cycle is easily achieved in most of the construction and the completion time of the project is dramatically reduced.

Disadvantages: Initial investment on formwork is higher at Rs.9,000 to Rs 10,000/sqm. Though 50 repetitions are easy to achieve but thereafter maintenance and correctness of the form is required so that the formwork can undertake another 50 jobs. The number of sets of the formwork are decided based on the completion time of construction and the repetitions to be achieved.

Massive construction has been taken up under the PMAY scheme by state governments across India. In Andhra Pradesh, the monolithic construction system is being used. The Telangana state has adopted all types of new construction systems such as the monolithic, precast, and the tunnel form.

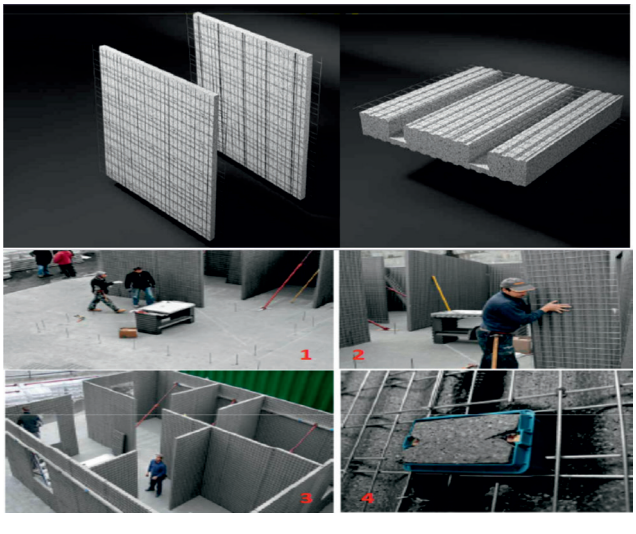


EWS housing construction in AP using monolithic type of construction with aluminum formwork.

Insulated wall panel construction using shotcreting

This system is conceived with insulated walls and roof panels of corrugated extruded polystyrene (EPS), which consists of zinc coated square mesh on either side and connected by shear connectors. The panels are applied with concrete through shotcreting machines.

Advantages: Lightweight, seismic resistant, sound, and thermal resistant. EPS reduce air conditioning loads also. Shotcreting is in situ work and needs to be closely monitored.





Light gauge steel or cold formed steel construction

In lightweight cold formed steel sections for speedy low rise building construction, the gauge thickness is from 0.7 to 2.0 mm. These can be used in industrial townships, residential and commercial buildings, hospitals, schools etc. The external and internal walls are to be covered with plaster boards, duly putting the rock wool in between them for the thermal insulation.



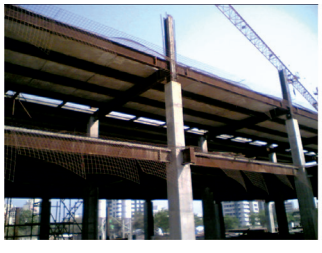
Merits: Lightweight, seismic resistance, thermal and acoustic insulation, reduced air conditioning load due to rock wool insulation inside.

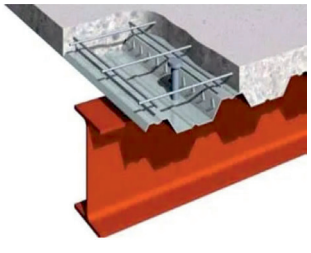
Demerits: Spacing of studs and joists will affect the internal and external planning of structure. Plaster boards are required to be fire resistant and should be durable enough to withstand the external environment. The cost is high compared to conventional systems.

Composite construction

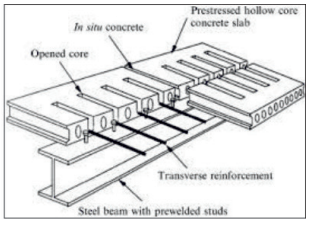
This method uses structural steel columns and beams with deck slab + concrete or In situ concrete with shuttering. Steel columns can be encased for additional strength. The deck slab is predominantly used as a floor element; Precast hollow core slabs are also being used as floor elements.

Merits: Very fast construction; concrete encasement makes the steel fire resistant, highly durable, and protects it from corrosion.



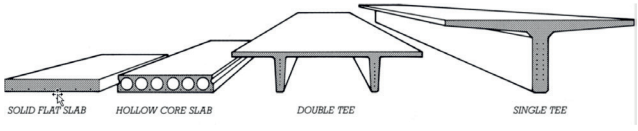




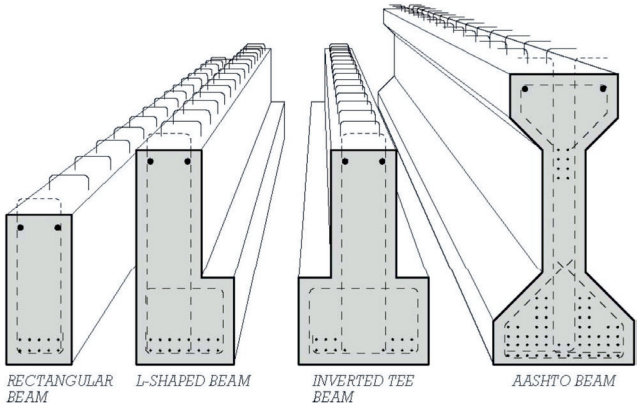


Prefabricated construction using precast concrete and structural steel

In precast, since production happens in a factory under controlled QA/QC conditions, one can work in all kinds of weather, the quality, finish and accuracy is better, less labour is required, and there is less wastage of materials.



Precast floor elements



Precast Beams and girders



Precast walls in stacked position



Precast walls in erection



Precast Hollow core slabs erection

The cost and viability depend on volumes; cost is less when the elements required are more. Faster cycle time is achievable as one works both offsite and at site. There is standardisation in design, engineering, and execution. Logistics (production, handling and erection) requires good urban infrastructure.



Two to three story Precast columns cast and erected at once leaving junctions open for beam reinforcement to join at the junction for cast insitu operation





Precast Stairs



Some of the Precast structures built in India are as follows:



Process R& D Center



A structure under construction in NCR



Precast structure after completion



11 story Residential Precast wall construction at Dundigal, Hyderabad

Conclusion

Departing from conventional method of construction, new techniques are being adopted depending on the suitability at the location, and for speedy and more cost-effective execution of projects by developers and builders.

Monolithic construction is currently popular with developers. Entrepreneurs are setting up precast industries; about 50 precast companies have come up so far, including a few that have been set up by developers. They include names like Brigade, Sobha Developers, Janapriya, Aurobindo Realty & Infrastructure, My Home, Bharat City, Supertech, etc.

Composite construction using precast elements is also being adopted. JSPL in Angul, Orissa, has used LGS construction for building a 4-storey residence for their staff. The LGS method will become popular once its cost of construction comes down.