



## **Prefabrication in Developing Countries: A Comparative Study in India**

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### **ABSTRACT**

Prefabrication is a growing industry used to describe products manufactured in a factory and then transported to the job site. Work on this manuscript began with a review of general materials to introduce construction methods for prefabricated structures. Prefabricated systems differ in materials, methods, configurations, etc. In this article, prefabricated systems are divided according to their configuration. The construction and assembly of buildings using prefabricated house frames has many advantages, but also some limitations. The purpose of the prefab system is to at least provide a means to obtain a well-designed home that fits the needs of its inhabitants. Arguably, prefabrication systems in building construction have the greatest impact in reducing time and cost.

Keywords: Prefabrication, Prefabricated Housing, Concrete, Pre-Cast, Panels

### **1. Introduction**

#### ***1.1 General***

Prefabrication is a construction method that includes the assembly of the parts constituting the structure at the manufacturing site or production site and the transportation of the finished or semi-finished parts to the place where the structure will be located. It combines robust design with modern high-performance equipment and high-quality manufacturing processes.

#### ***1.2 Importance***

The prefabricated house is made with light steel framed sandwich panels as the building shell material, as the model module of the new concept prefabricated house space series composite components, with bolt connection and round protection business activities. No country wants to fall behind other countries in this global competition. Ability - to support the completion of important tasks. Factory-made items (many modern buildings require special tools that cannot be economically moved from one job site to another). Construction time is shorter - less than half of conventional casting in situ.

#### ***1.3 Prefabricated Components:***

##### **1.3.1 Vertical Components:**

1. Column
2. Shear wall

##### **1.3.2 Horizontal Components:**

1. Beams
2. Slabs

#### ***1.4 Aims of Prefabrication***

- Faster construction time.
- Low labour costs
- Allows annual construction.
- Better comply with building codes, standards and accreditations.
- Provides less waste from construction sites.

- Provide worker safety and comfort more than on-site construction.
- Better construction.
- Ideal for simple and complex models.

### **1.5 Advantages of Prefabrication**

1. Self-supporting products are adopted, which greatly reduces the cost of formwork, formwork and scaffolding.
2. Construction time is shorter, buildings are completed faster and the investment is amortized sooner.
3. Quality control in an assembly plant environment is easier than in a construction environment.
4. Prefabrication can occur where labor is easier and costs for labor, electricity, materials, space and overhead are lower.
5. Reduce time spent on construction sites in bad weather or hazardous environments.

### **1.6 Disadvantages of Prefabrication:**

1. Prefabricated elements such as concrete panels or metal and glass panels should be handled with care.
2. In order not to fail the connection of prefabricated profiles, attention should be paid to their strength and corrosion resistance.
3. Likewise, water leaks can create joints in pre-assembled assemblies.
4. Shipping bulky prefabricated parts can be more costly than the materials from which they are made and can often be better packaged.
5. Large prefabricated sections must have heavy cranes and the correct dimensions and rods to put them in place.

### **1.7 Properties:**

1. Lightweight: Siporex has a dry kiln density of 400 to 650kg/m, ideal for low-capacity soils, seismic areas and additions to existing buildings.
2. High insulation: K value 0.122 kcal/hour./ m c It is used as insulation material in boilers and heat exchangers.
3. Fireproof and fireproof: it gives twice the fire resistance of concrete. Suitable for fire protection of firewalls and structural steel Siporex roof panels, wall panels, load bearing blocks.
- 4 High strength-to-weight ratio: 22 for Siporex 18 and 16 for M-150 grade concrete.

## **3. Methodology**

### **3.1 Production Process of Prefabricated concrete:**

#### **3.2.1 Production:**

The ALC (Autoclaved lightweight concrete) is available in the form of blocks, floor and roof slabs and wall panels for all type of buildings especially multi storey buildings.

#### **3.2.2 Procedure:**

- 1) If it is a block, the concrete is poured directly into the mold, if it is a plate, first the metal rods are placed in the mold and then the concrete is poured.
- 2) While the stone is partially poured into the mold, the other stone is partially poured into the mold, but after 10-15 minutes, the volume of the stone increases due to foaming or reaction and the mold is packed. aside.
- 3) After pouring the mixture into the mold, leave it for 5-6 hours because the cuts need a softness. The mixture should not be too hard or too soft. Therefore, use the measure button to measure sales.
- 4) Ball test: In this test, after 56 hours, small balls are placed into the mixture from a fixed height. As a result of their disappearance, an idea is formed in the mixture in the mold. Then measure the diameter of the reflection. Diameter should be 20mm + 2mm. If this is the diameter, the mixture is prepared to the desired softness and can be cut into blocks or plates.
- 5) Venting behind the measuring ball to drain excess heat from the water through the mix. With the help of rods, aeration is made in the mixture.
- 6) Ventilation holes should be opened in blocks, and reinforcement (vertical) should be removed in floors.
- 7) The molds are taken to the cutting machine from where they are with an overhead carrying mold and put into the cutting machine.

### **3.2 Milling Process**

1. In this process, a milling machine is used to create a tongue and groove on the sheet. These grooves are used to properly join floors with tenon joints in flooring and roofing.
2. After milling, bend the plate for a while as designed to control the deflection.

3. Finally, the plates are packed and combined in the desired order and the arrows showing the direction of the central reinforcement are embossed on the plates.
4. Move slabs or blocks from one point or use other cranes.
5. Lift tiles or blocks at one point or use other cranes.

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## **4. Result and Application**

### **4.1 Results:**

#### **4.1.1 Studies on Benefits:**

1. Reduce cost and time: Cost and time are major concerns for customers and contractors in the construction industry. Prefabricated construction technology reduces costs and time compared to traditional construction. While the school preparation phase and the module construction phase are carried out simultaneously in a prefabricated building, the construction phase comes after the site preparation phase in conventional buildings. The construction phase is carried out at the same time as the prefabricated house, reducing the construction time by approximately 40% compared to traditional construction. However, pre-planning for a prefabricated house is quite difficult as its design is different from the design.
2. Other benefits: Traditional constructions have safety issues such as high pressure operation, congestion, bad weather and working environment, but this problem has been reduced from 80% to 85% compared to most prefabricated houses. construction projects, Now About 80% occur in the workplace. These models in the factory are provided with the same product, by repeating the processes and mostly by automation. Prefabricated building systems also have the environmental benefit of reducing waste.

### **4.2 Application**

#### **4.2.1 Masonry with Siporex Blocks:**

- Portland cement 1:6 cement mortar should be used.
- Blocks should be placed according to 240mm wall height.
- There is no need to wet the Siporex blocks before using them on the wall.
- In loadbearing walls, the height of the unsupported Siporex walls should not exceed 18 times the wall thickness, and 24 times the wall thickness horizontally.
- For partition walls or non-bearing walls, the length and height should not exceed 30 times the wall thickness.
- Finishing works on Siporex blocks should be done with appropriate tools in order not to damage the block and to prevent cracking of the plaster.

#### **4.2.2 Internal and External Plaster:**

Siporex walls should be plastered out in 2 coats with cement mortar.

1. Internal Plaster:- first coat 4 to 6 mm thick.
2. External Plaster:- first coat 8 to 10 mm thick and second coat 10 mm thick.

#### **4.2.3 Painting:**

1. Internal Painting:- for unflustered walls berating paints such as acrylic emulsion can be applied.
2. External Painting:- better moisture protection is obtained with all cement paints by application with a stiff brush rather than by spraying.

#### **4.2.4 Fixtures in Siporex:**

For fixing various fixtures like door and window frames, wash basins, electrical fittings, cupboards, handrails, and hot and cold-water pipes etc. to Siporex walls, wire nails should not be used as they have low holding power, use of aluminium nails is recommended.

#### **4.2.5 Merits:**

1. It is a good idea for large constructions.

2. India is a developed country with many types of prefabricated parts. The last 50 years have seen major infrastructure developments, but in the last 15 years the world has turned to India for new technologies.
3. Good for work and fast work. For the eggs. The metro in Delhi is a miracle that the whole world is looking forward to in India.
4. The pre-engineered, pre-stressed tunneling technique used by the drilling rig is safe and spectacular.

#### **4.2.6 De-Merits:**

1. Work and art cannot be done in prefabricated houses.
2. According to the new technology, people are not creative enough to create art.
3. As soon as the tradesmen start this business, the price goes up.
4. Not popular anywhere anymore.

#### **4.3 Construction Techniques:**

1. Identical modules: The floor and ceiling of the skyscraper are built in sections, each measuring 15.6 x 3.9 meters and 45 cm deep.
2. Pre-Assembled Fixtures: Plumbing and plumbing on every floor from the factory. Upholstery is also pre-assembled according to the customer's choice.
3. Standardized truck: Each truck transports two modules to the job site with the necessary items, bolts, tools, and other equipment to be placed on top each other.
4. Timely assembly: each section is lifted by crane directly to the top of the building. Workers use the modules' equipment to quickly connect pipes and wires.
5. Indented Column: Broad's design passes seismic tests at a magnitude of 9.0.

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## **5. Conclusion**

### **5.1 General**

Goals can be achieved by modifying traditional home planning and working methods according to specific and personal needs and combining a number based on research, public demand, and use of goods and resources. There is no single method and solution to meet the needs of the wider community. However, it is ideal and desirable to have a system that gives people choice, along with the tools necessary to meet the situation. The point here is not necessarily a specific building type or design, but a systematic approach to architectural methodology. Mass adoption of alternative technologies requires guaranteed work and a job cannot be created if the product is efficient and economical.

Semiprefabrication is one way of doing this in a controlled way. Compared to other technologies, the transformation of prefabrication technology is not easy because it is a technology or knowledgebased technology rather than using technology or equipmentbased technology. Precast technology changes are rarely associated with manufacturing architects, but we are the custodians of the AEC industry culture.

### **5.2 Future scope**

Prefabricated buildings will be an important part of the 'Digital India' mission and will play an important role in all infrastructure projects. "From 'build brick by brick' to 'build before you build', transformative technologies largely driven by prefabrication are now beginning to blur the lines between construction and manufacturing in India. India is poised to become the world's third largest economy by manufacturing, in the last twenty years. The year confirmed the fact that India has always taken the lead in promoting innovation and technology in a single industry or business, from supercomputer to space, Palma to Biotech Real Estate - the future of manufacturing (smoked).

Continuing the wave of prefabs and growing at a 78% YBBO, the Indian construction industry stands at the beginning of a great opportunity to move to Fumet, with prefabricated or modular construction still important.

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