Module–02

Prefabricated/Manufactured Building Components

Definition:- A prefabricated building is a building that is manufactured and constructed using prefabrication. It consists of factory-made components or units that are transported and assembled on-site to form the complete building.

Advantages:-

- Less waste may occur.
- Constructiontimeisreducedandbuildingsarecompletedsooner,allowinganearlierreturn of the capital invested.
- Qualitycontrolcanbeeasierinafactoryassemblylinesettingthanaconstructionsite setting.
- Saving in cost, material, time& manpower.
- Shuttering and scaffolding is not necessary.
- Components produced at close supervision. So quality is good.
- Very thin sections can be entirely precast with precision.

Disadvantages:-

- Careful handling of prefabricated components such as concrete panels (or) steel and glass panels.
- Similarly leaks can format joints in prefabricated components.
- Attentionhastobepaidtothestrengthandcorrosionresistanceofthejoiningof prefabricated sections to avoid failure of the joint.
- Transportation costs may be higher for voluminous prefabricated sections.
- Large prefabricated structures require heavy duty cranes and precision measurement and handling to place in position.

- Local jobs are lost.

Types of Precast Components in a Building:-

The important components of prefabrication consist of

i. Roofing or flooring
ii. Slab
iii. Joist
iv. Beams
v. Wall panels
vi. Columns

i. Roofing or flooring

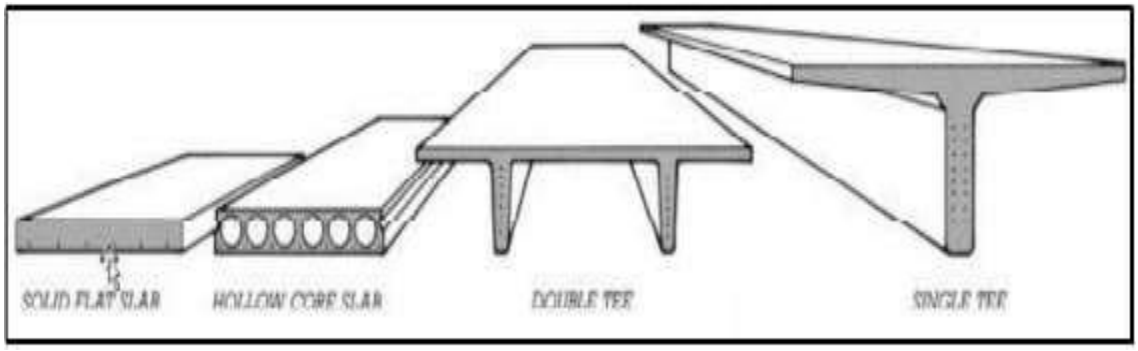
- Roofing involves reinforced concrete planks (Flats) and joists (Beam or Truss).
- These structural components are fabricated with standard size under controlled condition and it is attached with reinforced cement concrete joist which are provided at regular routine interval.
- Loadsactingonthefloorsandroofsaretransferredtothereinforcedcementjoistsandthen it is moved to the main beams.
- Main beams consist of channel sections with 10cm projections on each side with regular interval of spacing.
- RCC joists are connected with the channel sections by using bolts.
- Foundation part is the only section which is fabricated in the construction site.

ii. Slab

- Flooring or roofing slab consists of planks and it is supported by using reinforced cement concrete joist.
- Width and length of the prefabricated slab ranges from 0.5m and 5m.

Classification of component is based on size and weight of prefabrication.

- Hollow core sections.
- Double tee section\Channel sections.
- Lightweight concrete roofing slab.
- Solid rectangular planks.

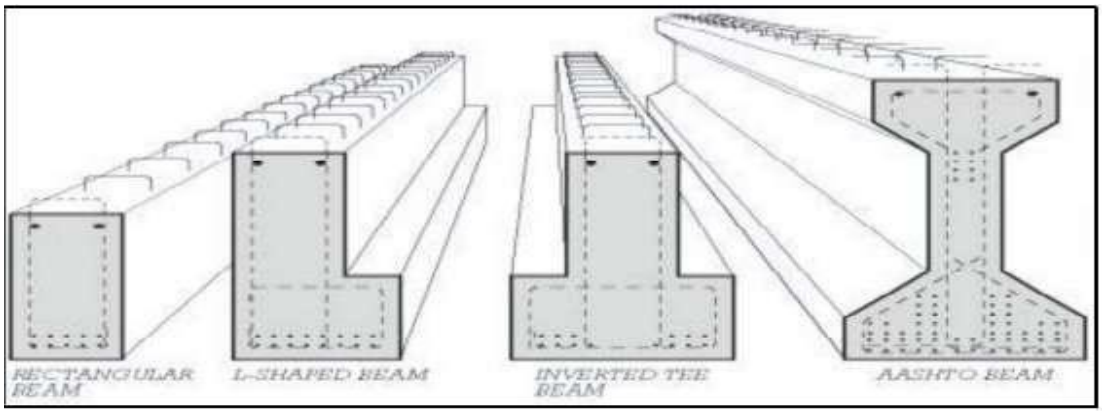


iii. Joist

- Joists are commonly acted as a beam which is used to carry the loads acting on the planks and it is transferred to the main beam by using channel sections.

iv. Beams

- Size of main and secondary beams are 300mmx300mm with different reinforcement are given at distinct condition
- Beams are fabricated for transparent distance between the columns.
- A square hole of 10cmx10cm size and 10cm depth is provided at either side of the beam for connecting beam or column reinforcement through welding.



v. Wall

- Wallpanelsaremanufacturedwithallnecessaryprovisionalfittingsuchasdoors,windows, frames, ventilators and so on.
- Wall panels are generally non-load bearing member.

vi. Columns

- Columns are fabricated with necessary grooves provided on each side to achieve strength and stability of the structure.

❖ Need of prefabrication

1. To decrease the labor requirement of construction.
2. To improve the quality of construction with low cost.
3. To enhance speedy construction because there is no need of curing
4. To enhance speedy construction because there is no need of curing period.
5. To improve the performance of the structure with less requirement of maintenance.
6. To decrease the consumption of money ,time ,wages and material.
7. To provide better aesthetic or attractive finish of the building structures.

❖ MODULAR COORDINATION

Definition.-Modular coordination is a concept of dimension and space, in which buildings Components are dimensioned and positioned in a term of basic unit or module.

The standard specifies that the module basic M =100mm as the basic unit to be used in a square of M.

Aims of Modular Coordination

- To reduce the variety of component size produced.
- The use of standard size of building blocks in the design of the building.
- To simplify the building design and preparation of building drawings.
- To determine the size and position of each component in relation to each component and the building as a whole.
- To optimize the standard sizes of building components.

Benefits of Modular Coordination (M.C.)

1. Better coordination and cooperation between various parties in the construction.
2. Reduction in design time, especially with the use of standard details and dimensional coordination.
3. Benefits through compute raided design and drafting.
4. Reduction in manufacturing and installation cost.
5. Reduction in wastage of materials, time and manpower in cutting and trimming on site.
6. Improved balance between quality and cost.

❖ **Standardization in prefabrication**

Standardization is to use of guidelines for the production of uniform interchangeable components especially for use in mass production.

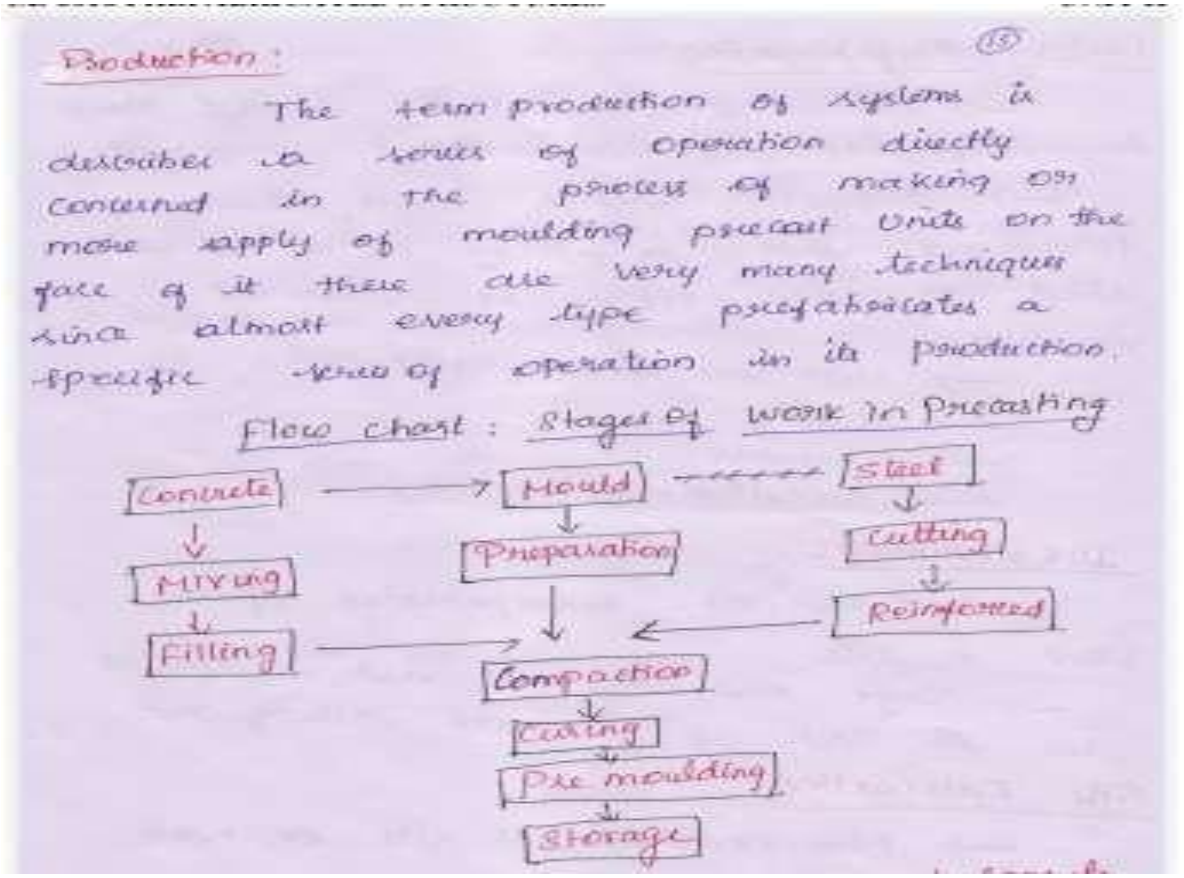
Advantages of standardization:-

- Easier in design in accordance to guidelines so that complexity is reduced.
- Easier to manufacture since the number of variants are limited.
- Makes repeated use of specialized equipment in erection and completion.
- Speed and easier construction.

Factors influencing standardization

1. To limit number of types of elements and use the min large quantities.
2. To use large size of panels so that the number of joints is reduced.
3. To limit the size and weight of prefabricate so that it can be handled easily.
4. To use the prefabricate weight almost same as lifting capacity of the equipment.

❖ Production of precast fabrication



Process involved in Manufacture of Prefabricated Structure

The various processes involved in the manufacture of precast elements may be classified as

Main Process:

→ Providing and assembling the moulds, placing reinforcement cage in position for reinforced concrete work, and stressing the wires in the case of prestressed elements.

→ Fixing the wires and tubes, where necessary.

→ Pouring the concrete

→ Vibrating the concrete into the moulds

→ Demoulding the forms and stacking the precast products

→ Curing (Steam curing if necessary)

❖ **Transportation of precast fabrication**

Transportation:

⇒ It must be carried out with extreme care to avoid any jerk and distress in elements and handled / transported as far as possible in the same orientation as it is to be placed in final position.

⇒ It should be properly planned and conformity with traffic rules and regulation as authorities.

⇒ The size of the element decide mode of/ size of transport vechicle.

⇒ Avoid excessive cantilever projection while transport.

⇒ Special cases in sharp bend curves/ uneven roads which leads undesirable stresses

⇒ Before loading, proper base packing materials, proper location, packing must be kept strictly one over the other.

Delivery:

⇒ Delivery of precast elements should

planned according to the general erection sequence to minimize unnecessary site storage and handling.

=> precast elements should be loaded and delivered with proper supports, frames, cushioning and tie-downs to prevent damage during transports.

❖ **Systems of precast fabrication**

Small Prefabrication:

Small, medium & large prefabrication systems are mainly classified according to their degree of precast elements using in that construction.

For eg:- brick is a small unit precasted and used in buildings. This is called as small prefabrication.

That the degree of precast element is very low.

Medium Prefabrication

Suppose the roofing systems and horizontal members are provided with precast elements. These constructions are known as medium prefabricated construction.

Here the degree of precast elements are moderate

Large Prefabrication System:-

In large prefabrication system most of the members like wall panels, roofing/flooring systems, beams and columns are prefabricated.

One of the main factor which affects the factory prefabrication is transport. Suppose the factory is situated far away from the construction site and the vechicle needs to cross congested traffic areas with heavy weighing elements the Cast insite prefabrication is preferred.

Cast ... of prefabrication

Open system of prefabrication

In the total prefabrication systems, the space frames are casted as a single unit and erected at the site. This wall fitting and fixing or done on site.

Closed system:-

In this system, the whole things are casted with fixing and erected on their position.

❖ Installment of precast fabrication

1. Check for site accessibility for the delivery of precast elements.
2. Check delivery check list for correct type ,quantity and panel identification.
3. Checkforadequatecranecapacityandworkingclearanceforliftingofprecastconcrete elements.
4. Conduct sample measurement to confirm on the accuracy of the critical dimensions of precast concrete elements and openings.
5. Conduct visual inspection on concrete finishes and check for any major defects.

6. Adjust the panel to position and secure it with diagonal temporary support.
7. For vertical precast component, check the position and alignment of the all elements before the installation.
8. Check the stability of the construction before removing the temporary support.
9. Check that the joint width between panels are with in design allowance.
10. Check that all horizontal joints are properly sealed.

Prepared by – Asst. Prof Channa Reddy