

UNIT I –INTRODUCTION

1. Define Prefabrication.

Prefabrication is defined as the practice of assembling components of a structure in a factory or other manufacturing site and transporting complete assemblies or sub-assemblies to the construction site where the structure is to be located.

2. What do you mean by the term prefab or prefabricates?

The term prefab or prefabricates refers to the prefabricated members. In general prefabrication means that the structure is disunited into members and is precast either in the factories or at the site depending upon the requirements and the type of prefabricated panel system.

3. What is the need for prefabrication?

Due to industrialization and development there is a great need for buildings to cope with the growth. The traditional construction method is time consuming and needs costly form work which needs to be assembled at the site for concreting of the elements.

It is found that for large buildings the cost of shuttering and scaffolding is about 60% of the total cost and hence the solution to this problem is prefabrication of the structures.

4. What is the principle of prefabrication?

The prefabrication procedure is based on the principle that when the method finds application particularly where the structure is composed of repeating units or forms or where multiple copies of the same basic structure are being constructed.

The theory behind the method is that time and cost is saved if similar construction tasks can be grouped and assembly line techniques can be employed in prefabrication at a location where skilled labour is available while congestion at the assembly site, which waste the time, can be reduced.

5. What are the materials and admixtures used in prefabricated structures?

Materials	Admixtures
<ul style="list-style-type: none">• Concrete, steel, timber, Aluminum, Fibreglass, composites• Light weight and cellular concrete.• Ceramic products.• Gravel, slag, mortar, cement, water.	<ul style="list-style-type: none">• Water reducer,• air entrainer,• set accelerater,• corrosion inhibitors,• colouring admixtures.

6. Define modular co-ordination

Modular coordination is defined as a concept for co-ordinating dimensions and space for which building and components are dimensionally used and positioned in basic units or modules. The standard specify that the module basic M-100mm. as the basic unit be used in a square of M.

7. What is meant by standardization? Give its uses?

The prefabricated product and prefabricated process must be standardized and it can be achieved by unification and combination. The standardization of prefabricates may be on a national scale comprising the whole country and the authorities should publish catalogues of standard prefabricates and standard housing units or even the whole buildings.

Uses:

- It is found useful in the design of co-ordinated set of buildings or development of a housing unit, industrial estate etc. by standardized constructional conception with particular architecture.
- It also provide great help in design work, planning, production and erecting of prefabricates.

8. What are the advantages and dis advantages of standardization?

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easier in design as it eliminates unnecessary choices. • Easier in manufacture as there is limitation of variants. • Makes repeated use of specialized equipments in erection and completion easier and quicker. 	<ul style="list-style-type: none"> • Since the joints are at corners that are at places where the moments reach their maximum values, the forming of joints is difficult. • The forming of insitu joints is very difficult, hence the joints must be over dimensioned. • No of joints are reduced and if larger precast members are needed.

9. Write the systems of prefabrication?

S.No	Classification	Prefabricated Systems
1	<i>Conceptual dimension</i>	<ul style="list-style-type: none"> • <i>Open system</i>-partially open & fully open system. • <i>Closed or Mekano System</i>
2	<i>Practical Dimension</i>	<ul style="list-style-type: none"> • <i>Skeleton system</i> Structural elements like slabs, beams and columns & Frame systems. • <i>Panel system</i> Small panel system and Large panel system Wall panel system -Cross wall & longitudinal wall system Floor panel system • <i>Frame systems</i>- H-Frames, T-Frame and other frame types • <i>Cellular system</i>-Box type system • <i>Combined system</i>

10. What are types of prefabrication?*Light weight panel system of prefabrication*

In light weight panel system the panels can be installed or erected without lifting equipments.

Heavy panel system of prefabrication

In heavy weight panel system, the panels are lifted using equipment.

11. How do you classify the panel system?

S.No	Classification	Panel category
1	Size	Small panel- panels are less than 2 m ² Large panel- panels are greater than 2 m ²
2	Weight	Light weight panel , Heavy weight panel
3	Materials	Wooden panels ,Metal panels ,Plastic panels, Combined panel

12. What are the advantages and disadvantages of prefabrication?

S.No	Advantages	Disadvantages
1	Self-supporting ready-made components are used, so the need for formwork, shuttering and scaffolding is greatly reduced.	Progressive collapse may occur if not constructed properly.
2	It gains significant advantage in construction time, safety, environmental impact and overall cost of construction.	Needs more costly machinery especially in the plant prefabrications.
3	On site construction and congestion is minimized	Improper joints leads to poor performance during earthquake prone areas
4	Quality control can be easier in a factory assembly line setting than a construction site setting.	In prefab plant preparation, for the production of new members involves additional cost. Similarly transportation costs higher for voluminous prefab units than for the materials of which they made, which can often be packed more efficiently.
5	Allows for lighter, slender structures giving a better space effect and aesthetic appearance.	The large panel units requires heavy duty cranes and precision measurements and handling to place in position.
6	Prefabricated steel sections reduces the on-site cutting and welding cost as well as the associated hazards.	Careful handling of components like concrete panels, steel, glass panels are required. Similary leaks can form at joints in prefab components.

13. Discuss the merits and demerits of prefabricated structures.

Merits	Demerits
<ul style="list-style-type: none"> • Saving in cost, material, time & manpower. • Shuttering and scaffolding is not necessary. • Installation of building services and finishes can be done immediately. • Independent of weather condition. • Components produced at close supervision .so quality is good • Clean and dry work at site. • Possibility of alterations and reuse • Correct shape and dimensions and sharp edges are maintained. • Very thin sections can be entirely precast with precision. 	<ul style="list-style-type: none"> • Handling and transportation may cause breakages of members during the transit and extra provision is to be made. • Difficulty in connecting precast units so as to produce same effect as monolithic. This leads to non-monolithic construction. • They are to be exactly placed in position, otherwise the loads coming on them are likely to get changed and the member may be affected. • High transport cost • Need of erection equipment • Skilled labour and supervision is required.

14. What are the applications of Prefabrication in precast concrete?

Areas of Applications	Prefabricated Units
i. Repeated apartment buildings	i. Building blocks, stair cases and floor panels,
ii. Housing units	lintel beams, beams, columns, frames
iii. Ware house	ii. Wall panels, modular kitchen
iv. Industrial buildings	iii. Manhole covers
v. Offshore structures	iv. Thin shells and folded concrete plates
vi. Diaphragmwall constructions	v. Prestressed precast concrete members
vii. Aircraft and space craft	vi. Pipes and tanks
viii. Radio towers	vii. Wings and fuselage sections
ix. Foot over Bridges, road bridges	viii. Poles, sleepers, pavement
x. Tubular structures	ix. Beams , slab decks and girders
xi. Security cabins	
xii. Bus stands	
xiii. Sheds and steel roof shelter	

15. Mention the types of production techniques?

i. Moulds	v. Floor units
ii. Connections	vi. Stair units
iii. Columns	vii. Wall panels
iv. Beams	

16. What are the basics of industrial production?

i. Division of work	iv. Standardization
ii. Repetition	v. Mechanization
iii. Specialization	vi. Scientific management

17. Define pigments

A pigment is a material that changes the color of reflected or transmitted light as the result of wavelength selective absorption. This physical process differs from fluorescence, phosphorescence and other forms of luminescence, in which a material emits light.

18. Define modular co-ordination

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19. List out the precautions taken while erecting precast elements?

- Check crane access to the site and erection platform to prevent cranes or trucks damaging the concrete floor during access.
- Obtain verification that the erection platform can support the erection loads.
- Ensure the locating dowels and leveling shims are correctly located. Dowels rather than blocks should be used to restrain the base of face lifted panels when they are being positioned.
- Clear the site for truck and crane access ensuring room for crane outriggers, counterweight tail swing, boom swing and under hook and overhead obstructions.

20. What are the types of prefabricated components?

According to IS 15916: 2010, cl.7.3.1. Pg.5 the prefabricated components are as follows

Reinforced / prestressed concrete channel unit

Reinforced / prestressed concrete Slab unit, Concrete beams, columns, hollow core slab,

Waffle slabs/shells, cellular concrete slabs/wall panels, precast lintels, staircase etc.

21. What are factors to be considered for selecting the materials for prefabrication?

- Easy availability
- Light weight for easy handling and transport
- Thermal insulation property
- Easy workability
- Durability
- Non combustibility
- Sound insulation
- Easy assembly and compatibility to form a complete unit
- Economy and any other special requirement in a particular application.

22. What are erection stresses?

For precast prestressed concrete members, the residual prestress at the age of particular operation of handling and erection shall be considered in conjunction with any stresses caused by the handling or erection of member. The compressive stress thus computed shall not exceed 50 percent of the cube strength of the concrete at the time of handling and erection. Tensile stresses up to a limit of 50 percent above those specified in IS 456 shall be permissible. (IS 15916:2010 cl.11.7.2 pg.17.)

23. What is meant by dimensional tolerance?

Dimensional tolerance in the prefabrication of prefabricates means the allowances given for the dimension of the elements. Dimensions and shapes of precast concrete structural members shall comply with tolerances given on the drawings or it can taken as under. *According to IS 15916:2010 Cl.6.2 pg 3.*

(for channels, precast planks, ribbed slabs)

Length

a) ± 5 mm

b) ± 5 mm or ± 0.1 percent whichever is greater

Thickness/cross-sectional dimensions:

- a) ± 3 mm
- b) ± 3 mm or 0.1 percent, whichever is greater

Straightness/bow:

- a) ± 5 mm or $1/750$ of length, whichever is greater
- b) ± 3 mm
- c) ± 2 mm

24. What is meant by offsite prefabrication?

Offsite prefabrication is also called as factory prefabrication in which if the factory is situated at a long distance from the construction site and the vehicle have to cross a congested traffic with heavy weighed elements, in such a case offsite prefabrication is adopted. For small elements the conveyance is easier with normal type lorry and trailers.