FAQ's

1. What do you understand by Reinforced Concrete Structures? Explain different types of Concrete Structures with advantages and disadvantages.

- Pre stressed concrete is a method for overcoming concrete's natural weakness in tension.
- It can be used to produce beams, floors or bridges with a longer span than is practical with ordinary reinforced concrete.

There are two methods of introducing pre stressing to a concrete

- Pre tensioning
- Post tensioning

Materials concrete will shrink whilst curing and it can also suffer sectional losses due to creep when subjected to pressure. The amount of shrinkage and creep likely to occur can be controlled by designing the strength and workability of the concrete.

The essence of pre stressed concrete is that once the initial compression has been applied, the resulting material has the characteristics of high-strength concrete when subject to any subsequent compression forces, and of ductile high-strength steel when subject to tension forces. This can result in improved structural capacity and/or serviceability compared to conventionally reinforced concrete in many situations.

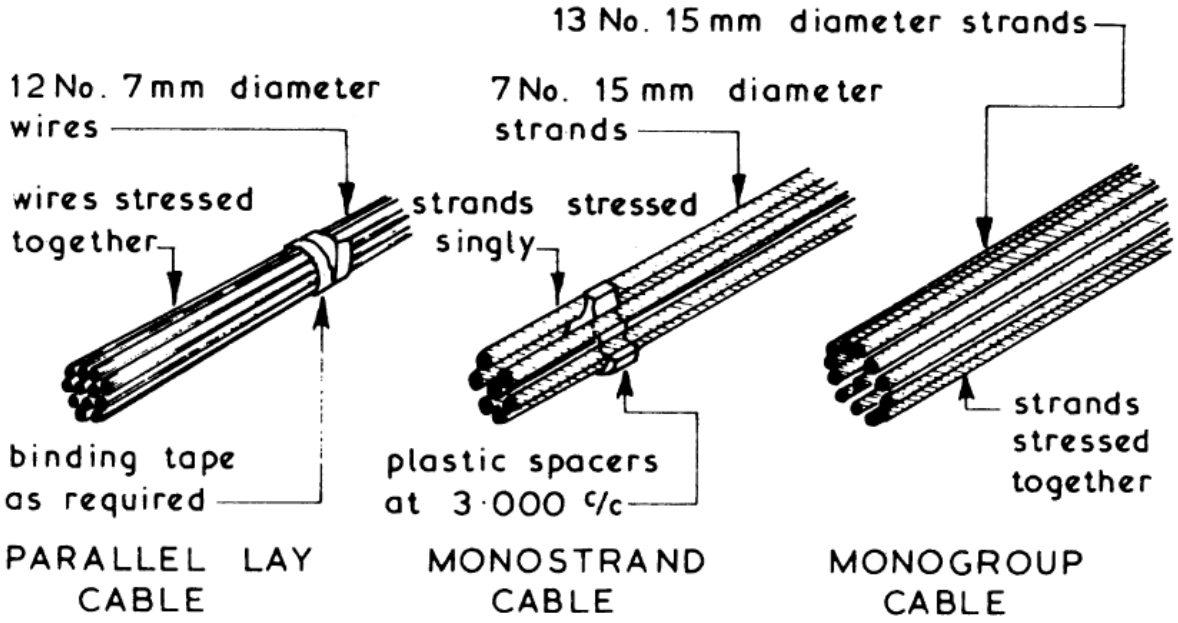
Tendons - these can be of small diameter wires (2 to 7 mm) in a plain round, crimped or indented format, these wires may be individual or grouped to form cables.

The two main advantages of strand are:-

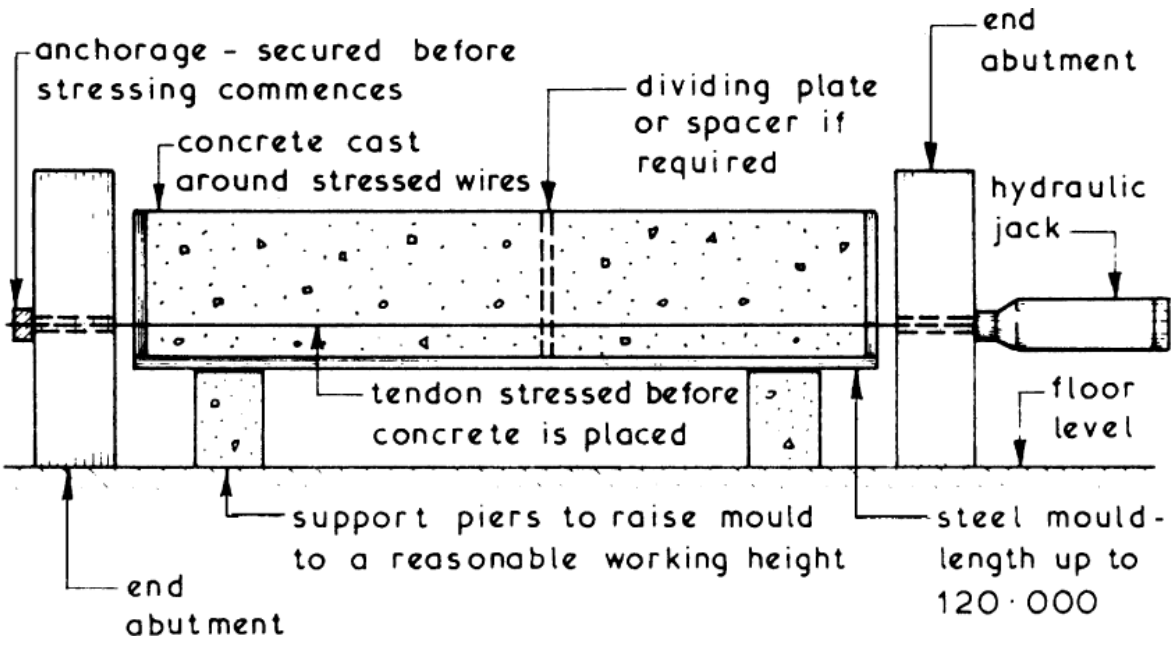
- A large pre stressing force can be provided over a restricted area.

- Strand can be supplied in long flexible lengths capable of being stored on drums thus saving site storage and site fabrication space.

Typical Tendon Formats ~

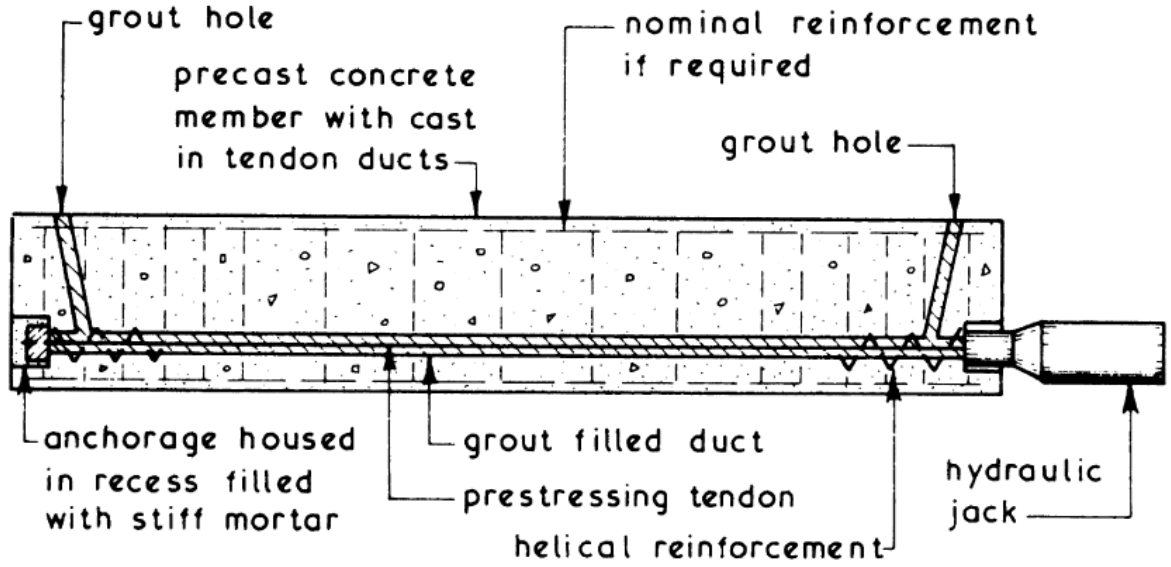


Pre-tensioned concrete is a variant of pre stressed concrete where the tendons are tensioned prior to the concrete being cast. The concrete bonds to the tendons as it cures, following which the end-anchoring of the tendons is released, and the tendon tension forces are transferred to the concrete as compression by static friction.

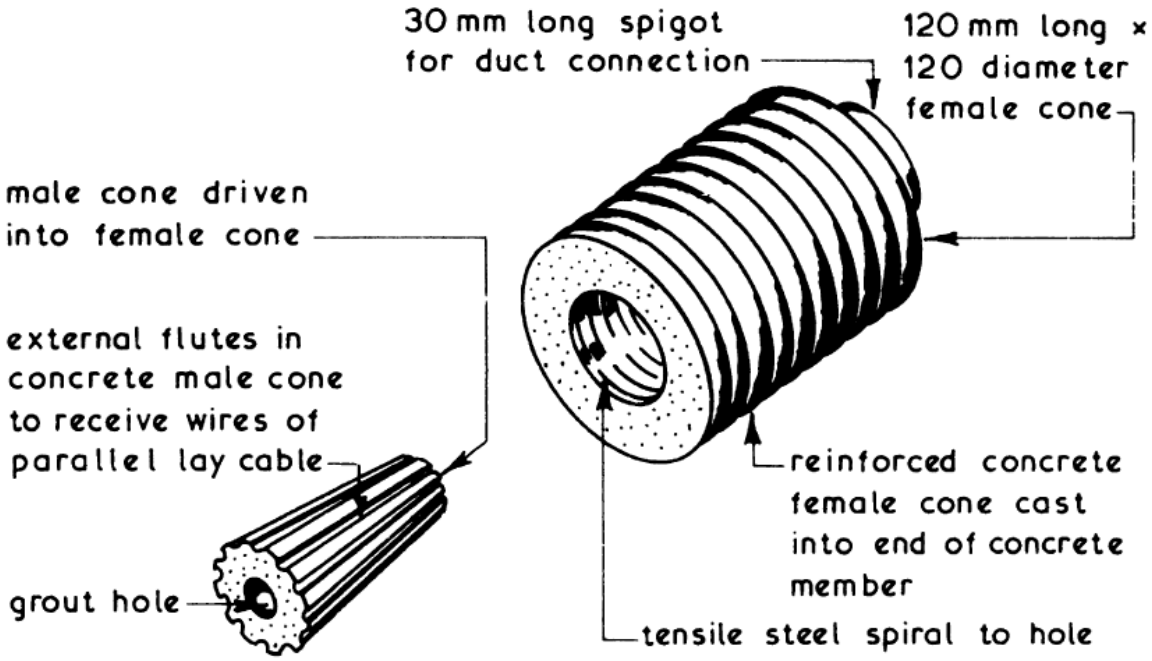


Post-tensioned concrete is a variant of pre stressed concrete where the tendons are tensioned after the surrounding concrete structure has been cast.

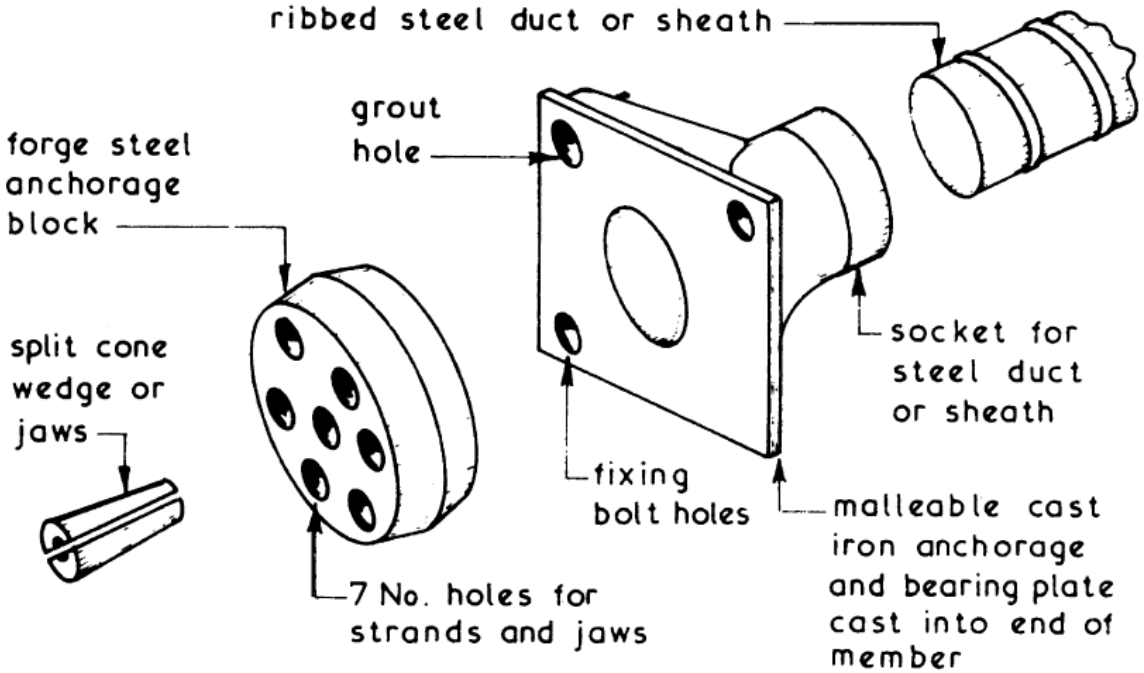
Stressing is carried out after the concrete has cured by means of hydraulic jacks operating from one or both ends of the member.



Typical Anchorage Details ~



FREYSSINET ANCHORAGE



TYPICAL MONOSTRAND ANCHORAGE

Comparison with Reinforced Concrete ~ when comparing prestressed concrete with conventional reinforced concrete the main advantages and disadvantages can be enumerated but in the final analysis each structure and/or component must be decided on its own merit.

Main advantages:-

1. Makes full use of the inherent compressive strength of concrete.
2. Makes full use of the special alloy steels used to form the prestressing tendons.
3. Eliminates tension cracks thus reducing the risk of corrosion of steel components.
4. Reduces shear stresses.
5. For any given span and loading condition a component with a smaller cross section can be used thus giving a reduction in weight.
6. Individual precast concrete units can be joined together to form a composite member.

Main Disadvantages:-

1. High degree of control over materials, design and quality of workmanship is required.
2. Special alloy steels are dearer than most traditional steels used in reinforced concrete.
3. Extra cost of special equipment required to carry out the prestressing activities.
4. Cost of extra safety requirements needed whilst stressing tendons.

As a general comparison between the two structural options under consideration it is usually found that:-

1. Up to 6·000 span traditional reinforced concrete is the most economic method.
2. Spans between 6·000 and 9·000 the two cost options are comparable.
3. Over 9·000 span prestressed concrete is more economical than reinforced concrete.

It should be noted that generally columns and walls do not need prestressing but in tall columns and high retaining walls where the bending stresses are high, prestressing techniques can sometimes be economically applied.

Precast concrete is a construction product produced by casting concrete in a reusable mould or "form" which is then cured in a controlled environment, transported to the construction site and lifted into place. In contrast, standard concrete is poured into site-specific forms and cured on site.

Reasons for using pre cast concrete

1. Pre cast concrete is comfortable :

The material has intrinsic properties of thermal inertia (allowing a more constant temperature both in cold and hot regions) and acoustic insulation.

Precast concrete is Safe

Not only is the structural stability maintained for longer periods, but concrete construction prevents the spread of the fire from one building to another.

It is sufficiently strong to resist impacts, blasts and natural catastrophes like earthquakes, tornadoes and floods.

Precast concrete is versatile

Factory production allows a wide choice of surface finishing, colour range and special shapes.

Precast concrete has another advantage: its mouldability which entails designers to copy classical details like keystones and capitals or match the finish of materials like weathered stones. The precast concrete industry can source a wide range of aggregates locally and offer a tremendous variety of colours and visual effects.

Precast concrete is Healthy

Indoor air quality is a concern for all of us.

Precast concrete is stable throughout its life and does not need chemical treatment to protect it against rot and insect attack: this means that there are no emissions in the internal environment.

Precast concrete is optimised

Advanced technologies used in the precasting plants create an improved quality product (i.e. reduced tolerances, thinner sections, engineered solutions) compared with cast-on-site concrete. Additionally this quality can be checked before a unit is inserted into the structure or site work!

Precast concrete is Durable

Concrete lasts for years. Egyptian and Chinese people used an ancient form of concrete for buildings and structures that still exist today. Concrete is used where the structural stability has to be maintained for long periods. Effective design detailing helps to lengthen the life of a concrete building; precast manufacturers can offer guidance on designing for durability.

Precast concrete is Ecological

Made of natural raw materials (stones, gravels, sand, cement), locally available almost everywhere and in an enormous quantity, precast concrete minimises the whole life cycle impact on the environment when compared with other construction materials. Precast concrete units can entirely be re-used or Recycled.

Precast concrete is Fast

The top floor of a skyscraper can be cast in the factory when the foundations have not yet started. But the project requirements of a

modern construction prefer a just-in-time delivery! On-site construction using precast concrete is not only faster, but also safer as secure working platforms are quickly established.

Precast concrete is Affordable

Precast concrete combines the excellent quality of factory production with a relatively inexpensive material. The costs to repair and maintain a concrete structures are highly limited.

There is therefore no need to compromise on quality to reduce costs, simply choose the best way to use locally available resources.

Precast concrete is Sustainable

Sustainable means a "3-win" situation for the three Pillars of our society: People, Profit and the Planet. If only one of this elements is "negative", the solution can't be considered sustainable!

2. What do you understand by prefabrication in concrete structures? And what are its salient features, advantages & disadvantages?

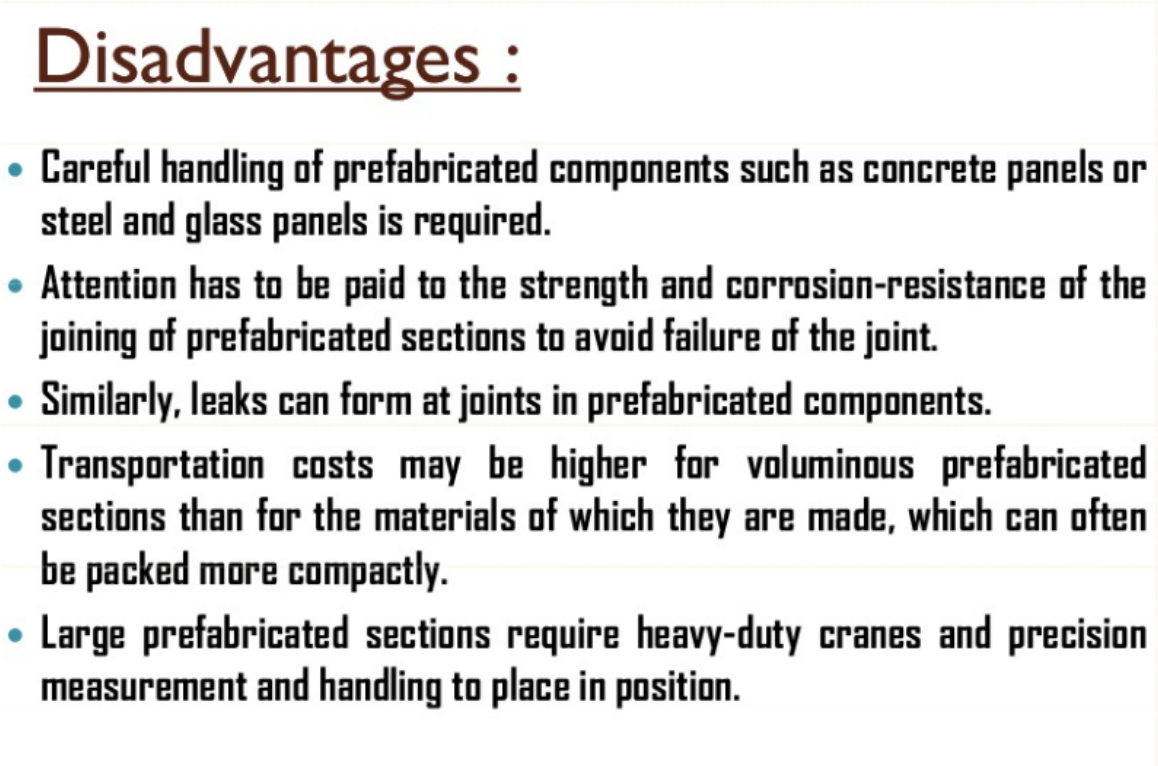
Prefabrication is the practice of assembling components of a structure in a factory or other manufacturing site, and transporting complete assemblies or sub-assemblies to the construction site where the structure is to be located.

Salient Features:

- The assembly of buildings or their components at a location other than the building site.
- The method controls construction costs by economizing on time, wages, and materials.
- Prefabricated units may include doors, stairs, window, walls, wall panels, floor panels, roof trusses, room-sized components, and even entire buildings.
- The term is used to distinguish this process from the more conventional construction practice of transporting the basic material to the construction site where all assembly is carried out.

ADVANTAGES OF PREFABRICATION

- High quality product
- Labor related savings
- Savings in time
- Overall efficiency is greatly increased
- Mass production is easier and quick
- Protected and controlled production environment
- Potential for lower production costs and other cost savings
- Independence of climatic conditions
- The disruption of traffic is avoided
- Ensures high degree of Safety



3. Explain the concept of Modularity in concrete structures.

Modular buildings and modular homes are sectional

Prefabricated buildings, or houses, that consist of multiple sections called modules. "Modular" is a method of construction differing from other methods of building.

Modular components are typically constructed indoors on assembly line. Modules' construction may take as little as ten days but more often one to three months. Completed modules are transported to the building site and assembled by a crane. Placement of the modules may take from several hours to several days.