BRIDGES





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- Introduction of Segmental bridge construction
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- Construction of segmental bridges
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➤A bridge is a structure built to across a obstacles such as a body of water, valley, or road, for the purpose of providing passage over the obstacle.

➤A structure carrying a road, path, railway etc across a river, road or other obstacle.



COMPONENTS OF A BRIDGE

- Bridge deck or Superstructure
- Bearings
- Pier
- Abutments
- Piles



SUPERSTRUCTURE OR BRIDGE DECK

• A deck is the surface of a bridge to pass vehicle, goods, people etc from one side to other.







• It's a major component that transmit the load received from the decking on to the substructure.









• Bridge pier supports the span of the bridge and transfer the load from superstructure to the foundation . Piers should be strong enough to take both horizontal and vertical loads.





ABUTMENT

• In engineering, abutment refers to the substructure at ends of the bridge span or dam where the super structure rests.







• A pile of a bridge is a structure that uses foundations consisting of long poles, which are made of concrete, wood or steel and are hammered into soft soil beneath the bridge until the end of the pile reaches a harder layer of compacted soil or rock.





TYPES OF BRIDGES

- Truss Bridges
- Arch Bridges
- Suspension Bridges
- Cable-Stayed Bridges
- Slab Bridges
- Box Girder Bridges

TRUSS BRIDGES

- Truss bridges are made by steel which takes up tension and compression.
- No bending moment is allowed in this structure.
- Most suitable shape of truss is triangular.



ARCH BRIDGE

- A bridge with abutment at each end shaped as a curved arch
- This work by transferring the weight of the bridge and it load partially into a horizontal thrust restrained by the abutments at either side.



SUSPENSION BRIDGE

 A bridge in which the weight of deck is supported by the vertical cables suspended from the further cables that runs between towers and are anchored in abutments at each end.





CABEL STAYED BRIDGE

• A cable stayed bridge has one or more towers or "pylons" from which the cable support the bridge deck.





• A short span bridge consisting of a Reinforced concrete slab resting on abutments.





• A box girder bridge is a bridge in which the main beam comprises of girders in the shape of hollow box.



Construction Methods for Bridge

1. Cast-in-Situ Method :

This Method Prefer for Short Bridges. Time consuming is large in cast-in-situ construction as it involves following steps.

Erection on ground supported staging
 Casting of concrete
 Dismantling of staging

2. Pre Cast Segmental Method

This method is used for the long bridges. It is economical when there is large no of span. This method involves the following steps.

- Casting of Precast segments in casting yard.
- Transporting the precast segments at the site.
- Erection of the precast segment using launcher or crane.
- External Prestressing.
- Grouting.



SEGMENTAL BRIDGE CONSTRUCION

A Segmental Bridge is a bridge built in short sections (called segments), that is one piece at a time. And then segments are erected to make the bridge. The bridge is either cast-in-place or precast.

Advantage of segmental bridge construction: -

- Very economical for long spans.
- > Prefabricated segments provides more quality control.



- The structure can be fully loaded immediately after being prestressed.
- The pre-stressed cables can be inspected and replaced at all times.
- > Low weight due to thin bridge sections.
- >Industrialization of the construction process.
- >Innovations in construction equipment.
- Low maintenance costs.
- Speed of construction, time taken less.



Disadvantage of Segmental bridge construction

High construction loading or high technology is used.
 Need high safety precautions during construction.
 Extra cost (due to more prestressing required).

History of Segmental bridge construction

Segmental bridge construction first appeared in the early 1950s.

- The first cast-in-place segmental concrete bridge, built in 1950, across the Lahn River in Germany.
- The first precast segmental concrete bridge, built in 1962, across the Seine River in France.

Segmental Bridge Applications





Classification of segmental bridges

Segmental bridges is classified under the following Categories: -

- Balance Cantilever Bridges
- Progressive Placement Bridges
- Span-by-Span Constructed Bridges
- Incrementally Launched Bridges



Segmental Construction Method Balanced Cantilever



Segmental Construction Method Progressive placement



Segmental Construction Method Span-by-span



Segmental Construction Method Incrementally launched



Construction of Segmental Bridges

The following steps are used for the construction of Segmental bridges.

- Casting of Segments
 Two method used for casting of segments
 - Short Line Method
 In this rate of segment production is slow. Three or four segments cast at a time.
 Long Line Method
 In this rate of segment production is fast. Segments equal to one span cast at a time.



Construction of Segmental Bridges

Contd.

After casting the segments are stored at staking yard and curing of segments will be done.

 Transfer the segment at erection site: After casting or curing of segments are transferred at erection site with the help of traveler or crane.

Casting of Segments

Short Line Segment Casting



Casting of Segments

Long Line Segment Casting





Storage of Segments





Typical Features of Precast Segments



Lifting of Segments



Lifting of Segments



Construction of Segmental Bridges

Contd.

Erection of the segments:
 The precast segments are erected on the sites by following erection methods.

- Balanced Cantilever erection
- Progressive Placement erection
- Span by Span erection
- Incremental Launching erection

Construction of Segmental Bridges

Contd.

High Machineries are used for the erection of segments some of the following.

- Launching Truss & accessories
- Launching girder & accessories
- Gantry crane or other cranes
- Hydraulic jacks
- Travelers













Incremental Launching, Step 1	
	Direction of Advancing
Casting Yard	Launching Nose
Temporary Support	
Incremental Launching	g, Step 2

Construction of Segmental Bridges

Contd.

4. Epoxy Glueing

In between the two segments epoxy Glueing is used to prevent the leakage of grout during grouting.

5. External perstressing

Used for giving the final strength to bridge.

- Pre-tension method
- Post tension method

Construction of Segmental Bridges

Contd.

6. Grouting

The main purpose of grouting is to protect the all strands against corrosion and develop the bond between prestressing steel and surrounding concrete.

Examples of Segmental bridges

Barak Bridge, Silchar India's First Cantilever Segmental Construction - 1961

Other Examples of Segmental bridges

Jadukata Bridge, Meghalaya

The longest PSC cantilever span in India, 145 m

Other Examples of Segmental bridges



Bassein Creek Bridge, Ghodbundar, Mumbai The world's longest Continuous Cantilever Br. 1970

Other Examples of Segmental bridges



Ganga Bridge Patna – 5575m, 4 Lanes Segments cast by short line method

Conclusions:

- This method is ideal for bridge construction bridge give Aesthetical view or good quality.
- Longer span bridge now possible.
- > Longer bridge over water now possible.
- Construction of long bridges now easy.
- Construction time is less.
- > Environment friendly construction.
- Construction line is highly mechanized by this method.



THANKS

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