

BRIDGE CONSTRUCTION

Organized by

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Bridge Construction

- When the **bridge span length** is below 6meters then it is called as **Culvert Bridge**.

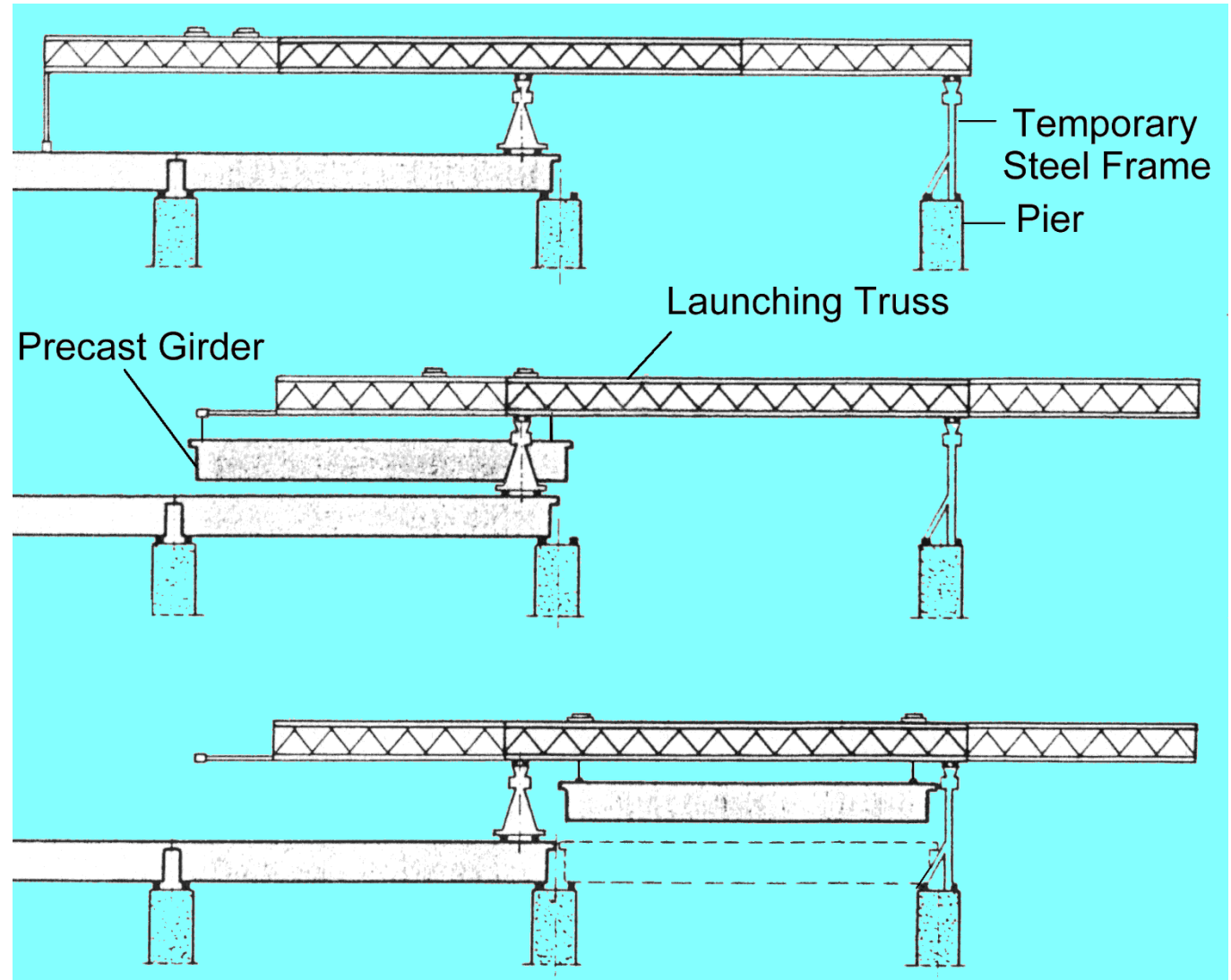
Suitability of Bridge construction system

Sys.	Site cond.	Structure Level	Span Length	Other aspects
A	Inaccess.	High	Short (40-80m)	Sharp curvature and super elevation
B	Inaccess.	High	Short (40-80m)	Straight or slightly curved superstructure
C	Inaccess.	High	Long (up to 250m)	Crossing navigable water ways
D	Inaccess.	High	Long (up to 200m)	Crossing navigable water ways
E	Inaccess.	High	Short (40-70m)	Long viaducts with short span
F	Inaccess.	Very high	Long (200 to 1,000m)	Crossing deep rivers, deep valleys and mountains.
G	Inaccess.	Very high	Very Long (500 to 2,000m)	Crossing deep rivers, deep valleys and mountains.

(A) Precast, Prestressed Concrete Girders



Post-Tensioning of Girders



Construction Sequence

Precast, Pre-stressed Concrete Girders

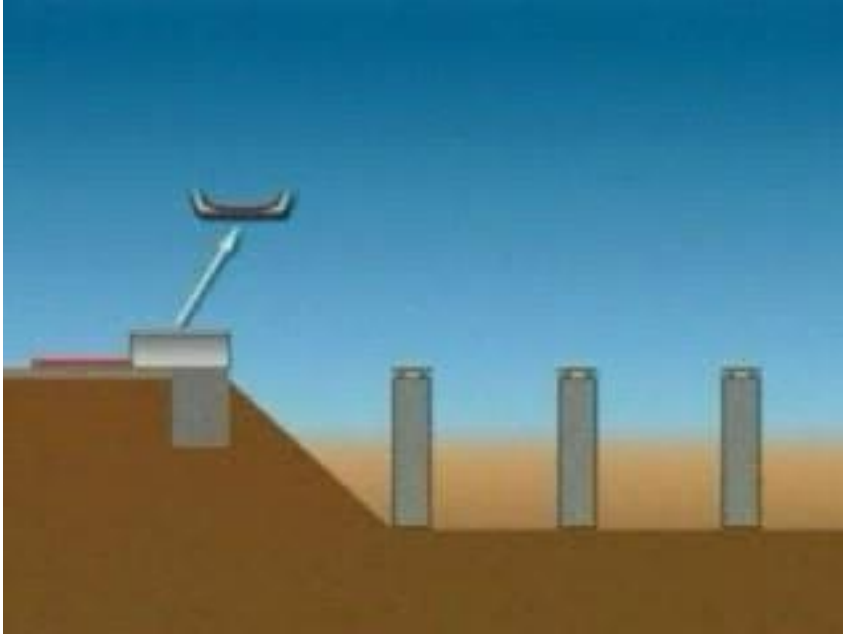
Advantages:

- Economy, speed, and improved quality of mass production.
- Sharp curvatures & superelevations.
- Inaccessible sites.
- No interference with traffic.

Disadvantages:

- Casting yard, transport and erection equipment.
- Unsuitability for complex roadway geometry.

(B) Incremental Launching (Deck Pushing)



Construction Sequence

Inc. Launching Construction



Incremental Launching (Deck Pushing)

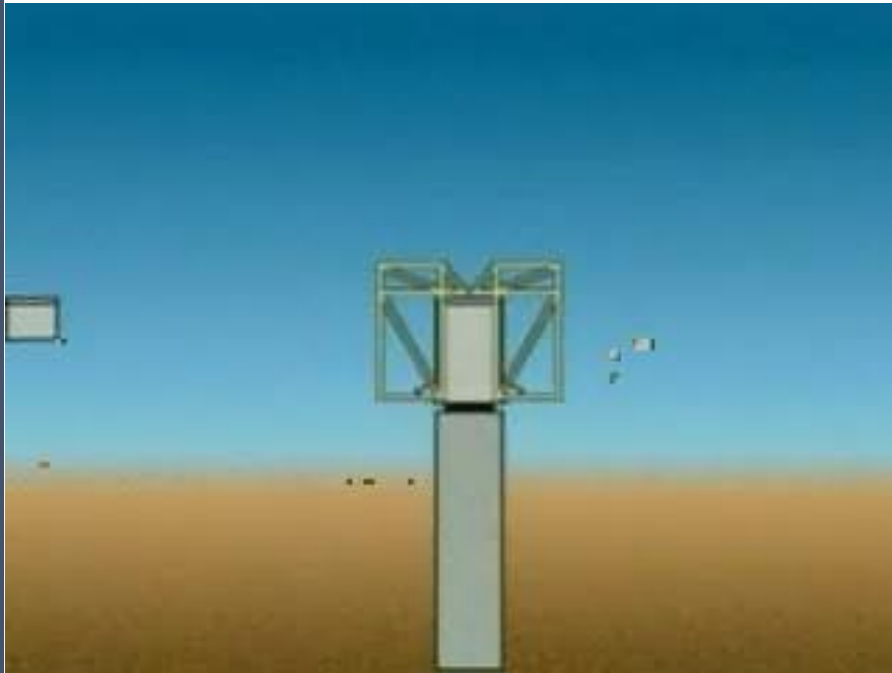
Advantages:

- Inaccessible sites.
- Riding learning curve (Repetitive operations).
- No interference with traffic.

Disadvantages:

- Casting yard and pushing equipment.
- Increase in longitudinal prestressing (cantilever moments).
- Large labor force during launching.
- Unsuitability for complex roadway geometry.

(C) Cast-in-Place, Balanced Cantilever carriage construction



Construction Sequence

Cantilever Carriage Construction



Cast-in-Place, Balanced Cantilever (Cantilever Carriage System)

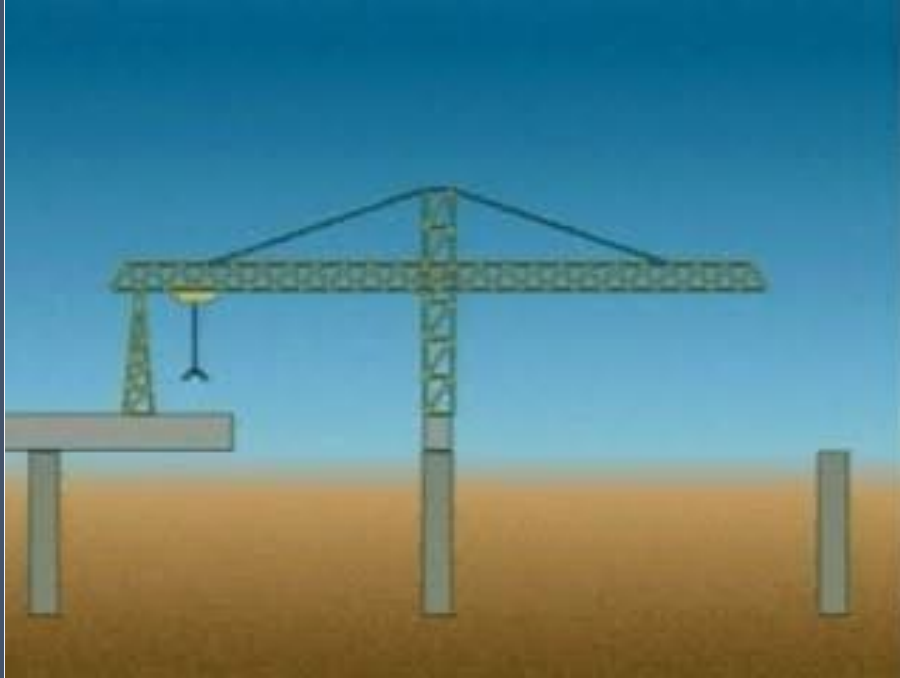
Advantages:

- Inaccessible sites.
- Long navigation channels.
- No interference with traffic or navigation.
- High labor efficiency.

Disadvantages:

- Special equipment and skilled labor.
- High precision required.
- Increase in reinforcement (cantilever moments).
- Limited length of segments.
- Low construction rate.

(D) Precast Segmental, Balanced Cantilever



Construction Sequence

Precast Segmental Construction



Precast Segmental, Balanced Cantilever

Advantages:

- **Economy, speed, and improved quality of mass production.**
- **No interference with traffic or navigation.**
- **Low labor requirement for both fabrication and erection operations.**
- **Adaptability to curvatures and superelevation.**

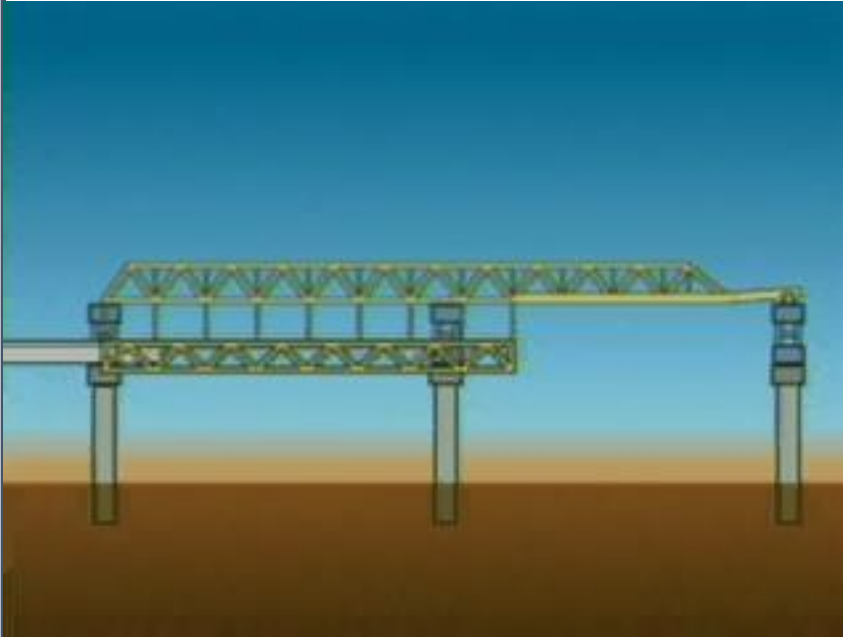
Disadvantages:

- **Casting yard, transport and erection equipment.**
- **High precision required.**
- **Increase in reinforcement (cantilever moments).**

(E) Flying Shuttering System

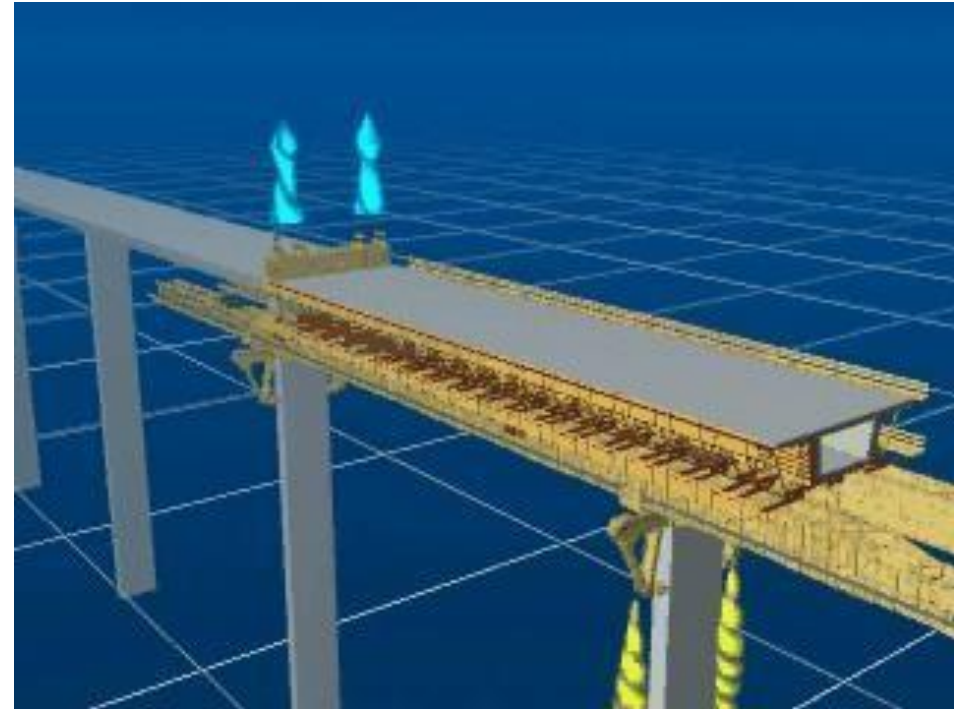
Two Phases:

- **Concreting Phase.**
- **Advancing Phase.**



Construction Sequence

Flying Shuttering Details



Flying Shuttering System

Advantages:

- Long viaducts with short spans.
- No interference with traffic.
- High construction progress rate

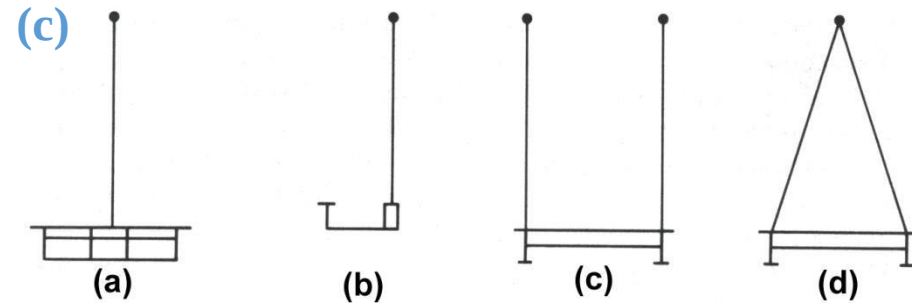
Disadvantages:

- Special equipment.
- Unsuitability for long spans.

(a) (F) Cable-Stayed Bridges

(c) Cable Arrangements:

(a) ng

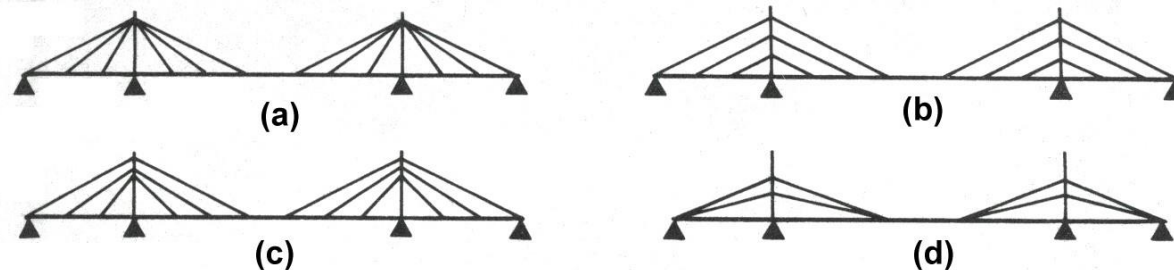


Transverse:

- (a) Single Plane – Vertical
- (b) Single Plane – Vertical/La
- (c) Double Plane – Vertical
- (d) Double Plane –

Longitudinal:

- (a) Radiating
- (b) Harp
- (c) Fan
- (d) Star



Cable-Stayed Bridges

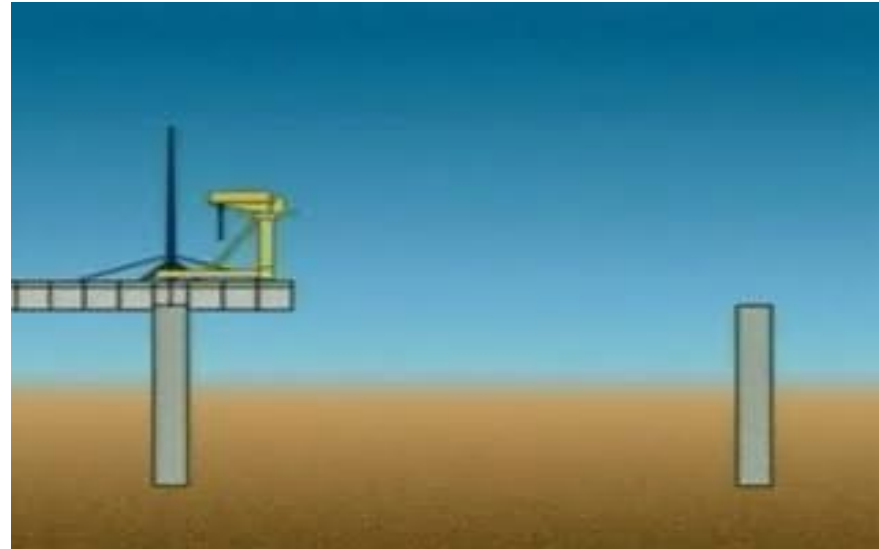
Construction Systems:

- • **Balanced Cantilever.**
- • **Free Cantilever.**
- **Deck pushing.**



Balanced Cantilever

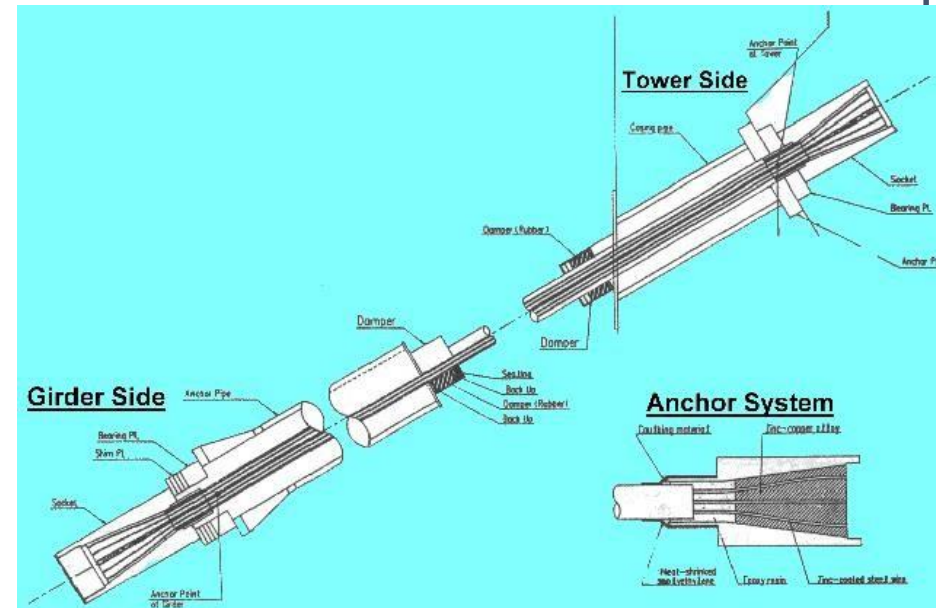
Free Cantilever



Stay Technology



Anchorage System for Wire Cables



Cable-Stayed Bridges

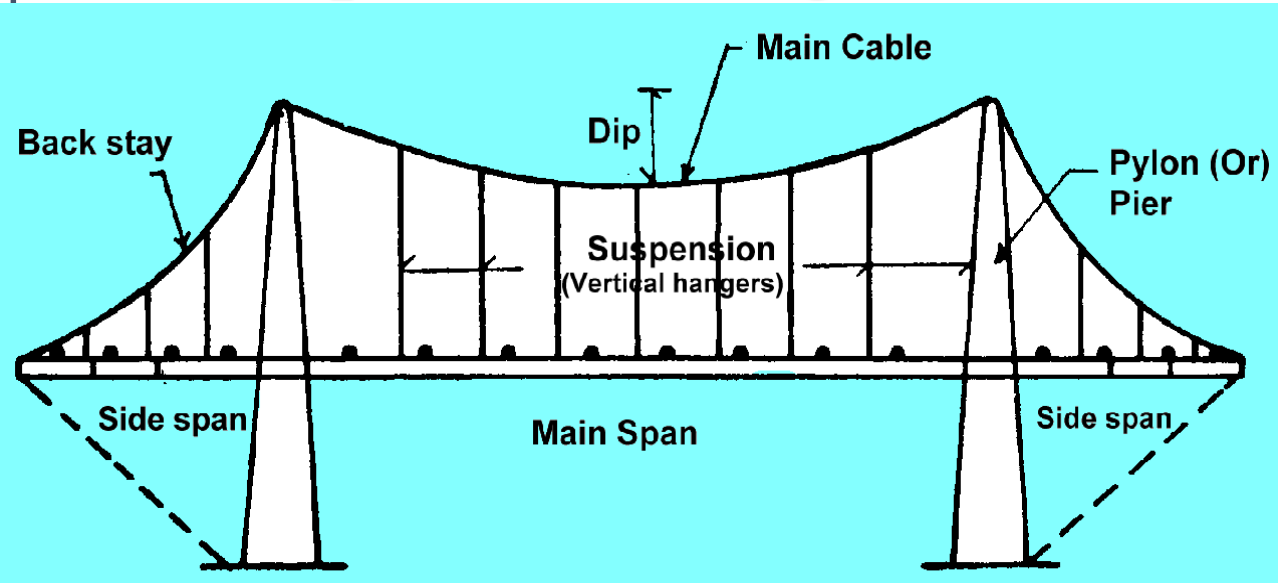
Advantages:

- **High clearance for traffic or navigation.**
- **Suitability for long spans.**
- **Less material quantities (smaller depths).**

Disadvantages:

- **High risks involved in bridge construction.**
- **High tech. required (very long span lengths).**
- **High degree of control required on quality, time and budget.**

(G) Suspension Bridges



Suspension Bridges

Advantages:

- Suitability for very long spans.
- High clearance for traffic or navigation.
- Less material quantities (smaller depths).

Disadvantages:

- High risks involved in bridge construction.
- High tech. required (very long span lengths).
- High degree of control required on quality, time and budget.

Developments in Suspension Bridges:

Suspension Bridges with Significant Jump in Span Length

Year	Name of Bridge	Country	Span Length
1826	Menai	U.K.	177
1883	Brooklyn	U.S.A.	486
1937	Golden Gate	U.S.A.	1,280
1998	Akashi Kaikyo	Japan	1
1999, 2016*	Messina Strait	Italy	3,300
? **	Gibraltar Strait	Spain/Morocco	5,000

* To be completed.

** At Design Stage



Bridge Construction Systems Applicable for Different Site Conditions

		Code	
I	Under Running	B	Incremental launching.
II	Across Navigable	D	Precast segmental construction.
	Mountains	G	Suspension bridges (> 1,000 m).