Classification Based on Main Span Length

- Short Span Bridges (up to 15m)
- Medium Span Bridges (up to 50m)
- Long Span Bridges (50-150m*)
- Extra Long Span Bridges (over 150m*)
  * (or 200 m)

Long & Extra Long Span Bridges

Long Span Bridges:
- Composite Steel Plate Girder Bridge
- Cast-in-place Post-Tensioned concrete Box Girder
- Post-Tensioned Concrete Segmental Construction
- Concrete Arch and Steel Arch

Extra Long Span Bridges:
- Cable Stayed Bridge
- Suspension Bridge

Akashi Kaikyō Bridge
Longest Suspension Bridge (Longest span = 1,991 m)
**Russian Russky Bridge**
Longest Cable-stayed Bridge (Longest span = 1,104 m)

**Chaotianmen Bridge**
Longest Steel Arch Bridge (Longest span = 552 m)

**Canada Pont de Quebec Bridge**
Longest Steel Truss Bridge (Longest span = 549 m)

**Wanxian Bridge**
Longest Concrete Arch Bridge (Longest span = 420 m)
Shibanpo Bridge
Longest Prestressed Concrete Bridge (Longest span = 330 m)

Brazil Rio-Niterói Bridge
Longest Steel Box/Plate Girder Bridge (Longest span = 300 m)

Economical Span Ranges for Segmental Construction

<table>
<thead>
<tr>
<th>Construction Method</th>
<th>Superstructure Depth – ft (m)</th>
<th>Economical Span Range – ft (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span-by-span Precast</td>
<td>Constant 6 (1.8)</td>
<td>up to 110 (to 33)</td>
</tr>
<tr>
<td>Precast</td>
<td>Constant 6 to 8 (1.8 to 2.4)</td>
<td>110-150 (33-45)</td>
</tr>
<tr>
<td>Precast/ Cast-in-place</td>
<td>Constant 7 to 12 (2.1 to 3.6)</td>
<td>120-160 (36-48)</td>
</tr>
<tr>
<td>Incremental Launch Cast-in-place</td>
<td>Constant 8 to 12 (2.4 to 3.6)</td>
<td>up to 240 (to 72)</td>
</tr>
<tr>
<td>Progressive Cantilever Precast</td>
<td>Constant 8 to 10 (2.4 to 3.0)</td>
<td>up to 200 (to 60)</td>
</tr>
<tr>
<td>Balanced Cantilever Precast</td>
<td>Constant 6 to 12 (1.8 to 3.6)</td>
<td>160 – 260 (48 – 78)</td>
</tr>
<tr>
<td>Precast</td>
<td>Variable 6 to 20 (1.8 to 6.0)</td>
<td>200 – 450* (60 – 135)</td>
</tr>
<tr>
<td>Cast-in-place</td>
<td>Variable 6 to 40 (1.8 to 12.0)</td>
<td>260 – 750 (78 – 225)</td>
</tr>
<tr>
<td>Cable Stay Precast or Cast-in-place by cantilever</td>
<td>Constant 6 to 15 (1.8 to 4.5)</td>
<td>500-1500 (150 – 450)</td>
</tr>
</tbody>
</table>

Span by Span Segmental Construction

- Disadvantage - the capital investment in the equipment for this type of construction is considerable.
- Advantage – quick, simple erection (2-3 spans/wk); Easy geometry control; savings from less MOT; min. user delays; simple design; durable structures.
Incrementally Launched Segmental Construction

- Disadvantage - Inefficient use of materials. Stringent dimensional control is an absolute necessity at the stationary casting site. Straight or constant radius. (not recommended)

Progressive Cantilever Segmental Construction

- Note – Various radius. A movable temporary stay arrangement must be used to limit the cantilever stresses during construction to a reasonable level.

Free Cantilever Segmental Construction

- Note - The form traveler moves forward on rails attached to the deck of the completed structure and is anchored to the deck at rear.
- 4 to 6 segments/day (45 ft)

Cable Stay Segmental Construction

- Viaduct main span 66.5 m
Post-tensioned Precast Piers

Precast Pier Details & Erection

Single-cell Box with Inclined Struts

Sava River Bridge, Serbia

- Current trends in cross-section design lead to single cell box girders for increasingly wider bridges. Ribs or struts are used to provide additional transverse capacity.
Precast Joints

Precast Joints

- Keys (i.e. no reinforcing across joints)
- Epoxy
  - Temporary Clamping
  - Temperature

- **Type A** joints include cast-in-place concrete joints, wet concrete joints or epoxy joints.
- **Type B** joints consist of dry joints between precast units

Cast-in-Place Joints

Cast-in-Place Joints

- Reinforcing Bars
- Joint Preparation
- Bulkheads

Grouting top & bottom slab cantilever and continuity tendon

- Outlet vent at top of anchor (A)
- Injection port at low point (B)
- Intermediate unit (C) when duct is longer than 100 ft
- Injection port (D) when (E) is more than 18" lower than vents (C) or (E)
- Outlet vent at top of anchor (B)

Anchor protection for interior & exterior anchors

- Anchos in blisters
- Seal cast into 8" overlap beyond corners
- Four-level protection
  - Grout
  - Plastic cap
  - Seal coat
  - Surrounding box

- Seal coat applied on the surface of anchor block outlining the area of sound concrete
- Four anchor heads, with tie rods, are to be mounted per anchor

- Drain with drip feature
PC Construction

- Camber
- Geometry control
- Prestressing parameters
- Erection loads
- Erection equipment
- Casting and erection manuals
- Integrated shop drawings

Cable-Stayed Bridge Demonstration Project

Bridge Reconstruction

- Bridge Destruction and Construction
  - Port Mann Bridge Construction
  - Port Mann Bridge Deconstruction

- Bridge Replacement
  - NJDOT Accelerated Bridge Construction

- Bridge Widening
  - Illinois Tollway Fox River Bridge