Bridge Type Selection

The major consideration for bridge type selection for bridges on the State Aid system is initial cost. Future maintenance costs, construction time, and location are considered when there is little or no increase in initial cost. Selecting an appropriate superstructure type is a critical factor in the planning and design process. County/Municipal Engineers, or their consultants usually make the choice of bridge type as they prepare the preliminary bridge layouts. In some cases the county/municipality may have a preference for a certain type of bridge. If there is any question as to the proper design for the situation, please contact the State Aid Bridge Office for assistance in determining bridge type and span lengths.

The following are the most common superstructure types currently used by Mn/DOT on the Local system. They list the economical and practical span limits, and some advantages and disadvantages of each superstructure type. Selecting the most economical bridge type can range in difficulty from very easy to extremely difficult. Along with selecting from the bridge types listed below, other options such as the post-tensioned slabs, box culverts and pre-cast arches should also be considered.

Click on the links below to read more about each structure type:

- **Pre-stressed Concrete I-Beam**
- **Pre-cast Concrete Rectangular Beam**
- **Cast-In-Place Simple Concrete Slab Span**
- **Cast-In-Place Continuous Concrete Slab Span**
- **Timber Slab**
- **Steel, Continuous Spans**
- **Pre-cast, Double Tee Beam Spans**
Pre-stressed Concrete I-beams

<table>
<thead>
<tr>
<th>Beam Size</th>
<th>Size Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>27M</td>
<td>– Spans up to 75 feet</td>
</tr>
<tr>
<td>45M</td>
<td>– Spans up to 115 feet</td>
</tr>
<tr>
<td>36M</td>
<td>– Spans up to 95 feet</td>
</tr>
<tr>
<td>54M</td>
<td>– Spans up to 135 feet</td>
</tr>
<tr>
<td>72</td>
<td>– Spans up to 160 feet</td>
</tr>
<tr>
<td>63</td>
<td>– Spans up to 150 feet</td>
</tr>
<tr>
<td>81</td>
<td>– Spans up to 170 feet</td>
</tr>
</tbody>
</table>

Advantages

1. Invariably the most economical for spans between 45 ft. and 150 ft.
2. Beam details standardized
3. Adaptable to most geometric conditions
4. Durable, low maintenance

Disadvantages

1. Not a shallow depth structure
2. Cannot be curved to fit difficult geometrics
3. Shipping limitations may limit the use of longer beams

Pre-Cast Rectangular Beams

<table>
<thead>
<tr>
<th>Beam Size</th>
<th>Span Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>14”</td>
<td>Spans up to 43 feet</td>
</tr>
<tr>
<td>18”</td>
<td>Spans up to 52 feet</td>
</tr>
<tr>
<td>22”</td>
<td>Spans up to 55 feet</td>
</tr>
</tbody>
</table>

Advantages

1. Reduced construction time
2. Longer span lengths at minimized structure depths
3. At times, can reduce the number of substructure units.

Disadvantages

1. Cannot be curved to fit difficult geometrics
**Cast-In-Place Simple Concrete Slab Span**

Span ranges 15 to 40 feet when conventionally reinforced

**Advantages**

Minimum depth for short spans  
Ease of design and detail  
Aesthetic for small stream crossings

**Disadvantages**

1. Not the most economical solution  
2. Requires formwork support  
3. Limited span length  
4. Maximum skew at 45 degrees

**Cast-In-Place Continuous Concrete Slab Span**

Constant depth thickness up to about 50 feet middle spans for three or more spans  
Constant depth thickness up to about 40 feet middle spans for two spans  
Variable depth thickness up to about 65 feet middle spans for three or more spans

**Advantages**

1. Absolute minimum depth  
2. Economical solution  
3. Aesthetic for small stream crossings

**Disadvantages**

1. Limited span length  
2. Requires formwork support  
3. Maximum skew at 45 degrees
**Timber Slab**

1 or 3 spans with a maximum span length of about 25 feet

**Advantages**

1. Timber bridges can be constructed in virtually any weather conditions.
2. Do not require special equipment for installation, and can normally be constructed without highly skilled labor.
3. Present a natural and aesthetically pleasing appearance in natural surroundings.

**Disadvantages**

1. The use of timber bridges are limited to low-volume roads, roads with ADT under 750
2. Asphalt wearing surface tends to crack from differential deck deflections, which can lead to premature deterioration.
3. Not the most economical solution

**Steel, Continuous Spans**

 Rolled beams – maximum spans up to about 90 feet
 Plate Girders - maximum spans over 200 feet

**Advantages**

1. Usually the best choice for spans over 145 ft.
2. Can be curved or cut to any geometry
3. Lighter than concrete superstructures

**Disadvantages**

1. Expensive
2. Painting is unreliable
3. Weathering steel stains supports and rusts under continuous moisture or salt exposure
Pre-cast, Double Tee Beam Spans

Maximum span length of 48 feet for the 22 inch depth stem
Maximum span length of 64 feet for the 30 inch depth stem

Advantages

1. May reduced construction time
2. May reduced inspection time
3. Economical pre-cast bridge in the 30 ft. to 40 ft. span range

Disadvantages

1. Not appropriate for flared or curved structures or skews
2. Not appropriate for higher ADT roadways where salt is applied to bridge
3. Not appropriate on steep grades