Notes to Designers for Prestressed Girders

BED CAPACITY

Teton Prestress in Idaho Falls
1,900 kips @ 30” cgs from bottom of girder
Maximum number of strand
AASHTO & BulbTee Girders: 42 – 0.6”Ø 60 – 0.5” Ø
WF Girders: forms not available

Oldcastle Precast in Spokane
1,900 kips for AASHTO & BulbTee Girders
Maximum number of strand: 42 – 0.6”Ø 60 – 0.5” Ø
3,076 kips for WF Girders
Maximum number of strand: 70 – 0.6”Ø 98 – 0.5” Ø

Forterra Structural Precast in Caldwell
2,500 kips @ 32” cgs from bottom of girder
Maximum number of strand
AASHTO, BulbTee, & WF Girders: 56 – 0.6”Ø 80 – 0.5” Ø

MAXIMUM NUMBER OF STRAND

The controlling values for the maximum span length curves are based on the following to allow all 3 fabricators the capability of furnishing the girders.

AASHTO & Bulb Tee Girders: 42 – 0.6”Ø 60 – 0.5” Ø
WF Girders: 56 – 0.6”Ø 80 – 0.5” Ø

LATERAL STABILITY

Lateral stability of the girder should be checked at release and erection using the procedure in Article 5.5.4.3 of the Bridge Design Manual. The centerline of the lifting loop should be a minimum of 4’ from the end of the girder. The need for adding debonded strand in the top flange for handling should be considered.
CRANE CAPACITY
Forterra Structural Precast in Caldwell
- Straddle Cranes: 75k (maximum girder weight of 150k)
- Heavy Straddle Crane and outside boom crane: 85k (maximum girder weight of 170k)
- Two outside boom cranes for girder weight greater than 170k.
- Outside boom cranes cost approximately $1000/day.

Oldcastle Precast in Spokane
- Single Crane: 108k
- Two Cranes: 200k
- Girder weight more than 200k would require renting cranes at an additional cost.

Commentary
If the girder weight exceeds the crane capacity listed above, the designer should consider the extra costs for lifting and transporting the girder to determine the most economical cost. Each project should be evaluated based upon the parameters of the site to determine the best solution.
**PRESTRESSED GIRDER**

**PRELIMINARY DESIGN CURVES**

**GIRDER W/CAST-IN-PLACE DECK**
Section Properties and maximum span length curves for the AASHTO, Bulb Tee, and Wide Flange girders are included in this Article. The maximum span length curves should only be used as an aid in preliminary design. The curves are based on the following design parameters:

- AASHTO LRFD Design Specifications
- Simple Span lengths are centerline-centerline bearing
- 42’-0” out-out bridge width
- Girder spacing is for 4, 5, 6, & 7 girders (6’-0”; 7’-3”; 9’-3”; 12’-0”)
- Concrete parapet
- Slab $f_c = 4.0$ ksi
- Girder $f_c = 8.0$ ksi
- 0.6”Ø 270 ksi strand
- Future wearing surface = 28 psf
- HL93 live load
- Harp points at 0.4 & 0.6 points
- Deck thickness determined by $(S+10)/30$ where $S$ is computed in accordance with Article 9.7.2.3
- Minimum 8” nominal deck slab thickness. Structural deck thickness is 0.5” less than the nominal thickness
- The maximum number of straight strand for each girder is:
  - AASHTO Type 2: 16 straight
  - AASHTO Type 3: 34 straight
  - AASHTO Type 4: 48 straight
  - Bulb Tee Girder: 24 straight
  - WF Girders: 44 straight
- No strand added for handling

**DECK BULB TEE GIRDER W/ASPHALT OVERLAY**
Section Properties and maximum span length curves for the Bulb Tee girders and WF girders with an 8” thick top flange are included in this Article. The maximum span length curves should only be used as an aid in preliminary design. The curves are based on the following design parameters:

- AASHTO LRFD Design Specifications
- Simple Span lengths are centerline-centerline bearing
- 42’-0” out-out bridge width
- Girder spacing for deck bulb tee girders is for 6, 7, & 8 girders (84”, 72” & 63” top flange width).
- Girder spacing for WF deck bulb tee is for 7, 8, & 9 girders (72”, 63”, & 56” top flange width).
- 2-Tube Curb Mounted Rail with 9½” curb height for 0.2’ asphalt pavement
- Total wearing surface = 56 psf (0.2’ at initial construction & 0.2’ future)
- HL93 live load
- Harp points at 0.4 & 0.6 points
- No strand added for handling
Revisions:
July 2009  Added design parameters on page 1  
          Added WSDOT WF girder data  
          Added Deck Bulb Tee Girder maximum span curves
Feb 2012  Revised maximum span graphs for refined losses  
          Changed from 7.5 ksi concrete to 10 ksi concrete
June 2013 Added Bed Capacity and Maximum Number of strand data  
          Revised maximum span graphs for maximum number of strand
Mar 2015  Maximum span curves checked for lateral stability during handling without adding additional strand using the procedure in Article 5.5.4.3 of the Bridge Design Manual.  
          All maximum span curves based on F’c=8 ksi and 0.6"Ø strand.  
          BT37x84 girder deleted from the standards due to lateral stability during handling  
          BT48 Series girders deleted. The BT37 Series girders provide a narrower top flange that can better accommodate superelevation.  
          DeckTee girders with asphalt overlay designed for a total of 0.4’ asphalt to protect spray-applied membrane seal.  
          DeckTee girders with asphalt overlay designed for a 2-tube curb mounted rail with 9½” curb height.  
          DeckTee girder with 5” c-i-p deck preliminary design curves deleted.
Aug 2016  Changed name of Hanson Prestress to Forterra Structural Precast.  
          Changed name of Central premix to Oldcastle Precast.  
          Added Crane Capacity data for handling girders in the prestress yard.
### AASHTO GIRDER SECTION PROPERTIES

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>AREA</th>
<th>CENTER OF GRAVITY</th>
<th>SECTION MODULUS</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TOP</td>
<td>BOTTOM</td>
<td>TOP</td>
</tr>
<tr>
<td>36&quot;</td>
<td>368.44</td>
<td>20.147</td>
<td>15.853</td>
<td>50,842</td>
</tr>
<tr>
<td>45&quot;</td>
<td>558.94</td>
<td>24.706</td>
<td>20.294</td>
<td>125,165</td>
</tr>
<tr>
<td>54&quot;</td>
<td>788.44</td>
<td>29.249</td>
<td>24.751</td>
<td>260,403</td>
</tr>
</tbody>
</table>

*ALL UNITS IN INCHES EXCEPT WEIGHT*
MAXIMUM SPAN RANGE
AASHTO GIRDERS
Refined Losses
0.6" Strand & $F'c = 8$ ksi
No strand added for handling

- 36" Type 2
- 45" Type 3
- 54" Type 4
### 37” TOP FLANGE BULB TEE GIRDER SECTION PROPERTIES

<table>
<thead>
<tr>
<th>Depth</th>
<th>Area</th>
<th>Center of Gravity</th>
<th>Section Modulus</th>
<th>Weight LB/FT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Top</td>
<td>Bottom</td>
<td>Moment of Inertia</td>
</tr>
<tr>
<td>30”</td>
<td>449.9375</td>
<td>15.644</td>
<td>14.356</td>
<td>51,361</td>
</tr>
<tr>
<td>36”</td>
<td>491.9375</td>
<td>18.857</td>
<td>17.143</td>
<td>82,126</td>
</tr>
<tr>
<td>42”</td>
<td>533.9375</td>
<td>22.036</td>
<td>19.964</td>
<td>121,708</td>
</tr>
<tr>
<td>48”</td>
<td>575.9375</td>
<td>25.190</td>
<td>22.810</td>
<td>170,872</td>
</tr>
<tr>
<td>54”</td>
<td>617.9375</td>
<td>28.322</td>
<td>25.678</td>
<td>230,379</td>
</tr>
<tr>
<td>60”</td>
<td>659.9375</td>
<td>31.438</td>
<td>28.562</td>
<td>300,990</td>
</tr>
<tr>
<td>66”</td>
<td>701.9375</td>
<td>34.539</td>
<td>31.461</td>
<td>383,465</td>
</tr>
<tr>
<td>72”</td>
<td>743.9375</td>
<td>37.630</td>
<td>34.370</td>
<td>478,562</td>
</tr>
</tbody>
</table>

![Diagram of 37” Top Flange Bulb Tee Girder Section Properties](attachment:image.png)
MAXIMUM SPAN RANGE
BulbTee w/37" Flange
Refined Losses
0.6" Strand & F'c=8 ksi
No strand added for handling
# WF GIRDER SECTION PROPERTIES

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>AREA</th>
<th>CENTER OF GRAVITY</th>
<th>SECTION MODULUS</th>
<th>WEIGHT LB/FT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TOP</td>
<td>BOTTOM</td>
<td>TOP</td>
</tr>
<tr>
<td>42&quot;</td>
<td>727.531</td>
<td>21.640</td>
<td>20.360</td>
<td>183,642</td>
</tr>
<tr>
<td>50&quot;</td>
<td>776.531</td>
<td>25.849</td>
<td>24.151</td>
<td>282,559</td>
</tr>
<tr>
<td>58&quot;</td>
<td>825.531</td>
<td>30.033</td>
<td>27.967</td>
<td>406,266</td>
</tr>
<tr>
<td>66&quot;</td>
<td>874.531</td>
<td>34.196</td>
<td>31.804</td>
<td>556,339</td>
</tr>
<tr>
<td>74&quot;</td>
<td>923.531</td>
<td>38.343</td>
<td>35.657</td>
<td>734,356</td>
</tr>
<tr>
<td>82.625&quot;</td>
<td>976.359</td>
<td>42.796</td>
<td>39.829</td>
<td>959,393</td>
</tr>
</tbody>
</table>

**Diagram:**
- **Depth:** 3"
- **Fillet:** 5.125"
- **3" Fillet**
- **13.125" x 4.5" Fillet**
- **3'-2.375"**
- **4'-1"**
MAXIMUM SPAN RANGE
WF GIRDER
0.6" Strand & F'c=8 ksi  Refined Losses
No strand added for handling

Girder Spacing - Feet
Span Length - Feet

WF42G  WF50G  WF58G  WF66G  WF74G  WF83G
**DECK BULB TEE GIRDER W/ ASPHALT OVERLAY**

<table>
<thead>
<tr>
<th>BASE GIRDER</th>
<th>H</th>
<th>Y = (H-22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30&quot; BT</td>
<td>37</td>
<td>15</td>
</tr>
<tr>
<td>36&quot; BT</td>
<td>43</td>
<td>21</td>
</tr>
<tr>
<td>42&quot; BT</td>
<td>49</td>
<td>27</td>
</tr>
<tr>
<td>48&quot; BT</td>
<td>55</td>
<td>33</td>
</tr>
<tr>
<td>54&quot; BT</td>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>60&quot; BT</td>
<td>67</td>
<td>45</td>
</tr>
<tr>
<td>66&quot; BT</td>
<td>73</td>
<td>51</td>
</tr>
<tr>
<td>72&quot; BT</td>
<td>79</td>
<td>57</td>
</tr>
</tbody>
</table>

\[
x = \frac{(F-50)}{2}
\]
MAXIMUM SPAN RANGE
DECK BULBTEE W/ASPHALT OVERLAY
0.6" STRAND & F’c=8 ksi  Refined Losses
No strand added for handling
WF DECK TEE GIRDER W/ ASPHALT OVERLAY

<table>
<thead>
<tr>
<th>BASE GIRDER</th>
<th>H</th>
<th>Y = (H-26.625)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42&quot; WF</td>
<td>47</td>
<td>20.375</td>
</tr>
<tr>
<td>50&quot; WF</td>
<td>55</td>
<td>28.375</td>
</tr>
<tr>
<td>58&quot; WF</td>
<td>63</td>
<td>36.375</td>
</tr>
<tr>
<td>66&quot; WF</td>
<td>71</td>
<td>44.375</td>
</tr>
<tr>
<td>74&quot; WF</td>
<td>79</td>
<td>52.375</td>
</tr>
<tr>
<td>83&quot; WF</td>
<td>87.625</td>
<td>61</td>
</tr>
</tbody>
</table>

\[ X = \frac{(F-49)}{2} \]

\[ F \text{ max} = 6' \]

\[ \gamma = 3' \]

\[ \delta_{c} = 3\text{"} \]

\[ 18.4375" \times 3" \text{ Fillet} \]

\[ 6.125" \text{ Fillet} \]

\[ 3" \text{ Fillet} \]

\[ 13.125" \times 4.5" \text{ Fillet} \]

\[ 5.125" \]

\[ \text{3'-2.375"} \]
MAXIMUM SPAN RANGE
WF DECK TEE W/ASPHALT OVERLAY
0.6" STRAND & F'c=8 ksi  Refined Losses
No strand added for handling