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 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- 42” single slope
- Slab f’c = 4.0 ksi
- Girder f’c = 8.0 ksi
- 0.6”Ø 270 ksi strand with straight & harp strand on 2” centers
- 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 Girder: 44 straight
- No strand added for handling
- Meets lateral stability criteria at release.

DECK BULB TEE GIRDER W/PPC 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).
- Girder f’c = 8.0 ksi
- 0.6”Ø 270 ksi strand with straight & harp strand on 2” centers
- 42” 2-Tube Curb Mounted Rail
- Total wearing surface = 9 psf (¼” PPC overlay)
- 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.
Nov 2019  Harp strand at 2” centers.
          42” single slope concrete parapet used for girders with c-i-p deck.
          42” 2- Tube Rail used for voided slabs and deck tee girders.
          AASHTO, Bulb Tee, and WF girders checked for lateral stability at release using PCI procedure.
          PPC overlay ( 9 psf) used for voided slabs and deck tee girders.
### 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>
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<td></td>
<td>Top</td>
<td>Bottom</td>
<td>Top</td>
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All units in inches except weight.

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**Type 2 Girder**

- 3' fillet
- 6' fillet
- 1'-6'
- 3'-0'
- 1'-4'
- 6' fillet
- 7.5' fillet
- 1'-10'

**Type 3 Girder**

- 1'-8'
- 6' fillet
- 7.5' fillet
- 5'-9'
- 1'-10'
- 2'-2'

**Type 4 Girder**

- 9' fillet
- 4'-6'
- 8'
- 2'-2'
MAXIMUM SPAN RANGE
AASHTO GIRDERS
0.2' ASPHALT OVERLAY & 42" SINGLE SLOPE PARAPET
0.6" Strand & F'c=8 ksi  Refined Losses
No strand added for handling
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>
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<td>25.678</td>
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<tr>
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<td>37.630</td>
<td>34.370</td>
<td>478,562</td>
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</table>

Diagram:

- 3' 1" overall length
- 7" depth
- 2" fillet
- 9½" x 3" fillet
- 2' 2" width
- 1' 1" flange width
- 3' 1" flange depth
- 2' 1" overall flange width
MAXIMUM SPAN RANGE
BulbTee w/37" Flange
0.2' ASPHALT OVERLAY & 42" SINGLE SLOPE PARAPET
0.6" Strand & F'c=8 ksi Refined Losses
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>
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<td>21.640</td>
<td>20.360</td>
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![WF Girder Section Diagram](image_url)
MAXIMUM SPAN RANGE
WF GIRDER W/0.2' ASPHALT OVERLAY & 42" SINGLE SLOPE PARAPET
0.6" Strand & F'c=8 ksi  Refined Losses
No strand added for handling

Span Length - Feet
Girder Spacing - Feet
## DECK BULB TEE GIRDER W/PPC 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>
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<tr>
<td>36&quot; BT</td>
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<td>54&quot; BT</td>
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<tr>
<td>60&quot; BT</td>
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<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>
\[ X = \frac{(F-50)}{2} \]

- \( F \) max 8'
- 2" Fillet
- 9½" x 3" Fillet
- 2' - 2"
- 7"
MAXIMUM SPAN RANGE
DECK BULBTEE W/PPC OVERLAY & 42" CURB MOUNT METAL RAIL
0.6" STRAND & F'c=8 ksi  Refined Losses
No strand added for handling
WF DECK TEE GIRDER W/PPC OVERLAY

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

\[ X = (F-49)/2 \]

\[ 8” \]

\[ 3” \] Fillet

6.125"

3’-2.375"

18.4375” x 3” Fillet

3” Fillet

13.125” x 4.5” Fillet

5.125”

3’ max

\[ 3 \]

\[ 6.125” \]
MAXIMUM SPAN RANGE
WF DECK TEE W/PPC OVERLAY & 42" CURB MOUNT METAL RAIL
0.6" STRAND & F'c=8 ksi  Refined Losses
No strand added for handling