PGSuper Design
Example: Non-Standard Strand Pattern

Victoria McCammon
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Bridge Information

TxDOT provides assistance at the local and regional levels in all aspects of planning, design, construction and maintenance of bridges. The Department also develops policies for a safe and comprehensive state bridge system.

Note: The link to the Shop Drawings page has changed. Please update your bookmarks.

Construction and Maintenance
- Bridge Specifications
- Shop Drawings
- Bridge Expansion Joints
- Proprietary Concrete Repair Materials
- Curing Mats for Concrete Structures
- Construction Tips
- Welding Certifications

Geotechnical Services

Design
- Bridge Standards
- Superstructure Design Information
- Substructure Design Information
- Other Design Information
- Steel Bridge Design Preferred Practices
- LRFD Bridge Design FAQs

Project Development
- Railroad Information...
Superstructure Design Information

This page provides guidance and recommendations on Load and Resistance Factor Design (LRFD) of specific bridge superstructure components.

- General Recommendations
- Deck Surface Texture Requirements
- Corrosion Protection Measures
- Concrete Deck Slabs on Stringers
- Concrete Deck Slabs on U Beams (U40 and U54)
- Prestressed Concrete I Beams and I Girders
- Prestressed Concrete U Beams (Types U40 and U54)
- Prestressed Slab Beams and Decked Slab Beams
- Prestressed Concrete Double-Tee Beams
- Prestressed Concrete Box Beams (B20, B28, B34, and B40)
- Design Resources
- Design Examples and Spreadsheets
Recommendations" section above.

**Structural Analysis**

- You need not increase section properties of the beam to account for the transformed area of strands or mild steel.
- For the calculation of live load distribution factors, modular ratio, n, may conservatively be taken as 1.0.

**Design Criteria** - For grade separation structures, use the same beam depth for the full length of structure for economies of scale and aesthetic reasons. Stream crossing structures may have different types and sizes of beams for purposes of economy. Optimize beam spacing in each span. Maintaining a constant beam spacing for the full length of structure is not necessary. Selection of the proper type beam for a span is a matter of economics; calculate relative costs using current average bid prices for beams and slab.

- Recommended Span Lengths for I Beams
- Recommended Span Lengths for I Girders

**Software**

Use PGSuper for beam design. Refer to PGSuper Design Guide for further guidance. Alternatively, use this spreadsheet to calculate live load distribution factors and PSTRS14 for beam design.

**Detailing**

On the plans for each design, show optional design parameters for maximum top flange stress, bottom flange stress, and ultimate moment due to all design loads. The fabricator will retain the option to use other strand arrangements, including straight strand patterns, stress relieved strand, or 0.6-in. diameter strand, if design parameters are satisfied by the prestress and concrete strength selected.

- Prestressed Concrete U Beams (Types U40 and U54)
- Prestressed Slab Beams and Decked Slab Beams
- Prestressed Concrete Double-Tee Beams
## I Girders, Recommended Span Lengths for LRFD

<table>
<thead>
<tr>
<th>Beam Type</th>
<th>Beam Depth</th>
<th>Approx Structure Depth</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>TX28</td>
<td>.28 in.</td>
<td>38 in.</td>
<td>Economical span limit is 70 ft. Spans should not exceed 80 ft.</td>
</tr>
<tr>
<td>TX34</td>
<td>34 in.</td>
<td>44 in.</td>
<td>Economical span limit is 80 ft. Spans should not exceed 95 ft.</td>
</tr>
<tr>
<td>TX40</td>
<td>40 in.</td>
<td>50 in.</td>
<td>Economical span limit is 95 ft. Spans should not exceed 105 ft.</td>
</tr>
<tr>
<td><strong>TX46</strong></td>
<td><strong>46 in.</strong></td>
<td><strong>56 in.</strong></td>
<td><strong>Economical span limit is 105 ft. Spans should not exceed 120 ft.</strong></td>
</tr>
<tr>
<td>TX54</td>
<td>54 in.</td>
<td>64 in.</td>
<td>Economical span limit is 125 ft. Spans should not exceed 140 ft.</td>
</tr>
<tr>
<td>TX62</td>
<td>62 in.</td>
<td>72 in.</td>
<td>Economical limit is 135 ft. Spans should not exceed 150 ft.</td>
</tr>
<tr>
<td>TX70</td>
<td>70 in.</td>
<td>80 in.</td>
<td>Economical limit is 145 ft. Spans should not exceed 150 ft due to handling constraints.</td>
</tr>
</tbody>
</table>

'Approx Structure depth is Beam Depth plus 8'' minimum slab plus 2'' estimated haunch.'
Did you know...

You can create your own live load trucks. Do it in the Vehicular Live Load Library.
Create a new PGSuper project using the Tx46 template

OK  Cancel
Project Properties

Bridge: Bella Blvd Underpass
Bridge ID: 0000
Job Number: 0000-00-000
Engineer: Victoria McAmmon
Company: Texas Department of Transportation

Comments:
County: Any
District: 00
Hwy: IH00

Show Project Properties when creating new projects
Move Pier

Move Abutment 1 from 1+00.00 to 12+43.33

Move bridge, retain all span lengths
Section at Station 13+48.33 - Normal to Alignment

44.000 ft
Section at Station 13+48.33 - Normal to Alignment

44.000 ft

3000 ft

5 spaces @ 8.000 ft = 40.000 ft

1000 ft

2

3

4

5

6

3000 ft

North
**Bridge Description**

**Superstructure Description**

- **Girder Family:** I-Beam
- **Girder Type:** 1x46
- **Number of Girders:** 6
- **Spacing Type:** Spread girders with same spacing in all spans
- **Girder Spacing:** 8.000 ft (3,000 ft or more)
- **Locate:** Center of Girders 0.000 ft from Bridge Line
- **Deck Type:** Composite Cast-In-Place Deck

Distribution factors computed using Type (k) cross section. With TxDOT Method per Section 3.5 of the TxDOT LRFD Bridge Design Manual, Revised April, 2007.
Maximum clear span (or distance between flange quarter points of steel beams) is 8.667 ft. If permitting use of prestressed concrete panels, ensure clear span is acceptable based on limits shown on standard drawing PCP.

Use Class S concrete (f_c = 4.0 ksi). If the deck will be subjected regularly to deicing agents, add a frost protection layer at the bottom of the deck slab.

Maximum Spacing = 8.667 ft + 3 ft = 11.667 ft

Typical overhang is 3.0 ft, measured from the center line of the beam to the edge of the slab.

Minimum Number of Beams = 8 + 1 = 9

Spacing = (89.333 ft – 2*3.0 ft) ÷ 8 = 10.417 ft

For TxDOT girders, limit overhang widths as follows:

<table>
<thead>
<tr>
<th>Overhang Width</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 ft to 1.5 ft</td>
<td>None</td>
</tr>
<tr>
<td>1.5 ft to 3.0 ft</td>
<td>75%</td>
</tr>
<tr>
<td>3.0 ft to 5.0 ft</td>
<td>50%</td>
</tr>
<tr>
<td>5.0 ft to 7.5 ft</td>
<td>25%</td>
</tr>
<tr>
<td>7.5 ft and over</td>
<td>0%</td>
</tr>
</tbody>
</table>

Note: Overhangs greater than 7.5 ft are not recommended for TxDOT girders.
Superstructure Description

Girder Family: I-Beam
Girder Type: 1x46
- Use same type for all girders
Number of Girders: 9
- Use same number of girders in all spans
Spacing Type: Spread girders with same spacing in all spans
Girder Spacing: 10.417 ft (3,000 ft or more)
Locate: Center of Girders 0.000 ft from Bridge Line
Measured normal to alignment at CL pier
Girder Connectivity:
Girder Orientation: Plumb
Deck Type: Composite Cast-In-Place Deck

Precast I-Beam, Composite Cast-In-Place Deck, Girders at spread spacing.
Distribution factors computed using Type (k) cross section. With TxDOT Method per Section 3.5 of the TxDOT LRFD Bridge Design Manual, Revised April, 2007.
### Bridge Description

<table>
<thead>
<tr>
<th>Station</th>
<th>Orientation</th>
<th>Connection, Boundary Condition, and Girder Spacing Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abut 1</td>
<td>12-43.33</td>
<td>Edit Abutment 1 Details...</td>
</tr>
<tr>
<td>Span 1</td>
<td>59.000 ft</td>
<td>Edit Span 1 Details...</td>
</tr>
<tr>
<td>Pier 2</td>
<td>13-02.33</td>
<td>Edit Pier 2 Details...</td>
</tr>
<tr>
<td>Span 2</td>
<td>120.000 ft</td>
<td>Edit Span 2 Details...</td>
</tr>
<tr>
<td>Pier 3</td>
<td>14-22.33</td>
<td>Edit Pier 3 Details...</td>
</tr>
<tr>
<td>Span 3</td>
<td>120.000 ft</td>
<td>Edit Span 3 Details...</td>
</tr>
<tr>
<td>Pier 4</td>
<td>15-42.33</td>
<td>Edit Pier 4 Details...</td>
</tr>
<tr>
<td>Span 4</td>
<td>63.500 ft</td>
<td>Edit Span 4 Details...</td>
</tr>
<tr>
<td>Abut 5</td>
<td>16-05.83</td>
<td>Edit Abutment 5 Details...</td>
</tr>
</tbody>
</table>

Enter station in the following format, xx+yy.zz  Example 1+23.45
Enter orientation as Normal, a bearing (N/S dd mm ss s E/W), or a skew angle (dd mm ss s L/R).
Example: N 34 23 32.1 W
Offset from Alignment to Bridge Line [0.0000] ft  (Measured normal to alignment)
Enter offset from the alignment, measured normal to the alignment. Use a signed value (+/-xxx.xx) or a left/right indicator (xxx.xxx L/R)
Positive values indicate the centerline of pier is offset to the right of the alignment.
Example: 2.25 or 2.25 L
Abutment 1 Details

General | Connections | Girder Spacing

Abutment 1
Move Abutment 1 from 12+43.33 to 12+43.33

Station 1243.33
Move bridge retaining all span lengths

Enter station in the following format, xx+yy.zz Example 1+23.45

Orientation NORMAL

Enter orientation as Normal, a bearing (N/S dd mm ss.s E/W), or a skew angle (dd mm ss.s L/R).
Example: N 34 23 32.1 W

OK Cancel Help
Move Pier 2 from 13+02.33 to 13+02.33

Station 13+02.33

Enter station in the following format, xx+yy.zz. Example 1+23.45

Orientation NORMAL

Enter orientation as Normal, a bearing (N/S, dd mm ss.s E/W), or a skew angle (dd mm ss.s L/R). Example: N 34 23 32.1 W
Bridge Description

General | Framing | Railing System | Deck Geometry and Materials | Deck Reinforcement | Condition and Rating | Environmental
--- | --- | --- | --- | --- | --- | ---

<table>
<thead>
<tr>
<th>Station</th>
<th>Orientation</th>
<th>Connection, Boundary Condition, and Girder Spacing Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abut 1</td>
<td>12-43.33</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Span 1</td>
<td>59.000 ft</td>
<td></td>
</tr>
<tr>
<td>Pier 2</td>
<td>13-02.33</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Span 2</td>
<td>120.000 ft</td>
<td></td>
</tr>
<tr>
<td>Pier 3</td>
<td>14-22.33</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Span 3</td>
<td>120.000 ft</td>
<td></td>
</tr>
<tr>
<td>Pier 4</td>
<td>15-42.33</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Span 4</td>
<td>63,500 ft</td>
<td></td>
</tr>
<tr>
<td>Abut 5</td>
<td>16-05.83</td>
<td>NORMAL</td>
</tr>
</tbody>
</table>

Enter station in the following format, xx+yy.zz  Example 1+23.45

Enter orientation as Normal, a bearing (N/S dd mm ss.s E/W), or a skew angle (dd mm ss.s L/R).
Example: N 34 23 32.1 W

Offset from Alignment to Bridge Line 0.0000 ft  [Measured normal to alignment]

Enter offset from the alignment, measured normal to the alignment. Use a signed value (+/-xxx.xx) or a left/right indicator (xxx.xxx L/R)
Positive values indicate the centerline of pier is offset to the right of the alignment.
Example: 2.25 or 2.25 L

Add Span  Remove Span  Layout by Span Lengths…

OK  Cancel  Help
The Girder Designer uses current bridge layout and project criteria information to determine an optimal design for the selected girder.

Select Girder:
- Span 1
- Girder 2

Design Options:
- Design For Flexure
- Design For Shear

Note: A successful design attempt does not guarantee compliance with all criteria. You should always run a Spec Check Report to review your final design.

Run Design  Cancel  Help
Section at Station 1.000 ft

8 spaces @ 10.417 ft = 83.336 ft

Girder 2

Progress
Computing Strength I critical section for shear for Span 1

Cancel
Design Outcome

The design for Span 1 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>495.72 kip</td>
<td>0.00 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>123.93 kip</td>
<td>0.00 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>8.500 in</td>
<td>0.000 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>0.000 in</td>
</tr>
<tr>
<td>$f_{ci}$</td>
<td>4.000 KSI</td>
<td>4.000 KSI</td>
</tr>
<tr>
<td>$f_c$</td>
<td>5.000 KSI</td>
<td>5.000 KSI</td>
</tr>
</tbody>
</table>

Design Notes:
Concrete release strength was controlled by Minimum
Concrete final strength was controlled by Minimum

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design]  [Reject the Design]  [Help]  [Print]
Design Outcome

The design for Span 4 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>557.69 kip</td>
<td>495.72 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>123.93 kip</td>
<td>123.93 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>12.500 in</td>
<td>8.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
<tr>
<td>f_{ci}</td>
<td>4.000 KSI</td>
<td>4.000 KSI</td>
</tr>
<tr>
<td>f_{c}</td>
<td>5.000 KSI</td>
<td>5.000 KSI</td>
</tr>
</tbody>
</table>

Design Notes:

Concrete release strength was controlled by Minimum
Concrete final strength was controlled by Minimum

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design] [Reject the Design] [Help] [Print]
Design Outcome

The design attempt for Span 2 Girder 2 failed.

Too many strands are required to satisfy the stress criteria.

Results from last trial:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>54</td>
<td>18</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>42</td>
<td>4</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>1673.06 kip</td>
<td>557.69 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>1301.27 kip</td>
<td>123.93 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>42.500 in</td>
<td>12.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at soffit edge</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
</tbody>
</table>

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design] [Reject the Design]
Girder Details for Span 2, Girder 2

General | Strands | Long. Reinforcement | Trans. Reinforcement | Condition and Rating
---|---|---|---|---
Girder Name | Tx46 | | | This girder is used for the entire bridge

Girder Concrete Properties

Normal Weight Concrete
Release Strength, f'c | 4.000 KSI | Eci | 3644 KSI
Final Strength, f'c | 5.000 KSI | Ec | 5000 KSI

Slab Offset ("A" Dimension)
A single Slab Offset is used for the entire bridge
Start of Girder | 8.000 in | End of Girder | 8.000 in

OK | Cancel | Help
**Girder Details for Span 2, Girder 2**

### General

**Specify Number of Strands Using:**
- Total Number of Permanent Strands

**Number of Straight:** 18, Harped: 4

- **Total Number of Permanent:** 22
- **Calculate Jacking Force:** 681.62 kip

### Vertical Location of Harped Strands

- **Distance between Top-Most Harped Strand and Girder Bottom:** 12.500 in
  - (Valid Range: 4.500 to 42.500)

- **Harping Points:**

### Prestressing Strand Type

- **Permanent:**
  - Grade 270 Low Relaxation 1/2"
Girder Details for Span 2, Girder 2

Strand Details
Specify Number of Strands Using: Total Number of Permanent Strands
Number of Straight: 18, Harped: 4
Total Number of Permanent: 22
Calculate Jacking Force: 966.74 kip

Vertical Location of Harped Strands
Girder Ends: Distance between Top-Most Harped Strand and Girder Bottom: 12.500 in
(Valid Range 4.500 to 42.500)
Harped Points: in

Prestressing Strand Type
Permanent: Grade 270 Low Relaxation 3.6"
The Girder Designer uses current bridge layout and project criteria information to determine an optimal design for the selected girder.

Select Girder:
- Span 2
- Girder 2

Design Options:
- Design For Flexure (checked)
- Design For Shear (unchecked)

Note: A successful design attempt does not guarantee compliance with all criteria. You should always run a Spec Check Report to review your final design.
Design Outcome

The design attempt for Span 2 Girder 2 failed.

Too many strands are required to satisfy the stress criteria.

Results from last trial:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>54</td>
<td>18</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>2372.90 kip</td>
<td>790.97 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>1406.16 kip</td>
<td>175.77 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>top of harped strand group at ends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of girder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance from bottom of girder to</td>
<td>42.500 in</td>
<td>12.500 in</td>
</tr>
<tr>
<td>bottom of harped strand group at</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bottom of girder</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
</tbody>
</table>

Update the Current Girder Parameters with the Proposed Design?

Accept the Design  Reject the Design
Girder Family: I-Beam
Girder Type: 1x46
Number of Girders: 9
Spacing Type: Spread girders with same spacing in all spans
Girder Spacing: 10.417 ft
Locate: Center of Girders
Measued normal to alignment at CL pier
Girder Connectivity:
Girder Orientation: Plumb
Deck Type: Composite Cast-In-Place Deck

Precast I-Beam, Composite Cast-In-Place Deck, Girders at spread spacing.

Distribution factors computed using Type (k) cross section. With TxDOT Method per Section 3.5 of the TxDOT LRFD Bridge Design Manual, Revised April, 2007
Superstructure Description

Girder Family: I-Beam
Girder Type: 1x46
Number of Girders: 4
Spacing Type: Spread girders with same spacing in all spans
Girder Spacing: 10.417 ft (3,000 ft or more)
Locate: Center of Girders
Measued normal to alignment at CL pier
Girder Connectivity
Girder Orientation: Plumb
Deck Type: Composite Cast-In-Place Deck

Precast I-Beam, Composite Cast-In-Place Deck. Girders at spread spacing. Distribution factors computed using Type (k) cross section. With TxDOT Method per Section 3.5 of the TxDOT LRFD Bridge Design Manual, Revised April, 2007
Superstructure Description

Girder Family: I-Beam
Girder Type: 1x46
- Use same type for all girders
Number of Girders: [ ] [ ]
- Use same number of girders in all spans
Spacing Type: Spread girders with same spacing in all spans
Girder Spacing: Spread girders with unique spacing for each span
Locate: Center of Girders: 0.000 ft from Bridge Line
Measured normal to alignment at CL pier
Girder Connectivity: 
Girder Orientation: Plumb
Deck Type: Composite Cast-In-Place Deck

Precast I-Beam, Composite Cast-In-Place Deck. Girders at spread spacing.
Distribution factors computed using Type (k) cross section. With TxDOT Method per Section 3.5 of the TxDOT LRFD Bridge Design Manual, Revised April, 2007
**Bridge Description**

**General**

**Superstructure Description**

- **Girder Family**: I-Beam
- **Girder Type**: 1x46
- **Number of Girders**:
  - Use default spacing
  - By selecting this option, a different spacing can be used between each girder. To do this, edit the Span Details for each span.
- **Spacing Type**: Spread
- **Girder Spacing**:
- **Locate**: Center of Girders
- **Girder Connectivity**: Don't show this hint again
- **Girder Orientation**: Plumb
- **Deck Type**: Composite Cast-In-Place Deck

**Deck Geometry and Materials**

- Precast I-Beam, Composite Cast-In-Place Deck, Girders at spread spacing.

**Deck Reinforcement**

Distribution factors computed using Type (k).

**Condition and Rating**

- KDOT Method per Section FD Bridge Design Manual.
Superstructure Description

- **Girder Family**: I-Beam
- **Girder Type**: 1x46
- **Number of Girders**: [Dropdown]
- **Spacing Type**: Spread girders with unique spacing for each span
- **Girder Spacing**: [Dropdown]
- **Locate**: Center of Girders [Dropdown]
- **Girder Connectivity**: [Dropdown]
- **Girder Orientation**: Plumb
- **Deck Type**: Composite Cast-In-Place Deck

Distribution factors computed using Type (k) cross section. With TxDOT Method per Section 3.5 of the TxDOT LRFD Bridge Design Manual, Revised April, 2007.
Span 2 Details

Span 2

Span Length: 120.00 ft

The length of Span 2 is changed by moving all piers after Pier 2. Only the length of Span 2 is changed.
### Span 2 Details

**General**

<table>
<thead>
<tr>
<th>Number of Girders</th>
<th>Start of Span</th>
<th>End of Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8.000 in</td>
<td>8.000 in</td>
</tr>
</tbody>
</table>

**Connections**

This type of girder is used for the entire bridge

- **Name**: Tx46

**Girders**

Girder spacing is defined span by span

- **Use same girder spacing at both ends of span**

Start of Span

- **Girder Spacing**: Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier 2</th>
<th>1-9 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahead</td>
<td>10.417</td>
</tr>
<tr>
<td>Allowable</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

Locate: Center of Girders - 0.000 ft from Bridge Line

End of Span

- **Girder Spacing**: Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier 3</th>
<th>1-9 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>10.417</td>
</tr>
<tr>
<td>Allowable</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

Locate: Center of Girders - 0.000 ft from Bridge Line
**Span 2 Details**

**General**
- The number of girders is defined span by span
- The same slab offset is used for the entire bridge

**Number of Girders**
- 10

**Start of Span**
- 8.000 in

**End of Span**
- 8.000 in

**Girder spacing is defined span by span**

- **Use same girder spacing at both ends of span**

**Start of Span**

- **Pier 2**
  - 1-10 (ft)
    - **Ahead**
      - 10.417
    - **Allowable**
      - 3.000 or more

- **Locate**
  - Center of Girder
  - 0.000 ft from Bridge Line

**End of Span**

- **Pier 3**
  - 1-10 (ft)
    - **Back**
      - 10.417
    - **Allowable**
      - 3.000 or more

- **Locate**
  - Center of Girder
  - 0.000 ft from Bridge Line
Bridge Model View

Bridge Description

<table>
<thead>
<tr>
<th>General</th>
<th>Framing</th>
<th>Railing System</th>
<th>Deck Geometry and Materials</th>
<th>Deck Reinforcement</th>
<th>Condition and Rating</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Station | Orientation | Connection, Boundary Condition, and Girder Spacing Details
--------|-------------|--------------------------------------------------------------
Abut 1   | 12-43.33    | NORMAL                                                      |
Span 1   | 59.000 ft   | Edit Abutment 1 Details...                                   |
Span 2   | 120.000 ft  | Edit Abutment 2 Details...                                  |
Pier 2   | 13-02.33    | Edit Pier 2 Details...                                      |
Span 3   | 120.000 ft  | Edit Pier 3 Details...                                      |
Pier 3   | 14-22.33    | Edit Pier 3 Details...                                      |
Span 4   | 63.500 ft   | Edit Pier 4 Details...                                      |
Pier 4   | 15-42.33    | Edit Pier 4 Details...                                      |
Span 5   | 16-05.83    | Edit Pier 5 Details...                                      |
Abut 5   |             | Edit Abutment 5 Details...                                  |

Add Span | Remove Span | Layout by Span Lengths...
---------|-------------|-------------------------------------------------------------

Enter station in the following format, xx+yy.zz Example 1+23.45

Enter orientation as Normal, a bearing (N/S dd mm ss.s E/W), or a skew angle (dd mm ss.s L/R). Example: N 34 23 32.1 W

Offset from Alignment to Bridge Line: 0.0000 ft [Measured normal to alignment]

Enter offset from the alignment, measured normal to the alignment. Use a signed value (+/-xx.xx) or a left/right indicator (xx.xx L/R)
Positive values indicate the centerline of pier is offset to the right of the alignment. Example: 2.25 or 2.25 L

OK | Cancel | Help
Design Outcome

The design attempt for Span 2 Girder 2 failed.

Too many strands are required to satisfy the stress criteria.

Results from last trial:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>54</td>
<td>18</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>2372.90 kip</td>
<td>790.97 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>1406.16 kip</td>
<td>175.77 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to</td>
<td>42.500 in</td>
<td>12.500 in</td>
</tr>
<tr>
<td>top of harped strand group at ends of girder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance from bottom of girder to</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
<tr>
<td>bottom of harped strand group at ends of girder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design] [Reject the Design]
Design Outcome

The design attempt for Span 2 Girder 2 failed.

Too many strands are required to satisfy the stress criteria.

Results from last trial:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
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<td>790.97 kp</td>
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<td>Harped Strand Jacking Force</td>
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<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
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<td>12.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
</tbody>
</table>
Section at Station 13+71.45 - Normal to Alignment

87.333 ft

11 spaces @ 7.578 ft = 83.333 ft
Design Outcome

The design for Span 2 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>54</td>
<td>18</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>2372.90 kip</td>
<td>790.97 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>878.65 kip</td>
<td>175.77 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>42.500 in</td>
<td>12.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
<tr>
<td>$f_{ci}$</td>
<td>8.800 KSI</td>
<td>4.000 KSI</td>
</tr>
<tr>
<td>$f_c$</td>
<td>8.800 KSI</td>
<td>5.000 KSI</td>
</tr>
</tbody>
</table>

Design Notes:

Warning: The designed girder release strength exceeds the normal value of 6.000 KSI
Warning: The designed girder final concrete strength exceeds the normal value of 8.500 KSI
Concrete release strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder
Concrete final strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design] [Reject the Design] [Help] [Print]
Bridge Information

TxDOT provides assistance at the local and regional levels in all aspects of planning, design, construction and maintenance of bridges. The Department also develops policies for a safe and comprehensive state bridge system.

Note: The link to the Shop Drawings page has changed. Please update your bookmarks.

Construction and Maintenance
- Bridge Specifications
- Shop Drawings
- Bridge Expansion Joints
- Proprietary Concrete Repair Materials
- Curing Mats for Concrete Structures
- Construction Tips
- Welding Certifications

Design
- Bridge Standards
- Superstructure Design Information
- Substructure Design Information
- Other Design Information
- Steel Bridge Design Preferred Practices
- LRFD Bridge Design FAQs

Project Development
- Railroad Information

Geotechnical Services
Superstructure Design Information

This page provides guidance and recommendations on Load and Resistance Factor Design (LRFD) of specific bridge superstructure components.

- General Recommendations
- Deck Surface Texture Requirements
- Corrosion Protection Measures
- Concrete Deck Slabs on Stringers
- Concrete Deck Slabs on U Beams (U40 and U54)
- Prestressed Concrete I Beams and I Girders
- Prestressed Concrete U Beams (Types U40 and U54)
- Prestressed Slab Beams and Decked Slab Beams
- Prestressed Concrete Double-Tee Beams
- Prestressed Concrete Box Beams (B20, B28, B34, and B40)
- Design Resources
- Design Examples and Spreadsheets
Limit States

**Limit States**

**Component** | **Limit State**
--- | ---
Prestressed concrete beams | Strength I and IV and Service I and III. Fatigue and extreme limit states need not be checked. Live load deflection need not be checked.

Load Factors

**Load Factors**

**Prestressed Concrete Design**

Recent incidents of further Alkali Silica Reactions (ASR) have caused us to revisit mix designs and the attainable concrete strengths used in the fabrication of prestressed concrete products. The current special provision to Item 420 has greatly increased amounts of fly-ash used in beam production. It is anticipated that this will also result in slower strength gains which could have a negative impact on fabricator production and ultimately on girder costs. Therefore, now more than ever, it is important to observe our recommended practice in the design of prestressed concrete beams.

Therefore, we are encouraging designers to limit release concrete strengths, $f_{ci}$, to a maximum of 6.0 ksi. Design concrete strength, $f_{c}$, should be limited to a maximum of 8.50 ksi.

**Note:** The need to occasionally exceed these limits is left to the designer to determine. All reasonable efforts, including waiving the recommendation to design for future overlay, providing additional beams in a given cross-section, reducing span lengths, or providing non-standard strand patterns, should be considered in keeping concrete strengths below these recommended limits.

The following links are provided for additional reading on ASR:
Preliminary Designer Attempt Complete

Design Outcome

The design for Span 2 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>54</td>
<td>18</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>2372.90 kip</td>
<td>790.97 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>878.85 kip</td>
<td>175.77 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>42.500 in</td>
<td>12.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
</tbody>
</table>

Design Notes:

Warning: The designed girder release strength exceeds the normal value of 6.000 KSI
Warning: The designed girder final concrete strength exceeds the normal value of 8.500 KSI
Concrete release strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder
Concrete final strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design] [Reject the Design]

For Help, press F1
Section at Station 13+75.53 - Normal to Alignment

- 1,000 ft
- 87.333 ft
- 1,000 ft

11 spaces @ 7.578 ft = 83.338 ft

- 2.993 ft
- 11.088 ft
The design for Span 2 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>2285.01 kip</td>
<td>2372.90 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>439.43 kip</td>
<td>878.65 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>42.500 in</td>
<td>42.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
<tr>
<td>$f'_{ci}$</td>
<td>8.200 KSI</td>
<td>8.800 KSI</td>
</tr>
<tr>
<td>$f'_c$</td>
<td>8.200 KSI</td>
<td>8.800 KSI</td>
</tr>
</tbody>
</table>

**Design Notes:**

Warning: The designed girder release strength exceeds the normal value of 6,000 KSI.

Concrete release strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder.
Concrete final strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder.

Update the Current Girder Parameters with the Proposed Design?

[Accept the Design] [Reject the Design]
Girder Details for Span 2, Girder 2

**General**

**Strands**

**Long. Reinforcement**

**Trans. Reinforcement**

**Condition and Rating**

**Strand Details**

Specify Number of Strands Using: **Number of Harped and Number of Straight**

- Number of Straight Strands: 52
- Number of Harped Strands: 10

**Calculate Jacking Force**

- 2285.01 kip
- 439.43 kip

**Vertical Location of Harped Strands**

Girder Ends: Distance between Top-Most Harped Strand and Girder Bottom: 42.500 in

(Harped Points: 10.500 to 42.500)

Prestressing Strand Type

Permanent

Grade 270 Low Relaxation 0.6"
### Girder Details for Span 2, Girder 2

#### General

<table>
<thead>
<tr>
<th>Condition and Rating</th>
<th>Long. Reinforcement</th>
<th>Trans. Reinforcement</th>
<th>Strands</th>
</tr>
</thead>
</table>

#### Strand Details

- **Specify Number of Strands Using**: Number of Harped and Number of Straight

<table>
<thead>
<tr>
<th>Number of Straight Strands</th>
<th>Number of Harped Strands</th>
<th>Calculate Jacking Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>12</td>
<td>2197.13 kip</td>
</tr>
<tr>
<td>527.31 kip</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Vertical Location of Harped Strands

- **Girder Ends**: Distance between Top-Most Harped Strand and Girder Bottom

  - 42.500 in

  *(Valid Range 12.500 to 42.500)*

- **Harping Points**

  - in

#### Prestressing Strand Type

- **Permanent**

  - Grade 270 Low Relaxation 0.6"
TxDOT Summary Report

For

Span 2 Girder 2

June 10, 2011 8:39:43 am

PGSuper™

Copyright © 2011, WSDOT, All Rights Reserved

Version 2.4.0 - Built on Jul 29 2010

Washington State Department of Transportation
### TxDOT Summary Report - Span 2, Girder 2

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>1.5H from end of girder or face of support</td>
</tr>
<tr>
<td>HP</td>
<td>Harp Point</td>
</tr>
<tr>
<td>Pick Point</td>
<td>Support point where girder is lifted from form</td>
</tr>
<tr>
<td>Bunk Point</td>
<td>Point where girder is supported during transportation</td>
</tr>
</tbody>
</table>

### Specification Check Summary

The Specification Check Was Not Successful

Compressive stress check failed for Service I for the Casting Yard Stage (At Release).

Tensile stress check failed for Service III for the Final with Live Load Stage (Bridge Site 3).

### Girder Summary

Note: A Non-Standard Strand Fill Was Used For This Design

### TxDOT Girder Schedule

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>2</td>
</tr>
<tr>
<td>Girder</td>
<td>2</td>
</tr>
<tr>
<td>Girder Type</td>
<td>Tx46</td>
</tr>
</tbody>
</table>
Stress Check for Service I for Casting Yard Stage (At Release) [5.9.4.1.2]

For temporary stresses before losses in pretensioned components
Allowable tensile stress = 0.2400 × f_{ci} = 0.588 KSI
Allowable tensile stress = 0.2400 × f_{ci} = 0.588 KSI if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.
Allowable compressive stress = -0.65f_{ci} = -3.900 KSI
f_{ci} required to satisfy this stress check = 7.793 KSI

<table>
<thead>
<tr>
<th>Location from End of Girder (ft)</th>
<th>Prestress (f_t) (KSI)</th>
<th>Service I (f_{tI}) (KSI)</th>
<th>Demand (f_d) (KSI)</th>
<th>Tension Status w/o rebar (C/D)</th>
<th>Tension Status w/ rebar (C/D)</th>
<th>Compression Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0L_g) 0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>Pass ((\infty))</td>
<td>Pass ((\infty))</td>
<td>Pass ((\infty))</td>
</tr>
<tr>
<td>(PSXFR) 0.008</td>
<td>-0.575</td>
<td>-5.066</td>
<td>-0.001</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Fail (0.77)</td>
</tr>
<tr>
<td>0.750</td>
<td>-0.550</td>
<td>-5.085</td>
<td>-0.055</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Fail (0.77)</td>
</tr>
</tbody>
</table>
Stress Check for Tensile Stresses for Service III for Final with Live Load (Bridge Site 3) [5.9.4.2.2]

For stresses at service limit state after losses which involve traffic loading in members with bonded prestressing tendons other than piles.

Allowable tensile stress in the precompressed tensile zone = $0.1900 \times f'_p = 0.554 \text{ KSI}$

$f'_p$ required to satisfy this stress check = 9.755 KSI

<table>
<thead>
<tr>
<th>Location from Left Support (ft)</th>
<th>Prestress $f'_p$ (KSI)</th>
<th>Service III $f'_p$ (KSI)</th>
<th>Demand $f'_p$ (KSI)</th>
<th>Tension Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0L_z) 0.000</td>
<td>-3.498</td>
<td>0.000</td>
<td>-3.498</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>3.083</td>
<td>-3.577</td>
<td>0.538</td>
<td>-3.040</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>(H) 4.375</td>
<td>-3.610</td>
<td>0.754</td>
<td>-2.856</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>11.200</td>
<td>-3.786</td>
<td>1.813</td>
<td>-1.973</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>(0.1L_z) 11.800</td>
<td>-3.801</td>
<td>1.899</td>
<td>-1.902</td>
<td>Pass (-)</td>
</tr>
</tbody>
</table>
Span 2 Details

General
- The number of girders is defined span by span
- The same slab offset is used for the entire bridge

Number of Girders: 13
- Start of Span: 8.000 in
- End of Span: 8.000 in

This type of girder is used for the entire bridge

Girder
- Name: Tx46

Girder spacing is defined span by span
- Use same girder spacing at both ends of span

Start of Span
- Girder Spacing: Measured normal to alignment at CL pier

Pier 2
- Girder Spacing: 1-13 (ft)
  - Ahead: 6.344
  - Allowable: 3.000 or more

Locate: Center of Girders
- 0.000 ft from Bridge Line

End of Span
- Girder Spacing: Measured normal to alignment at CL pier

Pier 3
- Girder Spacing: 1-13 (ft)
  - Back: 6.344
  - Allowable: 3.000 or more

Locate: Center of Girders
- 0.000 ft from Bridge Line

[OK] [Cancel] [Help]
Design Outcome

The design for Span 2 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>2109.24 kip</td>
<td>2197.13 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>439.43 kip</td>
<td>527.31 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>42.500 in</td>
<td>42.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
</tbody>
</table>

Design Notes:

Warning: The designed girder release strength exceeds the normal value of 6,000 KSI
Concrete release strength was controlled by Casting Yard, Service 1, Compression, at Bottom of Girder
Concrete final strength was controlled by Bridge Site 2, Service 1, Compression, at Bottom of Girder
## Girder Details for Span 2, Girder 2

<table>
<thead>
<tr>
<th>General</th>
<th>Strands</th>
<th>Long. Reinforcement</th>
<th>Trans. Reinforcement</th>
<th>Condition and Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder Name</td>
<td>T46</td>
<td></td>
<td></td>
<td>This girder is used for the entire bridge</td>
</tr>
</tbody>
</table>

### Girder Concrete Properties

**Normal Weight Concrete**

- **Release Strength, f'c**: 2700 KSI
- **Final Strength, f'c**: 7.80 KSI

### Slab Offset ("A" Dimension)

*A single Slab Offset is used for the entire bridge*

- **Start of Girder**: 8.000 in
- **End of Girder**: 8.000 in
**Girder Details for Span 2, Girder 2**

**General**

**Girder Name**: Tx46  
*This girder is used for the entire bridge*

**Girder Concrete Properties**

**Normal Weight Concrete**

- **Release Strength, f′c**: 6 KSI  
- **Ec**: 4463 KSI
- **Final Strength, f′c**: 8.5 KSI  
- **Ec**: 5000 KSI

**Slab Offset ("A" Dimension)**

*A single Slab Offset is used for the entire bridge*

- **Start of Girder**: 8.000 in  
- **End of Girder**: 8.000 in

**For Help, press F1**
### Girder Details for Span 2, Girder 2

**Strand Details**

Specify Number of Strands Using: **Number of Harped and Number of Straight**

<table>
<thead>
<tr>
<th>Number of Straight Strands</th>
<th>Number of Harped Strands</th>
<th>Calculate Jacking Force</th>
<th>Jacking Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>10</td>
<td>Yes</td>
<td>2109.24 kip</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>439.43 kip</td>
</tr>
</tbody>
</table>

**Vertical Location of Harped Strands**

Girder Ends: **Distance between Top-Most Harped Strand and Girder Bottom**

- 42.500 in
  - (Valid Range 10.500 to 42.500)

Harping Points: [ ] [ ] in

**Prestressing Strand Type**

Permanent

- Grade 270 Low Relaxation 0.6"
Girder Details for Span 2, Girder 2

**General**

**Strands**

Specify Number of Strands Using: Number of Harped and Number of Straight

- Number of Straight Strands: 46
- Number of Harped Strands: 12

- Calculate Jacking Force: 2021.36 kip
- Calculate Jacking Force: 527.31 kip

**Vertical Location of Harped Strands**

Girder Ends: Distance between Top-Most Harped Strand and Girder Bottom: 42.500 in

- Harping Points: in

- Prestressing Strand Type: Permanent
  - Grade 270 Low Relaxation 0.6"
Specification Check Summary

The Specification Check Was Not Successful

Compressive stress check failed for Service I for the Casting Yard Stage (At Release).

Girder Summary

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Span</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder Type</td>
<td>Tx46</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. (N. + N)</td>
<td>58</td>
</tr>
</tbody>
</table>
**Stress Check for Service I for Casting Yard Stage (At Release) [5.9.4.1.2]**

Specification = TxDOT 2010

For temporary stresses before losses in pretensioned components

Allowable tensile stress = $0.2400 \sqrt{f'_{ct}} = 0.588$ KSI

Allowable tensile stress = $0.2400 \sqrt{f'_{ct}} = 0.588$ KSI if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.

Allowable compressive stress = $-0.65 \sqrt{f'_{ct}} = -3.900$ KSI

$f'_{ct}$ required to satisfy this stress check = 7.310 KSI

<table>
<thead>
<tr>
<th>Location from End of Girder (ft)</th>
<th>Prestress</th>
<th>Service I</th>
<th>Demand</th>
<th>Tension Status w/o rebar (C/D)</th>
<th>Tension Status w/ rebar (C/D)</th>
<th>Compression Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0L_d) 0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>Pass (\infty)</td>
<td>Pass (\infty)</td>
<td>Pass</td>
</tr>
<tr>
<td>(PSXFR) 0.008</td>
<td>-0.571</td>
<td>-4.758</td>
<td>-0.001</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Fail (0.82)</td>
</tr>
<tr>
<td>0.750</td>
<td>-0.546</td>
<td>-4.778</td>
<td>-0.055</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Fail (0.82)</td>
</tr>
</tbody>
</table>

For Help, press F1
The Specification Check Was Not Successful

Compressive stress check failed for Service I for the Casting Yard Stage (At Release).

**Girder Summary**

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>2</td>
</tr>
<tr>
<td>Girder</td>
<td>2</td>
</tr>
<tr>
<td>Girder Type</td>
<td>Tx46</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. (N_h + N_v)</td>
<td>58</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>14.087 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>7.328 in</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Depressed</td>
</tr>
</tbody>
</table>
**Stress Check for Service I for Casting Yard Stage (At Release) [5.9.4.1.2]**

Specification = TxDOT 2010

For temporary stresses before losses in pretensioned components
Allowable tensile stress = $0.2400 \times f_{ct} = 0.588$ KSI

Allowable tensile stress = $0.2400 \times f_{ct} = 0.588$ KSI if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.

Allowable compressive stress = $-0.65f_{ct} = -3.908$ KSI

$f_{ct}$ required to satisfy this stress check = $7.086$ KSI

<table>
<thead>
<tr>
<th>Location from End of Girder (ft)</th>
<th>Prestress $f_p$ (KSI)</th>
<th>Service I $f_s$ (KSI)</th>
<th>Demand $f_d$ (KSI)</th>
<th>Tension Status w/o rebar (C/D)</th>
<th>Compression Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0L)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>Pass (\infty)</td>
<td>Pass \infty</td>
</tr>
<tr>
<td>(PSXFR)</td>
<td>-0.796</td>
<td>-4.606</td>
<td>-0.001</td>
<td>Pass (-)</td>
<td>Fail (0.85)</td>
</tr>
<tr>
<td>0.750</td>
<td>-0.768</td>
<td>-4.627</td>
<td>-0.055</td>
<td>Pass (-)</td>
<td>Fail (0.25)</td>
</tr>
</tbody>
</table>
**Girder Details for Span 2, Girder 2**

### General

#### Strands

<table>
<thead>
<tr>
<th>Specify Number of Strands Using</th>
<th>Number of Harped and Number of Straight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>42</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>16</td>
</tr>
</tbody>
</table>

#### Condition and Rating

| Calculate Jacking Force | 1845.59 kip | 703.08 kip |

#### Vertical Location of Harped Strands

- **Girder Ends**: Distance between Top-Most Harped Strand and Girder Bottom
  - 42.500 in
  - (Valid Range 16.500 to 42.500)
- **Harping Points**: ____________________________ in

#### Prestressing Strand Type

- Permanent
  - Grade 270 Low Relaxation 0.6"
The Specification Check Was Not Successful

Compressive stress check failed for Service I for the Casting Yard Stage (At Release).

Tensile stress check failed for Service III for the Final with Live Load Stage (Bridge Site 3).

**Girder Summary**

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Span</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder</td>
<td>2</td>
</tr>
<tr>
<td>Girder Type</td>
<td>T46</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. (N_h + N_l)</td>
<td>58</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>13.811 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>8.838 in</td>
</tr>
</tbody>
</table>
## Span 2 Details

### General
- **Number of Girders:** 16
- **Start of Span:** 8.000 in
- **End of Span:** 8.000 in

### Girders
- **Girder:** 1-16
- **Name:** Tx46

### Girder Spacing
- **Girder Spacing:**
  - **Start of Span:** Measured normal to alignment at CL pier
  - **End of Span:** Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier 2</th>
<th>1-16 (ft)</th>
<th>Ahead</th>
<th>Allowable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5.589</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pier 3</th>
<th>1-16 (ft)</th>
<th>Back</th>
<th>Allowable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5.589</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

### Locate
- **Center of Girders:**
  - **0.000 ft from Bridge Line**
Design Outcome

The design for Span 2 Girder 2 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>1757.70 kip</td>
<td>1669.82 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>351.54 kip</td>
<td>527.31 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped strand group at ends of girder</td>
<td>42.500 in</td>
<td>42.500 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of harped strand group at harping point</td>
<td>2.500 in</td>
<td>2.500 in</td>
</tr>
<tr>
<td>$f_{ci}$</td>
<td>6.000 KSI</td>
<td>6.000 KSI</td>
</tr>
<tr>
<td>$f_c$</td>
<td>7.000 KSI</td>
<td>8.500 KSI</td>
</tr>
</tbody>
</table>

Design Notes:

Warning: The designed girder release strength exceeds the normal value of 6.000 KSI
Concrete release strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder
Concrete final strength was controlled by Bridge Site 2, Service I, Compression, at Bottom of Girder

Update the Current Girder Parameters with the Proposed Design?

Accept the Design  Reject the Design  Help  Print
Girder Details for Span 2, Girder 2

Girder Name: T#46

This girder is used for the entire bridge

Girder Concrete Properties

Normal Weight Concrete

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release Strength, f'c</td>
<td>5150  KSI</td>
</tr>
<tr>
<td>Final Strength, f'c</td>
<td>7.000 KSI</td>
</tr>
<tr>
<td>Eci</td>
<td>4681  KSI</td>
</tr>
<tr>
<td>Ec</td>
<td>5000  KSI</td>
</tr>
</tbody>
</table>

Slab Offset ("A" Dimension)

A single Slab Offset is used for the entire bridge

Start of Girder: 8.000 in  End of Girder: 8.000 in
### Girder Details for Span 2, Girder 2

#### General

<table>
<thead>
<tr>
<th>Condition and Rating</th>
<th>Long. Reinforcement</th>
<th>Trans. Reinforcement</th>
<th>Strand Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number of Harped and Number of Straight</td>
</tr>
</tbody>
</table>

#### Strand Details

<table>
<thead>
<tr>
<th>Specify Number of Strands Using</th>
<th>Number of Straight Strands</th>
<th>Number of Harped Strands</th>
<th>Calculate Jacking Force</th>
<th>Jacking Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Harped and Straight</td>
<td>40</td>
<td>8</td>
<td>1757.70</td>
<td>kip</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>351.54</td>
<td>kip</td>
</tr>
</tbody>
</table>

#### Vertical Location of Harped Strands

- **Girder Ends:** Distance between Top-Most Harped Strand and Girder Bottom
  - **Distance:** 42.500 in
  - **Valid Range:** 8.500 to 42.500 in

- **Harping Points:**
  - **Harping Points:**
  - **Harping Points:**

#### Prestressing Strand Type

- **Permanent**
  - **Grade 270 Low Relaxation 0.6"**

---

**For Help, press F1**
The Specification Check Was Not Successful

Compressive stress check failed for Service I for the Casting Yard Stage (At Release).

Girder Summary

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Span</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder</td>
<td>2</td>
</tr>
<tr>
<td>Girder Type</td>
<td>T46</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. ((N_h + N_b))</td>
<td>48</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>15.020 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>8.354 in</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Depressed</td>
</tr>
</tbody>
</table>
Stress Check for Service I for Casting Yard Stage (At Release) [5.9.4.1.2]

For temporary stresses before losses in pretensioned components:
- Allowable tensile stress: $0.2400\sqrt{f_{ci}} = 0.588$ KSI
- Allowable tensile stress: $0.2400\sqrt{f_{ci}} = 0.588$ KSI if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.
- Allowable compressive stress: $-0.65f_{ci} = -3.900$ KSI
- $f_{ci}$ required to satisfy this stress check: $6.252$ KSI

<table>
<thead>
<tr>
<th>Location from End of Girder (ft)</th>
<th>$f_t$ (KSI)</th>
<th>$f_p$ (KSI)</th>
<th>$f_s$ (KSI)</th>
<th>$f_b$ (KSI)</th>
<th>$f_t$ (KSI)</th>
<th>$f_p$ (KSI)</th>
<th>$f_s$ (KSI)</th>
<th>$f_b$ (KSI)</th>
<th>Tension Status w/ rebar (C/D)</th>
<th>Tension Status w/ rebar (C/D)</th>
<th>Compression Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0Lg)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>Pass (\infty)</td>
<td>Pass (\infty)</td>
<td>Pass (\infty)</td>
</tr>
<tr>
<td>(PSXFR)</td>
<td>0.008</td>
<td>-0.416</td>
<td>-4.064</td>
<td>-0.001</td>
<td>-0.417</td>
<td>-4.064</td>
<td>-0.417</td>
<td>-4.064</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Fail (0.95)</td>
</tr>
<tr>
<td>0.750</td>
<td>-0.394</td>
<td>-4.082</td>
<td>-0.055</td>
<td>0.043</td>
<td>-0.449</td>
<td>-4.039</td>
<td>-0.449</td>
<td>-4.039</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Fail (0.07)</td>
</tr>
</tbody>
</table>
Bridge Model View

Plan View

Abutment 1
12+4.23

Abutment 2
13+0.23

Abutment 3
14+2.33

Abutment 4
15+4.33

Abutment 5
16+6.33

Section at Station 13+75.53 - Normal to Alignment

1,000 ft

87.333 ft

1,000 ft

15 spaces @ 5.589 ft = 83.835 ft

For Help, press F1
The Specification Check was Successful

**Girder Summary**

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Span</th>
<th>Girder</th>
<th>Girder Type</th>
<th>Prestressing Strands</th>
<th>NO. ((N_{h} + N_{s}))</th>
<th>Size</th>
<th>Strength</th>
<th>Eccentricity @ CL</th>
<th>Eccentricity @ End</th>
<th>Prestressing Strands</th>
<th>NO. (# of Harped Strands)</th>
<th>(Y_{c}) of Topmost Depressed Strand(s) @ End</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tx46</td>
<td></td>
<td>48</td>
<td>0.600 in Dia.</td>
<td>Grade 270 Low Relaxation</td>
<td>14.854 in</td>
<td>7.354 in</td>
<td>Depressed</td>
<td>12</td>
<td>42.500 in</td>
</tr>
</tbody>
</table>
**Stress Check for Service I for Casting Yard Stage (At Release) [5.9.4.1.2]**

For temporary stresses before losses in pretensioned components

Allowable tensile stress = \(0.2400 \times f_{ci} = 0.588\) KSI

Allowable tensile stress = \(0.2400 \times f_{ci} = 0.588\) KSI if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.

Allowable compressive stress = \(-0.65f_{ci} = -3.900\) KSI

\(f_{ci}\) required to satisfy this stress check = 5.987 KSI

<table>
<thead>
<tr>
<th>Location from End of Girder (ft)</th>
<th>Prestress</th>
<th>Service I</th>
<th>Demand</th>
<th>Tension Status w/o rebar (C/D)</th>
<th>Tension Status w/ rebar (C/D)</th>
<th>Compression Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>((0.0L_g)) 0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>Pass ((\infty))</td>
<td>Pass ((\infty))</td>
<td>Pass ((\infty))</td>
</tr>
<tr>
<td>((PSXFR) 0.008)</td>
<td>-0.665</td>
<td>-3.892</td>
<td>-0.001</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Pass (1.00)</td>
</tr>
<tr>
<td>0.750</td>
<td>-0.640</td>
<td>-3.912</td>
<td>-0.055</td>
<td>Pass (-)</td>
<td>Pass (-)</td>
<td>Pass ((\infty))</td>
</tr>
</tbody>
</table>
Stress Check for Tensile Stresses for Service III for Final with Live Load (Bridge Site 3) [5.9.4.2.2]

For stresses at service limit state after losses which involve traffic loading in members with bonded prestressing tendons other than piles
Allowable tensile stress in the precompressed tensile zone = 0.1900 f'_c = 0.554 KSI

f'c required to satisfy this stress check = 7.084 KSI

<table>
<thead>
<tr>
<th>Location from Left Support (ft)</th>
<th>Prestress f'p (KSI)</th>
<th>Service III f'p (KSI)</th>
<th>Demand f'p (KSI)</th>
<th>Tension Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.0Lc) 0.000</td>
<td>-2.941</td>
<td>0.000</td>
<td>-2.941</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>3.083</td>
<td>-3.016</td>
<td>0.475</td>
<td>-2.541</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>(H) 4.375</td>
<td>-3.047</td>
<td>0.666</td>
<td>-2.381</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>11.200</td>
<td>-3.216</td>
<td>1.602</td>
<td>-1.614</td>
<td>Pass (-)</td>
</tr>
<tr>
<td>(0.1Lc) 11.800</td>
<td>-3.231</td>
<td>1.678</td>
<td>-1.553</td>
<td>Pass (-)</td>
</tr>
</tbody>
</table>
Girder Details for Span 2, Girder 2

General | Strands | Long. Reinforcement | Trans. Reinforcement | Condition and Rating
---|---|---|---|---

Girder Name: T046

This girder is used for the entire bridge

Girder Concrete Properties

Normal Weight Concrete

Release Strength, f'ci: 6.000 KSI

Final Strength, f'c: 7.1 KSI

Eci: 4453 KSI

Ec: 5000 KSI

More Properties...

Slab Offset ("A" Dimension)

A single Slab Offset is used for the entire bridge

Start of Girder: 8.000 in

End of Girder: 8.000 in

OK  Cancel  Help
The Specification Check was Successful

**Girder Summary**

Note: A Non-Standard Strand Fill Was Used For This Design

<table>
<thead>
<tr>
<th>TxDOT Girder Schedule</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>2</td>
</tr>
<tr>
<td>Girder</td>
<td>2</td>
</tr>
<tr>
<td>Girder Type</td>
<td>T46</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. ((N_h + N_s))</td>
<td>48</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>14.854 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>7.354 in</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Depressed</td>
</tr>
<tr>
<td>NO. (# of Harped Strands)</td>
<td>12</td>
</tr>
<tr>
<td>Yc of Topmost Depressed Strand(s) @ End</td>
<td>42.500 in</td>
</tr>
</tbody>
</table>
Girder Details for Span 2, Girder 15

Strand Details
Specify Number of Strands Using: Number of Harped and Number of Straight

- Number of Straight Strands: 36
- Number of Harped Strands: 12
- Calculate Jacking Force: 1115.37 kip
- Calculate Jacking Force: 371.79 kip

Vertical Location of Harped Strands

- Girder Ends: Distance between Top-Most Harped Strand and Girder Bottom: 42.500 in (Valid Range 12.500 to 42.500)
- Harping Points: 

Prestressing Strand Type
Permanent

Grade 270 Low Relaxation 1/2"
Bridge Model View

Plan View

Section at Station 13+75.53 - Normal to Alignment

1,000 ft

87.333 ft

1,000 ft

15 spaces @ 5.589 ft = 83.835 ft

15 spaces @ 5.589 ft = 83.835 ft

For Help, press F1
Design Outcome

The design for Span 2 Girder 15 was successful.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>54</td>
<td>36</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>1673.06 kip</td>
<td>1115.37 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>619.65 kip</td>
<td>371.79 kip</td>
</tr>
<tr>
<td>Distance from bottom of girder to top of harped</td>
<td>42.50 in</td>
<td>42.50 in</td>
</tr>
<tr>
<td>Distance from bottom of girder to bottom of</td>
<td>2.50 in</td>
<td>2.50 in</td>
</tr>
<tr>
<td>harped strand group at ends of girder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$f_{ci}$</td>
<td>6.400 KSI</td>
<td>6.000 KSI</td>
</tr>
<tr>
<td>$f_{c}$</td>
<td>7.700 KSI</td>
<td>7.100 KSI</td>
</tr>
</tbody>
</table>

Design Notes:

Warning: The designed girder release strength exceeds the normal value of 6,000 KSI.
Concrete release strength was controlled by Casting Yard, Service I, Compression, at Bottom of Girder...
**Girder Details for Span 2, Girder 15**

<table>
<thead>
<tr>
<th>General</th>
<th>Strands</th>
<th>Long. Reinforcement</th>
<th>Trans. Reinforcement</th>
<th>Condition and Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder Name</td>
<td>T x 46</td>
<td></td>
<td></td>
<td>This girder is used for the entire bridge</td>
</tr>
</tbody>
</table>

**Girder Concrete Properties**

- **Normal Weight Concrete**
  - Release Strength, f′c: 5,400 KSI
  - Ec: 4,610 KSI
  - Final Strength, f′c: 7,700 KSI
  - Ec: 5,000 KSI

**Slab Offset ("A" Dimension)**

A single Slab Offset is used for the entire bridge

- Start of Girder: 8,000 in
- End of Girder: 8,000 in

[OK] [Cancel] [Help]
Girder Details for Span 2, Girder 15

General | Strands | Long. Reinforcement | Trans. Reinforcement | Condition and Rating
--- | --- | --- | --- | ---

Girder Name: T4x6

This girder is used for the entire bridge

Girder Concrete Properties

Normal Weight Concrete

Release Strength, f'ci: 6 KSI

Final Strength, f'c: 8.5 KSI

More Properties...

Slab Offset ("A" Dimension)

A single Slab Offset is used for the entire bridge

Start of Girder: 8.000 in
End of Girder: 8.000 in
### Girder Details for Span 2, Girder 15

#### General
- **Specify Number of Strands Using**: Total Number of Permanent Strands

#### Strand Details
- **Number of Straight**: 54, **Harged**: 20
- **Total Number of Permanent**: 74
- **Calculate Jacking Force**: 2292.71 kip

#### Vertical Location of Harped Strands
- **Girder Ends**: Distance between Top-Most Harped Strand and Girder Bottom = 42.500 in (Valid Range 20.500 to 42.500)
- **Harping Points**:

#### Prestressing Strand Type
- **Permanent**: Grade 270 Low Relaxation 1/2"
### Girder Details for Span 2, Girder 15

**General**

**Strands**

**Long. Reinforcement**

**Trans. Reinforcement**

**Condition and Rating**

#### Strand Details

Specify Number of Strands Using: **Number of Harped and Number of Straight**

- **Number of Straight Strands**: 54
- **Calculate Jacking Force**: 1673.06 kip
- **Number of Harped Strands**: 20
- **Calculate Jacking Force**: 619.65 kip

#### Vertical Location of Harped Strands

- **Girder Ends**: Distance between Top-Most Harped Strand and Girder Bottom: 42.500 in
- (Valid Range 20.500 to 42.500)

#### Prestressing Strand Type

- **Permanent**
- **Grade 270 Low Relaxation 1/2"**

---

For Help, press F1
Girder Details for Span 2, Girder 15

General | Strands | Long. Reinforcement | Trans. Reinforcement | Condition and Rating

Strand Details
Specify Number of Strands Using: Number of Harped and Number of Straight

- Number of Straight Strands: 52
- Number of Harped Strands: 22
- Calculate Jacking Force: 1611.09 kip
- Calculate Jacking Force: 681.62 kip

Vertical Location of Harped Strands
Girder Ends: Distance between Top-Most Harped Strand and Girder Bottom: 42.500 in
(Valid Range 22.500 to 42.500)

Harping Points: in

Prestressing Strand Type
Permanent
Grade 270 Low Relaxation 1/2"
The Specification Check Was Not Successful

Compressive stress check failed for Service I for the Casting Yard Stage (At Release).

Tensile stress check failed for Service III for the Final with Live Load Stage (Bridge Site 3).

**Girder Summary**

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>2</td>
</tr>
<tr>
<td>Girder</td>
<td>15</td>
</tr>
<tr>
<td>Girder Type</td>
<td>Tx46</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. ((N_h + N_s))</td>
<td>74</td>
</tr>
<tr>
<td>Size</td>
<td>0.500 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>12.198 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>6.950 in</td>
</tr>
</tbody>
</table>
**Girder Summary**

Note: A Non-Standard Strand Fill Was Used For This Design

---

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>2</td>
</tr>
<tr>
<td>Girder</td>
<td>2</td>
</tr>
<tr>
<td>Girder Type</td>
<td>Tx46</td>
</tr>
<tr>
<td>Prestressing Strands Total</td>
<td>48</td>
</tr>
<tr>
<td>NO. (N_h + N_s)</td>
<td>48</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>14.854 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>7.354 in</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Depressed</td>
</tr>
</tbody>
</table>
### Span 2 Details

#### General
- The number of girders is defined span by span.
- The same slab offset is used for the entire bridge.

#### Number of Girders
- Number of Girders: 15
- Start of Span: 8.000 in
- End of Span: 8.000 in

#### Girder Information
- **Girder 1-15**
  - **Name**: Tx46

---

#### Girder Spacing is Defined Span by Span
- **Use same girder spacing at both ends of span**

#### Start of Span
- **GirderSpacing**: Measured normal to alignment at CL pier
- **Pier 2**: 1-15 (ft)
  - **Ahead**: 5.589 in
  - **Allowable**: 3.000 or more

#### Locate
- **Center of Girders**: 0.000 ft from **Bridge Line**

#### End of Span
- **GirderSpacing**: Measured normal to alignment at CL pier
- **Pier 3**: 1-15 (ft)
  - **Back**: 5.589 in
  - **Allowable**: 3.000 or more

#### Locate
- **Center of Girders**: 0.000 ft from **Bridge Line**
### Span 2 Details

#### General

- **The number of girders is defined span by span**
- **The same slab offset is used for the entire bridge**

<table>
<thead>
<tr>
<th>Number of Girders</th>
<th>Start of Span</th>
<th>End of Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>8.000 in</td>
<td>8.000 in</td>
</tr>
</tbody>
</table>

#### Girder Details

- **This type of girder is used for the entire bridge**

<table>
<thead>
<tr>
<th>Girder</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-15</td>
<td>Tx46</td>
</tr>
</tbody>
</table>

#### Girder Spacing

- **Girder spacing is defined span by span**
- **Use same girder spacing at both ends of span**

<table>
<thead>
<tr>
<th>Start of Span</th>
<th>Girder Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pier 2</td>
<td>1-15 (ft)</td>
</tr>
<tr>
<td></td>
<td>Ahead 5.589 ft</td>
</tr>
<tr>
<td></td>
<td>Allowable 3.000 or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Locate</th>
<th>Center of Girders</th>
<th>0.000 ft from Bridge Line</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>End of Span</th>
<th>Girder Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pier 3</td>
<td>1-15 (ft)</td>
</tr>
<tr>
<td></td>
<td>Back 5.589 ft</td>
</tr>
<tr>
<td></td>
<td>Allowable 3.000 or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Locate</th>
<th>Center of Girders</th>
<th>0.000 ft from Bridge Line</th>
</tr>
</thead>
</table>
Span 2 Details

**General**

- The number of girders is defined span by span
- The same slab offset is used for the entire bridge

**Number of Girders**

- 15

**Start of Span**

- 8.000 in

**End of Span**

- 8.000 in

**This type of girder is used for the entire bridge**

- Name: Tx46

**Girder spacing is defined span by span**

- Use same girder spacing at both ends of span

**Start of Span**

- Girder Spacing: Measured normal to alignment at CL pier

**Pier 2**

- Girder 1-15
- Ahead: 0.000 ft
- Allowable: 3.000

**Locate**

- Center of Girders: 0.000 ft from Bridge Line

**End of Span**

- Girder Spacing: Measured normal to alignment at CL pier

**Pier 3**

- Girder 1-15 (ft)
- Back: 5.589
- Allowable: 3.000 or more

**Locate**

- Center of Girders: 0.000 ft from Bridge Line

[OK] [Cancel] [Help]
The number of girders is defined span by span. The same slab offset is used for the entire bridge.

**Number of Girders**: 15
**Start of Span**: 8.000 in
**End of Span**: 8.000 in

This type of girder is used for the entire bridge:

**Girder**: 1-15
**Name**: Tx46

Girder spacing is defined span by span:

- **Use same girder spacing at both ends of span**
- **Start of Span**
  - **Girder Spacing**
  - **Measured normal to alignment at CL pier**
  - **Pier 2**: 1-2 (ft)  2-3 (ft)  3-4 (ft)  4-5 (ft)  5-6 (ft)  6-7 (ft)  7-8 (ft)
  - **Ahead**: 5.589  5.589  5.589  5.589  5.589  5.589  5.589
  - **Allowable**: 3.000 or more  3.000 or more  3.000 or more  3.000 or more  3.000 or more  3.000 or more  3.000 or more
- **Locate**: Center of Girders
  - **0.000 ft from Bridge Line**

- **End of Span**
  - **Girder Spacing**
  - **Measured normal to alignment at CL pier**
  - **Pier 3**: 1-2 (ft)  2-3 (ft)  3-4 (ft)  4-5 (ft)  5-6 (ft)  6-7 (ft)  7-8 (ft)
  - **Back**: 5.589  5.589  5.589  5.589  5.589  5.589  5.589
  - **Allowable**: 3.000 or more  3.000 or more  3.000 or more  3.000 or more  3.000 or more  3.000 or more  3.000 or more
- **Locate**: Center of Girders
  - **0.000 ft from Bridge Line**
Span 2 Details

General | Connections | Girder

The number of girders is defined span by span. The same slab offset is used for the entire bridge.

Number of Girders: 15
Start of Span: 8.000 in, End of Span: 8.000 in

This type of girder is used for the entire bridge:
Girder: 1-15
Name: Tx46

Girder spacing is defined span by span.

Use same girder spacing at both ends of span:

Start of Span: Girder Spacing: Measured normal to alignment at CL pier

End of Span: Girder Spacing: Measured normal to alignment at CL pier

For Help, press F1
### Span 2 Details

**General**

- **The number of girders is defined span by span**
- **The same slab offset is used for the entire bridge**

- **Number of Girders:** 15
- **Start of Span:** 8.000 in
- **End of Span:** 8.000 in

**This type of girder is used for the entire bridge**

**Name:** Tx46

**Girder spacing is defined span by span**

- **Use same girder spacing at both ends of span**

**Start of Span**

<table>
<thead>
<tr>
<th>Pier 2</th>
<th>1-4 (ft)</th>
<th>4-5 (ft)</th>
<th>5-6 (ft)</th>
<th>6-7 (ft)</th>
<th>7-8 (ft)</th>
<th>8-9 (ft)</th>
<th>9-10 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahead</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
</tr>
<tr>
<td>Allowable</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

**Locate:** Center of Girders: 0.000 ft from Bridge Line

**End of Span**

<table>
<thead>
<tr>
<th>Pier 3</th>
<th>1-4 (ft)</th>
<th>4-5 (ft)</th>
<th>5-6 (ft)</th>
<th>6-7 (ft)</th>
<th>7-8 (ft)</th>
<th>8-9 (ft)</th>
<th>9-10 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
</tr>
<tr>
<td>Allowable</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

**Locate:** Center of Girders: 0.000 ft from Bridge Line

[OK] [Cancel] [Help]
**Span 2 Details**

**General**
- The same slab offset is used for the entire bridge.

**Number of Girders**
- Number of Girders: 15
  - Start of Span: 8.000 in
  - End of Span: 8.000 in

**Girder**
- Type: Tx46

**Girder spacing is defined span by span**
- Use same girder spacing at both ends of span.

**Start of Span**
- Girder Spacing: Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier</th>
<th>1-4 (ft)</th>
<th>4-10 (ft)</th>
<th>10-11 (ft)</th>
<th>11-12 (ft)</th>
<th>12-13 (ft)</th>
<th>13-14 (ft)</th>
<th>14-15 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahead</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
</tr>
<tr>
<td>Allowable</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

**Locate**: Center of Girders, 0.000 ft from Bridge Line

**End of Span**
- Girder Spacing: Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier</th>
<th>1-4 (ft)</th>
<th>4-10 (ft)</th>
<th>10-11 (ft)</th>
<th>11-12 (ft)</th>
<th>12-13 (ft)</th>
<th>13-14 (ft)</th>
<th>14-15 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
<td>5.589</td>
</tr>
<tr>
<td>Allowable</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
</tr>
</tbody>
</table>

**Locate**: Center of Girders, 0.000 ft from Bridge Line

---

**For Help, press F1**
Span 2 Details

General | Connections | Girders
---|---|---

The number of girders is defined span by span. The same slab offset is used for the entire bridge.

Number of Girders: 15
Start of Span: 8,000 in
End of Span: 8,000 in

This type of girder is used for the entire bridge:

Girder: 1-15
Name: Tx46

Girder spacing is defined span by span.

Use same girder spacing at both ends of span:

Start of Span: 1-4 (ft) | 4-10 (ft) | 10-11 (ft) | 11-12 (ft) | 12-13 (ft) | 13-14 (ft) | 14-15 (ft)
---|---|---|---|---|---|---
Ahead: 5.589 | 5.589 | Expand | | | | | | 5.589
Allowable: 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more

Locate: Center of Girders 0.000 ft from Bridge Line

End of Span: 1-4 (ft) | 4-10 (ft) | 10-11 (ft) | 11-12 (ft) | 12-13 (ft) | 13-14 (ft) | 14-15 (ft)
---|---|---|---|---|---|---
Back: 5.589 | 5.589 | | | | | | | 5.589
Allowable: 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more | 3.000 or more

Locate: Center of Girders 0.000 ft from Bridge Line

OK | Cancel | Help

For Help, press F1
### Span 2 Details

#### General

- **The number of girders is defined span by span**
- **The same slab offset is used for the entire bridge**

<table>
<thead>
<tr>
<th>Number of Girders</th>
<th>Start of Span</th>
<th>End of Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>8.000 in</td>
<td>8.000 in</td>
</tr>
</tbody>
</table>

- **This type of girder is used for the entire bridge**

<table>
<thead>
<tr>
<th>Girder</th>
<th>Name</th>
<th>Tx46</th>
</tr>
</thead>
</table>

- **Girder spacing is defined span by span**

- **Use same girder spacing at both ends of span**

<table>
<thead>
<tr>
<th>Pier</th>
<th>1-4 (ft)</th>
<th>4-12 (ft)</th>
<th>12-13 (ft)</th>
<th>13-14 (ft)</th>
<th>14-15 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ahead</td>
<td>Allowable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pier 2</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
</tr>
<tr>
<td>Pier 3</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
</tr>
</tbody>
</table>

- **Locate**

<table>
<thead>
<tr>
<th>Center of Girders</th>
<th>0.000 ft</th>
<th>from Bridge Line</th>
</tr>
</thead>
</table>

- **End of Span**

<table>
<thead>
<tr>
<th>Pier</th>
<th>1-4 (ft)</th>
<th>4-12 (ft)</th>
<th>12-13 (ft)</th>
<th>13-14 (ft)</th>
<th>14-15 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Back</td>
<td>Allowable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pier 2</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
</tr>
<tr>
<td>Pier 3</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
<td>3.000 or more</td>
<td>5.589</td>
</tr>
</tbody>
</table>

- **Locate**

<table>
<thead>
<tr>
<th>Center of Girders</th>
<th>0.000 ft</th>
<th>from Bridge Line</th>
</tr>
</thead>
</table>

### Diagram

- **Bridge Model View**

- **1.000 ft**
- **2.759 ft**
- **1 ft**

For Help, press F1
Span 2 Details

General | Connections | Girders

The number of girders is defined span by span
The same slab offset is used for the entire bridge

Number of Girders: 15
Start of Span: 8.000 in
End of Span: 8.000 in

This type of girder is used for the entire bridge

Girder: 1-15
Name: T4x6

Girder spacing is defined span by span
Use same girder spacing at both ends of span

Start of Span: 1-4 (ft)
Girder Spacing: 5.589 ft
Measured normal to alignment at CL pier

Pier 2
1-4 (ft) 4-12 (ft) 12-13 (ft) 1
Ahead 5.589 5.589 5.589
Allowable 3.000 or more 3.000 or more 3.000 or more 3.000 or more

Locate Center of Girders 0.000 ft from Bridge Line

End of Span: 14-15 (ft)
Girder Spacing: 5.589 ft
Measured normal to alignment at CL pier

Pier 3
1-4 (ft) 4-12 (ft) 12-13 (ft) 13-14 (ft) 14-15 (ft)
Back 5.589 5.589 5.589 5.589 5.589
Allowable 3.000 or more 3.000 or more 3.000 or more 3.000 or more 3.000 or more

Locate Center of Girders 0.000 ft from Bridge Line

OK Cancel Help
### Span 2 Details

#### General

- The number of girders is defined span by span. The same slab offset is used for the entire bridge.
- Number of Girders: 15
- Start of Span: 8.000 in
- End of Span: 8.000 in

#### Girder

- **Name**: Tx46

#### Girder Spacing is defined span by span

- **Use same girder spacing at both ends of span**
- **Start of Span**
  - Girder Spacing: Measured normal to alignment at CL pier
  - Allowable: 3.000 or more, 3.000 or more, 3.000 or more
  - Locate: Center of Girders
  - 0.000 ft from Bridge Line

- **End of Span**
  - Girder Spacing: Measured normal to alignment at CL pier
  - Allowable: 3.000 or more, 3.000 or more, 3.000 or more
  - Locate: Center of Girders
  - 0.000 ft from Bridge Line
Span 2 Details

**General**

The number of girders is defined span by span. The same slab offset is used for the entire bridge.

- **Number of Girders**: 15
- **Start of Span**: 8.000 in
- **End of Span**: 8.000 in

**Connections**

This type of girder is used for the entire bridge.

- **Name**: Tx46

**Girders**

Girder spacing is defined span by span.

- **Use same girder spacing at both ends of span**: Check box

**Start of Span**

- **Girder Spacing**: Measured normal to alignment at CL pier
- **Pier 2**: 1-4 (ft) 4-12 (ft) 12-15 (ft)
  - **Ahead**: 5.589 6.287 5.589
  - **Allowable**: 3.000 or more 3.000 or more 3.000 or more
- **Locate**: Center of Girders 0.000 ft from Bridge Line

**End of Span**

- **Girder Spacing**: Measured normal to alignment at CL pier
- **Pier 3**: 1-4 (ft) 4-12 (ft) 12-15 (ft)
  - **Back**: 5.589 6.834 5.589
  - **Allowable**: 3.000 or more 3.000 or more 3.000 or more
- **Locate**: Center of Girders 0.000 ft from Bridge Line

**OK** | **Cancel** | **Help**
The Specification Check was Successful

Girder Summary

Note: A Non-Standard Strand Fill Was Used For This Design

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th>Span</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder</td>
<td>5</td>
</tr>
<tr>
<td>Girder Type</td>
<td>Tx40</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Total</td>
</tr>
<tr>
<td>NO. (N_h + N_s)</td>
<td>48</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>14.854 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>7.354 in</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Depressed</td>
</tr>
<tr>
<td>NO. (# of Harped Strands)</td>
<td>12</td>
</tr>
<tr>
<td>Y_c of Topmost Depressed Strand(s) @ End</td>
<td>42.500 in</td>
</tr>
</tbody>
</table>
The Specification Check was not successful.

Compressive stress check failed for Service I for the Superimposed Dead Load Stage (Bridge Site 2).

**Girder Summary**

Note: A Non-Standard Strand Fill was used for this design.

**TxDOT Girder Schedule**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Span</td>
<td>2</td>
</tr>
<tr>
<td>Girder</td>
<td>5</td>
</tr>
<tr>
<td>Girder Type</td>
<td>TxD40</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>48</td>
</tr>
<tr>
<td>NO. (N_h + N_s)</td>
<td>48</td>
</tr>
<tr>
<td>Size</td>
<td>0.600 in Dia.</td>
</tr>
<tr>
<td>Strength</td>
<td>Grade 270 Low Relaxation</td>
</tr>
<tr>
<td>Eccentricity @ CL</td>
<td>14.854 in</td>
</tr>
<tr>
<td>Eccentricity @ End</td>
<td>7.354 in</td>
</tr>
<tr>
<td>Prestressing Strands</td>
<td>Depressed</td>
</tr>
</tbody>
</table>
### Bridge Model View

#### Plan View

<table>
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<tr>
<th>Nr</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>59 ft</td>
<td>60 ft</td>
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<td></td>
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<tr>
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<td></td>
</tr>
</tbody>
</table>

#### Section at Station 13+43.86 - Normal to Alignment

- 1,000 ft
- 87.333 ft
- 1,000 ft

- 2.78 ft spaces @ 5.589 ft = 16.787 ft
- 7 spaces @ 7.186 ft = 50.302 ft
- 3 spaces @ 5.589 ft = 16.787 ft
Span 2 Details

General

The number of girders is defined span by span
The same slab offset is used for the entire bridge

Number of Girders: 15
Start of Span: 8.000 in
End of Span: 8.000 in

This type of girder is used for the entire bridge

Girder: 1-15
Name: Tx46

Girder spacing is defined span by span

☑ Use same girder spacing at both ends of span

Start of Span
Girder Spacing: Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier 2</th>
<th>1-4 (ft)</th>
<th>4-12 (ft)</th>
<th>12-15 (ft)</th>
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<tbody>
<tr>
<td>Ahead</td>
<td>5.589</td>
<td>6.287</td>
<td>5.589</td>
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<td>Allowable: 3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
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Locate: Center of Girders from Bridge Line

End of Span
Girder Spacing: Measured normal to alignment at CL pier

<table>
<thead>
<tr>
<th>Pier 3</th>
<th>1-4 (ft)</th>
<th>4-12 (ft)</th>
<th>12-15 (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>5.589</td>
<td>6.834</td>
<td>5.589</td>
</tr>
<tr>
<td>Allowable: 3.000 or more</td>
<td>3.000 or more</td>
<td>3.000 or more</td>
<td></td>
</tr>
</tbody>
</table>

Locate: Center of Girders from Bridge Line

OK  Cancel  Help
<p>| | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>7x48</td>
<td>22</td>
<td>1/2</td>
<td>270</td>
<td>16.88</td>
<td>13.42</td>
<td>4</td>
<td>12.5</td>
<td>4.000</td>
<td>5.000</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1/2</td>
<td></td>
<td></td>
<td></td>
<td>4.000</td>
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</tr>
<tr>
<td>1</td>
<td>2</td>
<td>T</td>
<td>22</td>
<td>1</td>
<td>270</td>
<td>16.88</td>
<td>13.42</td>
<td>4</td>
<td>12.5</td>
<td>4.000</td>
<td>5.000</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>T</td>
<td>48</td>
<td>5</td>
<td>270</td>
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<td>6.000</td>
<td>7.100</td>
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<tr>
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<td>4</td>
<td>T</td>
<td>48</td>
<td>5</td>
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<td>7.100</td>
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<tr>
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<td>5</td>
<td>T</td>
<td>48</td>
<td>5</td>
<td>270</td>
<td>14.85</td>
<td>7.35</td>
<td>12</td>
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<td>6.000</td>
<td>7.100</td>
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<tr>
<td>4</td>
<td>2</td>
<td>T</td>
<td>22</td>
<td>1</td>
<td>270</td>
<td>16.88</td>
<td>13.42</td>
<td>4</td>
<td>12.5</td>
<td>4.000</td>
<td>5.000</td>
</tr>
<tr>
<td>1&amp;4</td>
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<td>TX46</td>
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<td>1/2</td>
<td>270</td>
<td>16.88</td>
<td>13.42</td>
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<td>12.5</td>
<td>4.000</td>
<td>5.000</td>
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<tr>
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<td>270</td>
<td>14.85</td>
<td>7.35</td>
<td>12</td>
<td>42.5</td>
<td>6.000</td>
<td>7.100</td>
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</tbody>
</table>
HL93 LOADING

Texas Department of Transportation
Bridge Division

PRESTRESSED CONCRETE
I-GIRDER DESIGNS
(NON-STANDARD SPANS)

IGND

FILE: igndstel.dgn
DN: JMH
TXDOT: June 2007

REVISIONS
02/09: General Notes.
10/09: General Notes.
12/10: Rel Strength & LLDF.

FEDERAL AID PROJECT
SHEET

COUNTY
CONTROL SECT
JOB
HIGHWAY
<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>SPAN NO.</th>
<th>GIRDERS NO.</th>
<th>GIRDERS TYPE</th>
<th>MIN-20 STRANDS</th>
<th>TOTAL NO.</th>
<th>P resisting STRANDS</th>
<th>CONCRETE</th>
<th>DESIGN LOAD COMPOUND STRESS</th>
<th>DESIGN LOAD SERVICE STRESS</th>
<th>REQUIRED MINIMUM ULTIMATE STRESS</th>
<th>LIVE LOAD DISTRIBUTION FACTOR</th>
</tr>
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<td>BELLA BLVD UNDERPASS</td>
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<td>T x 48</td>
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<td>-1.963</td>
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<tr>
<td></td>
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<td>22</td>
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<td>4.558</td>
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## Non-Standard Strand Patterns

<table>
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<tr>
<th>Pattern</th>
<th>Strand Arrangement at L of Girder</th>
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</thead>
<tbody>
<tr>
<td>*</td>
<td>2.5 (14), 4.5 (14), 6.5 (14), 8.5 (2), 10.5 (2), 12.5 (2)</td>
</tr>
</tbody>
</table>

**General Notes:**

Designed in accordance with AASHTO LRFD Specifications. All concrete must be Class H. Provide Class H (HPC) if shown.
Alternate Designs

Standard Design
1/2” Strand
With Overlay

22 Girders
Alternate Designs

Non-Standard Design
1/2” Strand
With Overlay

19 Girders
Alternate Designs

Standard Design
0.6” Strand
No Overlay

19 Girders
Alternate Designs

Non-Standard Design
0.6” Strand
No Overlay

16 Girders

Saves: 1434 LF of Tx46
Questions

- Email me at:
  - Victoria.McCammon@txdot.gov

- Email Taya Retterer at:
  - taya.retterer@txdot.gov