



Section 1 - Bridge Superstructure PC/Pretensioned Bulb-Tee Girder (Harped Strands)

XS Sheet Numbers:

XS 1-121-2

Description of Component:

Precast Pretensioned Bulb-Tee Girder with Harped Strands

Standard Drawing Features:

1) Elevation:

- Girder Length “L” needs to be provided. If different girder lengths are used, fill out the table.
- Shear stirrups spacing in regions A, B, C, etc, shall be provided and the table may be used. #5 stirrups are preferred. Caltrans study has shown that #5@3 inches at “D” distance from girder ends satisfies girder web splitting force and local strut & tie analysis.
- “Y” dimension shall be provided to the table. Manufacturers prefer “Y” number as small as possible. But designer needs to calculate the tensile stress at girder top to meet the allowable stress requirements. Variation of 3 inches of “Y” should be considered in the calculations.
- Number of Intermediate diaphragms should be designed based on MTD 11-8 and detailed accordingly.
- Special details shall be provided if girder ends are not leveled.

2) Typical Girder Section:

- Girder Depth “D” shall be provided and may be shown on the table.
- The spacing for #3 confinement reinforcement is required not to exceed 6 inches based on AASHTO LRFD Article 5.9.4.4.2. within 1.5D from girder ends. This sheet provides #3@4 inches within 1.5D and #3@12 inches at rest of the girder.

3) Section A-A:

- The stirrups for splitting resistance should be verified based on AASHTO LRFD 5.9.4.4 - Pretensioned Anchorage Zone. Other standard confinement details are provided for this area to develop the strands (see note of Typical Girder Section). End blocks are normally not needed unless design requires.

4) Clearances for Pretension Strands:

- This detail shows strands at mid-span range.

5) Girder Table:

- Table shall be used for specifying girder length, girder depth, jacking forces at 4 inches and 6 inches of “X”, areas of strands, “Y”, concrete strength, mid-



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span deflections due to deck dead load and additional load such as barrier railing. Additional top reinforcement at girder ends may be needed if temporary tensile stress exceeds the allowable stress as specified in AASHTO LRFD Bridge Specifications. With designed additional top reinforcement, the temporary tensile stress limits could be increased per Table 5.9.2.3.1b-1 of AASHTO LRFD Bridge Specifications. If different girders exist, Girder A, B, C, symbols may be used to identify each of them. In some cases, especially for long span girders, prestress force may be controlled by strength limit state. In order to reduce initial concrete strength, designer could reduce the initial jacking force from maximum 75% to a lower percentage (such as 72%) to meet the requirements of service limit state. At the same time, using extra area of strands to meet the requirements of strength limit state.

6) Strand Extension Hook Detail (At Bent):

- Per Caltrans EQ Committee's request and SDC 2.0, the details have been added and the designer shall determine numbers of required strands hooked according to the requirements of seismic design of precast bridge systems.

Design/General Notes:

Several notes, including the maximum tensile stress limit (75%) and the maximum temporary tensile stress limit (80%), have been moved to standard specifications.

One design option is to add temporary top prestressing strands which gives the designer a choice to reduce girder concrete strength at release.

Additional Drawings Needed to Complete PS&E:

This sheet works with XS 1-121-3

Contract Specifications:

Standard Specifications 2018

Restrictions on Use of Standard Drawings:

The project designer and project engineer are responsible for designing this sheet and stamping this sheet.

Special Considerations:

The project designer and project engineer may modify this sheet based on project needs. Caltrans designers are urged to consult with the Concrete Design Committee on



Caltrans® User Guide to Bridge Standard Detail Sheets

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any design change to the girder cross-section. Consultant designers may check with the precast industry (PCI West).