PS8 – Prestressed I Beam Thicker Web

This example describes how to define thicker web of prestressed I girder stem near the support. This example *assumes access to* Example7 (BID10) in the sample database from the installation.

## Topics Covered

- Define thicker webs near support for prestressed I girder.
- Compare prestressed I girder ratings between girders with and without thicker web definitions.

## Define thicker webs near support for prestressed I girder.

### Analysis Results

Open the bridge **Example7 (BID10)** from the **Bridge Explorer** and rate girder **G1** with vehicle **HS 20-44** in **Inventory** and **Operating** using Load Factor Rating (**LFR** Analysis). Rating results are shown below.



The rating is controlled by concrete design shear at the right support.

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## Beam Details

To define thicker web at the supports, open the **Beam Details** window of Girder **G1**.



Navigate to the **Web end block** tab to enter a thicker web information as shown below.



Click **OK** to apply the data and close the window.

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## Compare prestressed I girder ratings between with and without thicker web definitions.

Rerun the **LFR Analysis** as done previously. The results for rating an **HS 20-44** vehicle using **Load Factor Rating** are shown below.

Analysis Results - Exterior Member

Print
Print

Report type:
Rating Results Summary

Lane/Impact loading type
● As requested   ○ Detailed

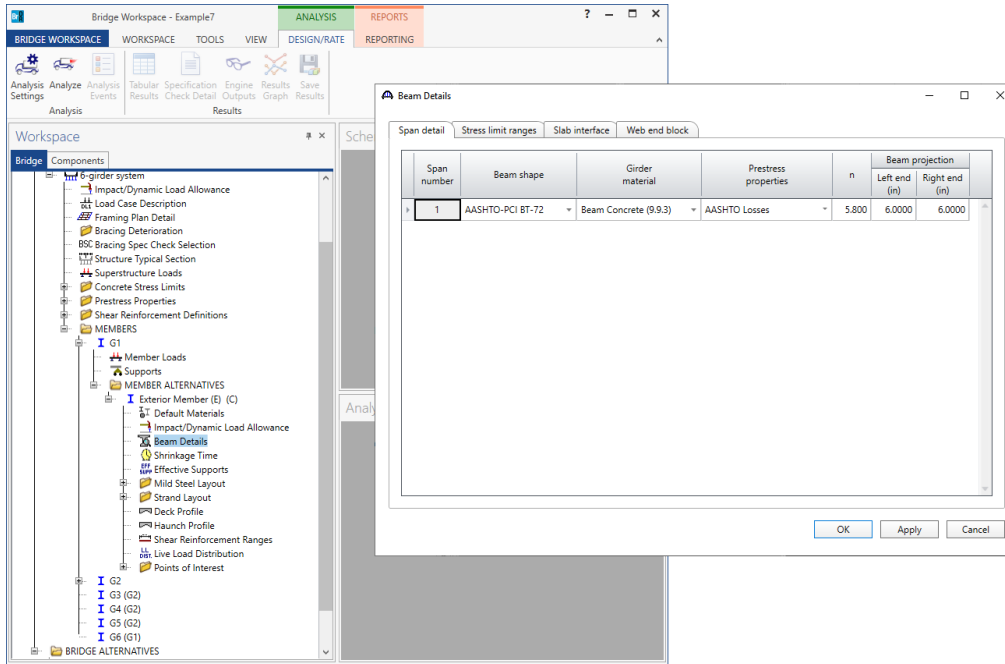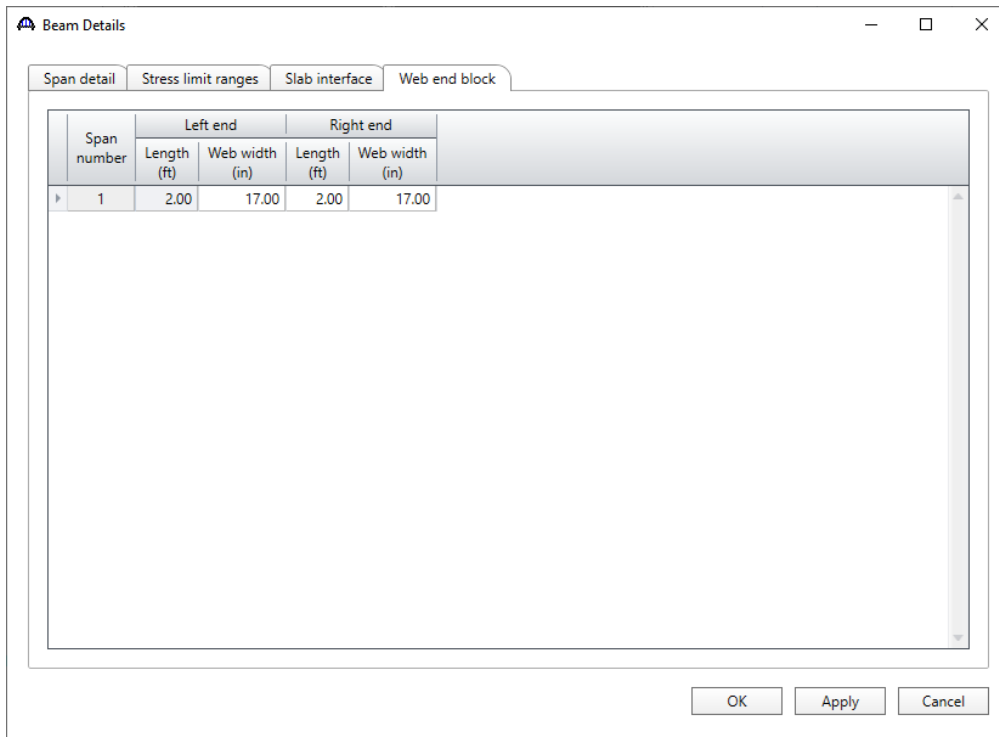Display Format
Single rating level per row

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Location (ft) | Location Span-(%) | Limit State | Impact | Lane |
|---|---|---|---|---|---|---|---|---|---|---|
| HS 20-44 | Axle Load | LFR | Inventory | 55.47 | 1.541 | 60.00 | 1 - (50.0) | PS Tensile Stress - Concrete | As Requested | As Requested |
| HS 20-44 | Axle Load | LFR | Operating | 106.73 | 2.965 | 3.33 | 1 - (2.8) | Design Shear - Concrete | As Requested | As Requested |
| HS 20-44 | Lane | LFR | Inventory | 61.64 | 1.712 | 60.00 | 1 - (50.0) | PS Tensile Stress - Concrete | As Requested | As Requested |
| HS 20-44 | Lane | LFR | Operating | 111.63 | 3.101 | 3.33 | 1 - (2.8) | Design Shear - Concrete | As Requested | As Requested |

AASHTO LFR Engine Version 7.5.0.3001

Analysis preference setting: None

Close

After defining thicker web at supports of **G1**, rating is controlled by PS tensile stress at mid span.

# PS8 – Prestressed I Beam Thicker Web
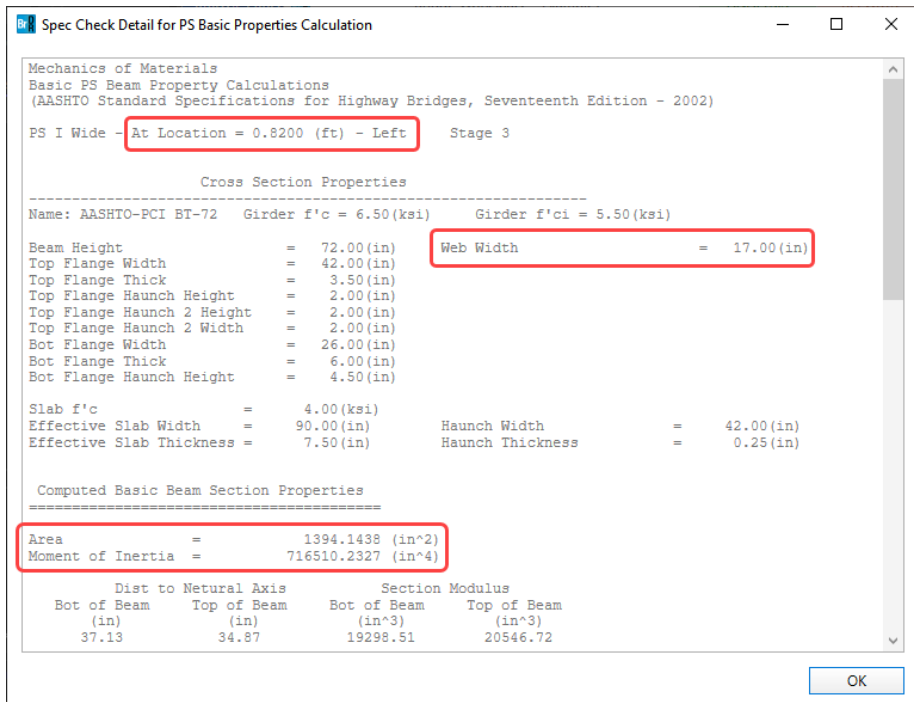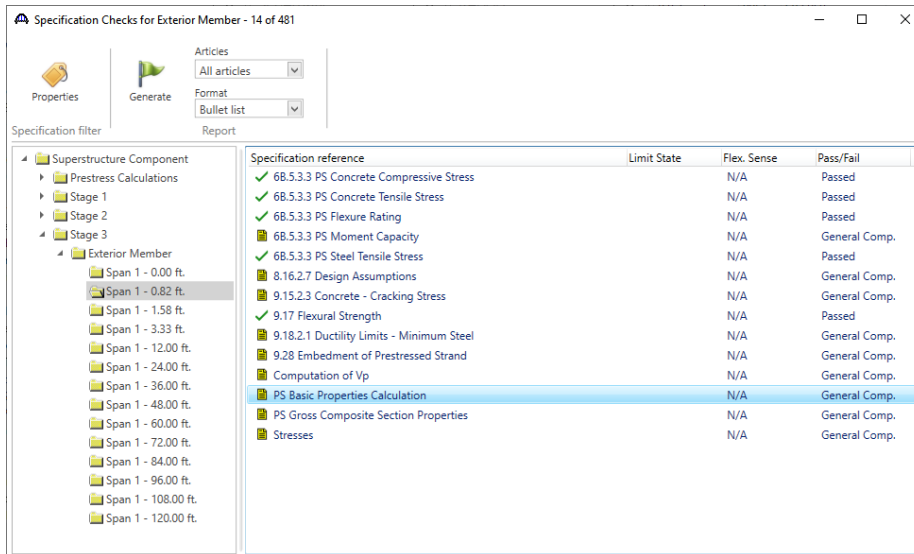
Open the **Specification Checks** window by clicking on the **Specification Check Detail** button from the **Results** group of the **DESIGN/RATE** ribbon.
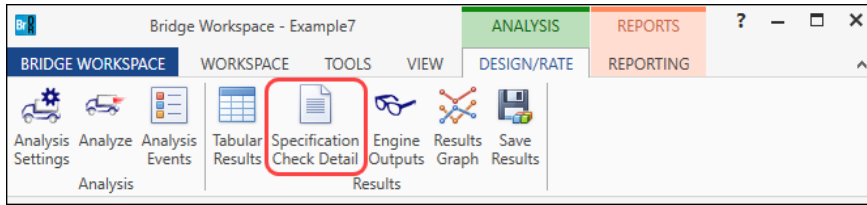


Compare the PS basic properties calculation article between location near support and mid span.

*@ Span 1 – 0.82 ft (near support)*

# PS8 – Prestressed I Beam Thicker Web

## @ *Span 1 – 60 ft (mid-span)*



Specification Checks for Exterior Member - 21 of 481

**Articles:** All articles
**Format:** Bullet list

| Specification reference | Limit State | Flex. Sense | Pass/Fail |
|---|---|---|---|
| ✓ 6B.5.3.3 PS Concrete Compressive Stress | | N/A | Passed |
| ✓ 6B.5.3.3 PS Concrete Tensile Stress | | N/A | Passed |
| ✓ 6B.5.3.3 PS Flexure Rating | | N/A | Passed |
| 📄 6B.5.3.3 PS Moment Capacity | | N/A | General Comp. |
| ✓ 6B.5.3.3 PS Shear Rating | | N/A | Passed |
| ✓ 6B.5.3.3 PS Steel Tensile Stress | | N/A | Passed |
| 📄 8.16.2.7 Design Assumptions | | N/A | General Comp. |
| 📄 9.15.2.3 Concrete - Cracking Stress | | N/A | General Comp. |
| ✓ 9.17 Flexural Strength | | N/A | Passed |
| 📄 9.18.2.1 Ductility Limits - Minimum Steel | | N/A | General Comp. |
| 📄 9.20.1.3 Nominal Shear Capacity | | N/A | General Comp. |
| 📄 9.20.2.1 Shear Strength Provided by Concrete | | N/A | General Comp. |
| 📄 9.20.2.2 Shear Strength Provided by Concrete | | N/A | General Comp. |
| 📄 9.20.2.3 Shear Strength Provided by Concrete | | N/A | General Comp. |
| 📄 9.20.2.5 Shear Strength Provided by Concrete | | N/A | General Comp. |
| 📄 9.20.3.1 Shear Strength Provided by Web Reinforcement | | N/A | General Comp. |
| 📄 9.28 Embedment of Prestressed Strand | | N/A | General Comp. |
| 📄 Computation of Vp | | N/A | General Comp. |
| 📄 PS Basic Properties Calculation | | N/A | General Comp. |
| 📄 PS Gross Composite Section Properties | | N/A | General Comp. |
| 📄 Stresses | | N/A | General Comp. |

Superstructure Component
- Prestress Calculations
- Stage 1
- Stage 2
- Stage 3
  - Exterior Member
    - Span 1 - 0.00 ft.
    - Span 1 - 0.82 ft.
    - Span 1 - 1.58 ft.
    - Span 1 - 3.33 ft.
    - Span 1 - 12.00 ft.
    - Span 1 - 24.00 ft.
    - Span 1 - 36.00 ft.
    - Span 1 - 48.00 ft.
    - Span 1 - 60.00 ft.
    - Span 1 - 72.00 ft.
    - Span 1 - 84.00 ft.
    - Span 1 - 96.00 ft.
    - Span 1 - 108.00 ft.
    - Span 1 - 120.00 ft.

### Spec Check Detail for PS Basic Properties Calculation

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Mechanics of Materials
Basic PS Beam Property Calculations
(AASHTO Standard Specifications for Highway Bridges, Seventeenth Edition - 2002)

PS I Wide - At Location = 60.0000 (ft) - Left      Stage 3


                Cross Section Properties
---------------------------------------------------------------
Name: AASHTO-PCI BT-72   Girder f'c = 6.50(ksi)      Girder f'ci = 5.50(ksi)

Beam Height            =    72.00(in)    Web Width            =     6.00(in)
Top Flange Width       =    42.00(in)
Top Flange Thick       =     3.50(in)
Top Flange Haunch Height =   2.00(in)
Top Flange Haunch 2 Height =  2.00(in)
Top Flange Haunch 2 Width =   2.00(in)
Bot Flange Width       =    26.00(in)
Bot Flange Thick       =     6.00(in)
Bot Flange Haunch Height =   4.50(in)

Slab f'c            =     4.00(ksi)
Effective Slab Width    =    90.00(in)    Haunch Width    =    42.00(in)
Effective Slab Thickness =   7.50(in)     Haunch Thickness =    0.25(in)


 Computed Basic Beam Section Properties
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Area            =         767.0000 (in^2)
Moment of Inertia =      545857.2181 (in^4)

      Dist to Netural Axis          Section Modulus
  Bot of Beam   Top of Beam     Bot of Beam    Top of Beam
    (in)          (in)            (in^3)         (in^3)
    36.60         35.40          14912.64       15421.29
```