AASHTOWare BrDR 7.5.0 Prestress Tutorial 8 Prestressed I Beam Thicker Web

## PS8 – Prestressed I Beam Thicker Web

### **BrDR** Training

#### 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.

🕰 Analysis Re	sults - Exteri	ior Member							-	- 🗆	Х
Print Print											
Report type:		C Lane/	Impact load	ing type	Display	Format					
Rating Results	Summary	~ O			led Single	rating leve	l per row	$\sim$			
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	34.14	0.948	120.00	1 - (100.0)	Design Shear - Concrete	As Requested	As Requested	1
HS 20-44	Axle Load	LFR	Operating	57.01	1.583	120.00	1 - (100.0)	Design Shear - Concrete	As Requested	As Requested	ī -
HS 20-44	Lane	LFR	Inventory	35.70	0.992	120.00	1 - (100.0)	Design Shear - Concrete	As Requested	As Requested	ī –
HS 20-44	Lane	LFR	Operating	59.62	1.656	120.00	1 - (100.0)	Design Shear - Concrete	As Requested	As Requested	1
ASHTO LFR En	gine Versior	7.5.0.3001									
analysis prefere	-										
										Clos	

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

## PS8 – Prestressed I Beam Thicker Web

### Beam Details

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

	Bridge Workspace - Example7	ANALYSIS		REPOR	TS					? -	□ ×	1							
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	⊨ mr 6-girder system	^				Span umber		Beam shap	e		Girder material		Prestress properties		n		Right end		
	Impact/Dynamic Load Allowance				_		-			1				_		(in)	(in)		
	🛲 Framing Plan Detail				•	1	AASHT	O-PCI BT-7	2 *	Beam C	oncrete (9.9	3) -	AASHTO Losses	Ť	5.800	6.0000	6.0000		
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	Structure Typical Section																		
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Navigate to the **Web end block** tab to enter a thicker web information as shown below.

Bea	m Details					- 0	
pa	n detail	Stress lin	nit ranges	Slab inter	face Web e	block	
	-	Le	ft end	Ric	ht end		
	Span number	Length (ft)	Web width (in)				
Þ	1	2.00	17.00	2.00	17.00		-

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

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

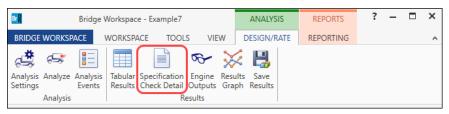
Rerun the LFR Analysis as done previously. The results for rating an HS 20-44 vehicle using Load Factor Rating are shown below.

Analysis Re	sults - Exter	or Member								- 0	×
eport type: Rating Results	Summary		'Impact Ioadi As requeste		Single	r Format rating leve	l 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	
ASHTO LFR En nalysis prefere	-										

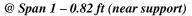
After defining thicker web at supports of G1, rating is controlled by PS tensile stress at mid span.

### Specification Check Detail

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.



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			Specification			Limit State		Flex. Sense	Pass/Fai		
	ture Componen ss Calculations	t		PS Concrete Compre	essive Stress	Limit State		N/A	Passed		
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Stage 2				PS Flexure Rating				N/A	Passed		
🖌 🚞 Stage 3			🗎 6B.5.3.3 I	PS Moment Capacity	/			N/A	Genera	l Com	ıp
🔺 🚞 Exte	erior Member		✓ 68.5.3.3 I	PS Steel Tensile Stres	is			N/A	Passed		
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# PS8 – Prestressed I Beam Thicker Web

## @ Span 1 - 60 ft (mid-span)

Articles         All articles         All articles         All articles         Format         Bullet list         Bullet list         Bullet list         Superstructure Component         Prestress Calculations         Stage 1         Stage 2         Stage 3         Span 1 - 0.00 ft.         Span 1 - 0.82 ft.         Span 1 - 0.82 ft.         Span 1 - 1.20 ft.         Span 1 - 1.20 ft.         Span 1 - 1.20 ft.         Span 1 - 2400 ft.         Span 1 - 3.33 ft.         Span 1 - 3.60 ft.         Span 1 - 3.60 ft.         Span 1 - 48.00 ft.         Span 1 - 48.00 ft.         Span 1 - 60.00 ft.         Span 1 - 60.00 ft.	imit State Flex. Sen N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	se Pass/Fail Passed Passed General Comp. Passed Passed General Comp.
Properties       Generate       Format Bullet list         Superstructure Component       Report         Superstructure Component       Specification reference       L         Stage 1       Stage 2       68.5.33 PS Concrete Tensile Stress       68.5.33 PS Clearce Tensile Stress         Stage 3       68.5.33 PS Flexure Rating       68.5.33 PS Shore Rating       68.5.33 PS Shore Rating         Span 1 - 0.00 ft.       Span 1 - 0.02 ft.       9.15.23 Concrete - Cracking Stress       9.15.23 Concrete - Cracking Stress         Span 1 - 1.58 ft.       Span 1 - 12.00 ft.       9.15.2.3 Concrete - Cracking Stress       9.17 Flexural Strength         Span 1 - 3.33 ft.       Span 1 - 24.00 ft.       9.17 Flexural Strength       9.18.2.1 Ductility Limits - Minimum Steel         Span 1 - 48.00 ft.       Span 1 - 48.00 ft.       9.20.2.1 Shear Strength Provided by Concrete	N/A N/A N/A N/A N/A N/A N/A	Passed Passed Passed General Comp. Passed Passed
Bullet list       Cification filter     Report       Superstructure Component     >       >      Specification reference       >      Stage 1       >      Stage 2       >      Stage 2       >      Stage 2       >      Stage 3       >      Exterior Member       >      Span 1 - 0.00 ft.       >      Span 1 - 0.02 ft.       >      Span 1 - 0.28 ft.       >      Span 1 - 1.58 ft.       >      Span 1 - 1.200 ft.       >      Span 1 - 24.00 ft.       >      Span 1 - 24.00 ft.       >      Span 1 - 24.00 ft.       >      Span 1 - 48.00 ft.       >      Span 1 - 48.00 ft.       >      Span 1 - 48.00 ft.	N/A N/A N/A N/A N/A N/A N/A	Passed Passed Passed General Comp. Passed Passed
Superstructure Component       Specification reference       L         Image: Stage 1       ✓ 68.5.3.3 PS Concrete Compressive Stress         Image: Stage 2       ✓ 68.5.3.3 PS Concrete Tensile Stress         Image: Stage 3       ✓ 68.5.3.3 PS Flexure Rating         Image: Stage 3       ✓ 68.5.3.3 PS Shore Rating         Image: Stage 3       ✓ 68.5.3.3 PS Shore Rating         Image: Stage 1       ✓ 68.5.3.3 PS Shore Rating         Image: Stage 3       ✓ 68.5.3.3 PS Shore Rating         Image: Stage 1       ♥ 50.5.3 PS Shore Rating     <	N/A N/A N/A N/A N/A N/A N/A	Passed Passed Passed General Comp. Passed Passed
<ul> <li>Prestress Calculations</li> <li>Stage 1</li> <li>Stage 2</li> <li>Stage 3</li> <li>Exterior Member</li> <li>Span 1 - 0.00 ft.</li> <li>Span 1 - 0.82 ft.</li> <li>Span 1 - 1.58 ft.</li> <li>Span 1 - 1.200 ft.</li> <li>Span 1 - 1.200 ft.</li> <li>Span 1 - 1.200 ft.</li> <li>Span 1 - 2.400 ft.</li> <li>Span 1 - 3.33 ft.</li> <li>Span 1 - 3.00 ft.</li> <li>Span 1 - 3.00 ft.</li> <li>Span 1 - 48.00 ft.</li> <li>Span 1 - 48.00 ft.</li> </ul>	N/A N/A N/A N/A N/A N/A N/A	Passed Passed Passed General Comp. Passed Passed
<ul> <li>Stage 1</li> <li>Stage 2</li> <li>Stage 3</li> <li>Exterior Member</li> <li>Span 1 - 0.82 ft.</li> <li>Span 1 - 1.58 ft.</li> <li>Span 1 - 1.20 ft.</li> <li>Span 1 - 12.00 ft.</li> <li>Span 1 - 44.00 ft.</li> <li>Span 1 - 48.00 ft.</li> <li>Span</li></ul>	N/A N/A N/A N/A N/A N/A	Passed Passed General Comp. Passed Passed
<ul> <li>Stage 2</li> <li>Stage 3</li> <li>Exterior Member</li> <li>Span 1 - 0.00 ft.</li> <li>Span 1 - 0.02 ft.</li> <li>Span 1 - 0.82 ft.</li> <li>Span 1 - 1.58 ft.</li> <li>Span 1 - 1.58 ft.</li> <li>Span 1 - 1.200 ft.</li> <li>Span 1 - 12.00 ft.</li> <li>Span 1 - 48.00 ft.</li></ul>	N/A N/A N/A N/A N/A	Passed General Comp. Passed Passed
▲	N/A N/A N/A N/A N/A	General Comp. Passed Passed
▲	N/A N/A N/A N/A	Passed Passed
Image: Span 1 - 0.00 ft.       Image: Span 1 - 0.82 ft.         Image: Span 1 - 0.82 ft.       Image: Span 1 - 0.82 ft.         Image: Span 1 - 1.58 ft.       Image: Span 1 - 1.58 ft.         Image: Span 1 - 1.58 ft.       Image: Span 1 - 1.58 ft.         Image: Span 1 - 1.58 ft.       Image: Span 1 - 1.58 ft.         Image: Span 1 - 1.58 ft.       Image: Span 1 - 1.58 ft.         Image: Span 1 - 1.200 ft.       Image: Span 1 - 1.200 ft.         Image: Span 1 - 24.00 ft.       Image: Span 1 - 26.00 ft.         Image: Span 1 - 24.00 ft.       Image: Span 1 - 26.00 ft.         Image: Span 1 - 24.00 ft.       Image: Span 1 - 26.00 ft.         Image: Span 1 - 24.00 ft.       Image: Span 1 - 26.00 ft.         Image: Span 1 - 26.00 ft.       Image: Span 1 - 26.00 ft.         Image: Span 1 - 28.00 ft.       Image: Span 1 - 28.00 ft.         Image: Span 1 - 28.00 ft.       Image: Span 1 - 28.00 ft.         Image: Span 1 - 28.00 ft.       Image: Span 20.2 ft.         Image: Span 1 - 28.00 ft.       Image: Span 20.2 ft.         Image: Span 1 - 28.00 ft.       Image: Span 20.2 ft.         Image: Span 1 - 28.00 ft.       Image: Span 20.2 ft.         Image: Span 1 - 28.00 ft.       Image: Span 20.2 ft.         Image: Span 1 - 28.00 ft.       Image: Span 20.2 ft.         Image: Span 1 - 28.00 ft.	N/A N/A N/A	Passed
Span 1 - 0.82 ft.       8.16.2.7 Design Assumptions         Span 1 - 1.58 ft.       9.15.2.3 Concrete - Cracking Stress         Span 1 - 3.33 ft.       9.17 Flexural Strength         Span 1 - 24.00 ft.       9.18.2.1 Ductility Limits - Minimum Steel         Span 1 - 48.00 ft.       9.20.2.1 Shear Strength Provided by Concrete         Span 1 - 48.00 ft.       9.20.2.1 Shear Strength Provided by Concrete	N/A N/A N/A	
	N/A N/A	deneral comp.
	N/A	General Comp.
Span 1 - 12.00 ft. Span 1 - 24.00 ft. Span 1 - 36.00 ft. Span 1 - 48.00 ft. Span 1 - 48.		Passed
Span 1 - 24.00 ft.  Span 1 - 36.00 ft.  Span 1 - 48.00 ft.  Span 1 - 48.00 ft.  9 - 20.2.1 Shear Strength Provided by Concrete  9 - 20.2.2 Shear Strength Provided by Concrete	N/A	General Comp.
Span 1 - 48.00 ft. 9 20.2.2 Shear Strength Provided by Concrete 9 20.2.2 Shear Strength Provided by Concrete	N/A	General Comp.
9 20 2 2 Shear Strength Provided by Concrete	N/A	General Comp.
	N/A	General Comp.
Span 1 - 72.00 ft.	N/A	General Comp.
Span 1 - 84.00 ft.	N/A	General Comp.
Span 1 - 96.00 ft.	N/A	General Comp.
Span 1 - 108.00 ft. 9.28 Embedment of Prestressed Strand	N/A	General Comp.
🔄 Span 1 - 120.00 ft.	N/A	General Comp.
PS Basic Properties Calculation	N/A	General Comp.
<ul> <li>PS Gross Composite Section Properties</li> <li>Stresses</li> </ul>	N/A N/A	General Comp. General Comp.
Spec Check Detail for PS Basic Properties Calculation		- 🗆
25 I Wide - At Location = 60.0000 (ft) - Left Stage 3 Cross Section Properties		
Tame: AASHTO-PCI BT-72 Girder f'c = 6.50(ksi) Girder f'c =	5.50(ksi)	
Beam Height = 72.00(in) Web Width	=	6.00(in)
op Flange Width = 42.00(in)		
op Flange Thick = 3.50(in) op Flange Haunch Height = 2.00(in)		
op Flange Haunch 2 Height = 2.00(in)		
op Flange Haunch 2 Width = 2.00(in) Bot Flange Width = 26.00(in)		
Sot Flange Width = $20.00(1n)$ Sot Flange Thick = $6.00(in)$		
Bot Flange Haunch Height = 4.50(in)		
(lab f'c) = 4.00 (ksi)		
	=	42.00(in)
	=	0.25(in)
ffective Slab Width = 90.00(in) Haunch Width ffective Slab Thickness = 7.50(in) Haunch Thickness		
Effective Slab Width = 90.00(in) Haunch Width Effective Slab Thickness = 7.50(in) Haunch Thickness Computed Basic Beam Section Properties		
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Effective Slab Width = 90.00(in) Haunch Width Effective Slab Thickness = 7.50(in) Haunch Thickness Computed Basic Beam Section Properties		
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Effective Slab Width = 90.00(in) Haunch Width Effective Slab Thickness = 7.50(in) Haunch Thickness Computed Basic Beam Section Properties Harea = 767.0000 (in^2) Moment of Inertia = 545857.2181 (in^4)		
Effective Slab Width = 90.00(in) Haunch Width Effective Slab Thickness = 7.50(in) Haunch Thickness Computed Basic Beam Section Properties		