AASHTOWare BrDR 7.5.0 Reinforced Concrete Structure Tutorial RC7-Varied Flange Width RC Tee Beam Section Properties Example

## RC7 – Varied RC Tee Beam Section Properties

This example describes the entry of an RC tee beam cross section using the **Allow flange width to vary** option. This feature is only available in schedule based tee beam cross sections. This example assumes access to **RCTrainingBridge1** (BID11) delivered with the BrDR sample database from the installation.

### **Topics** Covered

- Enter varied RC tee beam section properties
- Compare spec check details at different locations

#### Enter varied RC tee beam section properties

Open **RCTrainingBridge1** from the Bridge Explorer, expand **Schedule Based RC Structure** superstructure definition, **G2** member and **Schedule Based Tee** member alternative as shown below.



#### Girder Profile

Double-click on **Girder profile** in the **Bridge Workspace** for the **Schedule Based Tee** member alternative to open the **Girder Profile** window as shown below.

A Girder Profile	– 🗆 X
Type: Reinforced Concrete Tee Section Web depth Reinforcement	
Allow flange width to vary	
Tributary width: 96.0000 in Top 1	flange
Mat	erial: Class A (US)
	width (Std): 72.0000 in width (LRFD): 96.0000 in
Stru	ct. thick: 6.5000 in
24.0000 in A: Othe	er parts
CJ: In Mat	erial: Class A (US)
	OK Apply Cancel

Check the Allow flange width to vary check box and enter data as shown below in the Section tab.

Class A (US)       Class A (US)       Class A (US)       1       0.00       57.50       65.50       65.50       96.00       96.00       72.00       96.0	Gird	ler Profile Reinforced Concre	ete 1	[PP															-		
Allow flange width to vary       A:       in       C.:       in         Top flange material       Other part material       Support (ft)       Start (ft)       End (ft)       Top (ft)       Top flange (ft)       Top flange tickness (in)       Start tributary width (in)       End (ft)       Start tributary tributary width (in)       End (ft)       Start tributary tributary tributary tributary tributary       Start tributary tributary tributary tributary       Start tributary tributary tributary tributary tributary       Start tributary tributary tributary tributary       Start tributary tributary tributary tributary tributary       Start tributary t	Sect	tion Web depth	ſ	Web width Rein	for	cement															
Top flange material       Other part material       Support part material       Start class A (US)       Other part material       Support sumber       Start clistance (ft)       Length (ft)       End clistance (ft)       Top flange thickness (in)       Start thickness (in)       End thickness (in)       Start thickness (in)       Start thickness (in)       Start thickness (in)       Start thickness (in)       Start thickness (in)       Start thickness (in)       End thickness (in)       Start thickness (in)<	/ A	Allow flange width t	to va	ary A:		in	CJ:	in													
Class A (US)       *       Class A (US)       *       1       *       0.00       57.50       6.50       6.50       72.00       96.00       72.00       96.00           *       Class A (US)       *       Class A (US)       *       1       *       57.50       196.50       6.50       96.00       96.00       72.00       96.00       96.00		Top flange material		Other part material		Support number	Start distance (ft)	Length (ft)	End distance (ft)	Top flange total thickness (in)	Top flange structural thickness (in)	Start tributary width (in)	End tributary width (in)	Start effective flange width (LRFD) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	Top flange n	Other parts n		
▶ Class A (US) ▼ Class A (US) ▼ 1 ▼ 57.50 196.50 254.00 6.50 6.50 96.00 96.00 72.00 72.00 96.00 96.00		Class A (US)	•	Class A (US)	•	1 -	0.00	57.50	57.50	6.50	6.50	72.00	96.00	60.00	72.00	72.00	96.00				-
New Desirate Delete	Þ	Class A (US)	-	Class A (US)	•	1 *	57.50	196.50	254.00	6.50	6.50	96.00	96.00	72.00	72.00	96.00	96.00				
																	Nava	Duslis		Delete	

Select the Web Width tab and enter constant web width as shown below.

А	A Girder Profile										-		×
Ţ	Type: Reinforced Concrete Tee												
	Section Web depth Web width Reinforcement												
		Top begin width (in)	Top end width (in)	Bottom begin width (in)	Bottom end width (in)	Support number	Start distance (ft)	Length (ft)	End distance (ft)				
	Þ	24.00	24.00	24.00	24.00	1 *	0.00	254.00	254.00			4	-
													~
										New Duplicate		Delete	
										OK Apply		Cance	el

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

# LFR analysis

To perform an LFR rating, select the Analysis Settings button on the Analysis group of the DESIGN/RATE ribbon to open the window shown below.

Bridge W	orkspace - RCTrainingBridge1	ANALYSIS	REPORTS	?	-	×
BRIDGE WORKSPACE	WORKSPACE TOOLS VIEW	DESIGN/RATE	REPORTING			^
at a 🗄	]	2 🖪				
Analysis Analyze Analys Settings Event	is Tabular Specification Engine Rest s Results Check Detail Outputs Gra	ults Save ph Results				
Analysis	Results					

Click the Open Template button and select the HS 20 LFR Rating to be used in the rating and click OK.

Analysis Settings – – – – – – – – – – – – – – – – – – –			-			
Design review       Rating         nalysis type:       Line Girder         ane / Impact loading type:       As Requested         Vehicles       Output         Engine       Description         Traffic directions:       Image: Constraint of the selection         Vehicle selection       Vehicle summary         Image: Standard       Vehicle summary         Ima	Analysis Settings			-		×
nalysis type: ine Girder A Requested Apply preference setting: None Vehicles Output Engine Description Traffic direction: Both directions Vehicles Advanced Vehicle selection Vehicles Vehicle	O Design review	Rating method:	LFR	~		
Apply preference setting: None   Apply preference setting: None   Apply preference setting: None    Apply preference setting: None    Advanced	nalysis type: Line Girder					
Vehicles Traffic direction: Both directions       Vehicle selection     Vehicle summary	ne / Impact loading type: As Requested	Apply preference setting:	None	~		
Traffic direction: Both directions           Vehicle selection       Refresh       Temporary vehicles       Advanced         Image: Standard       Image: Standard       Image: Standard       Image: Standard       Image: Standard         Image: Standard       Image: Standard       Image: Standard       Image: Standard       Image: Standard       Image: Standard         Image: Standard       Image: Standard       Image: Standard       Image: Standard       Image: Standard       Image: Standard         Image: Standard	Vehicles Output Engine Description					
Vehicle selection Vehicle summary          Image: Standard Image: Standa	Traffic direction: Both directions	Refresh	Temporary vehicles	Advanced	]	
B→Vehicles P→Standard Alternate Military Loading + EV2 + EV2 + EV3 + H 20-44 + H 20-44 + H 2 0-44 + H 2 0-44 + H 2 0-44 + H 2 0-44 - H 2 0-44 - Legal operating - Permit inventory - Legal operating - Permit operating - Permit operating - Permit operating - Permit operating - Permit operating - Permit operating - NRL - SU6 - SU5 - SU	Vehicle selection	Vehicle summar	y			
	<ul> <li>➡-Vehicles</li> <li>➡-Standard</li> <li>➡-Alternate Military Loading</li> <li>➡-EV2</li> <li>₩EV3</li> <li>➡ H 15-44</li> <li>➡H 20-44</li> <li>➡HS 15-44</li> <li>➡HS 20-44</li> <li>➡NRL</li> <li>➡SU4</li> <li>➡SU5</li> <li>➡SU6</li> <li>➡SU7</li> <li>➡Type 3-3</li> <li>\_Type 3S2</li> <li>➡Agency</li> <li>➡User defined</li> <li>➡Temporary</li> </ul>	Add to Ad	cles y 0-44 ng 0-44 verating vventory perating			

# Compare spec check details at different locations

Bridge Workspace - RCTraini	ngBridge1	ANALYSIS	REPORTS	?	_	□ ×
BRIDGE WORKSPACE WORKSPACE	TOOLS VIEW	DESIGN/RATE	REPORTING			^
Analysis Settings Analysis Analysis Analysis Analysis Events Analysis Events	cation Engine Resu Detail Outputs Gra Results	ults Save ph Results				
Analysis						_ 🗆 ×
Analysis - Schedule Based Tee						<b>▼</b> ×
<ul> <li>         Ø Analysis Event         Ø         Schedule Based Tee         </li> </ul>	<ul> <li>Location - 97.6c</li> <li>Location - 107.4</li> <li>Location - 117.2</li> <li>Location - 127.0</li> <li>Location - 136.8</li> <li>Location - 166.2</li> <li>Location - 166.4</li> <li>Location - 166.2</li> <li>Location - 168.8</li> <li>Location - 191.6</li> <li>Location - 191.6</li> <li>Location - 191.4</li> <li>Location - 207.2</li> <li>Location - 207.2</li> <li>Location - 238.4</li> <li>Location - 238.4</li> <li>Location - 246.2</li> <li>Location - 246.2</li> <li>Location - 238.4</li> <li>Location - 246.2</li> <li>Location - 254.0</li> <li>Completed Specific</li> <li>Info - Populating Lip</li> <li>Info - Analysis comp</li> </ul>	00 (ft) 000 (ft	composite (stage 1). osite (short term) (s	tage 3)		~
	🔅 🖸 Errors 🔬 Warning	15				
	Туре	Description				Close

Next click the Analyze button on the Analysis group of the DESIGN/RATE ribbon to perform the rating.

When the rating is finished, click the **Specification Check Detail** button from the **Results** group of the **DESIGN/RATE** ribbon to view the article list for each point of interest.



A Specification (	Checks for Sched	lule Based Tee -	7 of 217				_		>
		Articles							
		All articles	$\sim$						
Properties	Generate	Format							
		Bullet list	$\sim$						
Specification filter		Report							
🔺 🛄 Sch	edule Based Tee	•	^	Specification reference	Limit State	Flex. Sense	Pass/Fa	il	_
	Span 1 - 0.00 ft.			✓ 6B.4.1 RC Flexure Rating General Concrete Flexure		N/A	Passed		
	Span 1 - 7.80 ft.			✓ 6B.4.1 RC Shear Rating General Concrete Shear		N/A	Passed		
	Span 1 - 15.60 f	t.		8.16.2.7 Design Assumptions		N/A	Genera	al Comp	p.
	Span 1 - 23.40 f	t.		✓ 8.16.3 Flexural		N/A	Passed		
	Span 1 - 31.20 f	t.	- 11	8.16.6.1 Shear Strength		N/A	Genera	al Comp	p.
	Span 1 - 39.00 f	t.	-	8.16.6.2.1 Shear in Beams and One-Way Slabs and Footings		N/A	Genera	al Com	ρ.
_	Span I - 46.80 f	t.		8.16.6.3 Shear Strength Provided by Shear Reinforcement		N/A	Genera	al Comr	n.
	Span 1 - 54.60 f	t.							
	Span 1 - 62.40 f	t.							
<u> </u>	Span 1 - 70.20 f	t.							
<u> </u>	Span 1 - 78.00 f	t.	$\sim$						

#### Open the Flexural article **8.16.3** for **Span 1** at **39.0 ft** as shown below.

#### Comparing article 8.16.3 Flexural at different locations, different flange widths are used for analysis.



Rec Check Detail for 8.16.3 Flexural	- 0	×
8 Reinforced Concrete 8.16 Strength Design Method ( 8.16.3 Flexure (AASHTO Standard Specification	Load Factor Design) ons for Highway Bridges, Seventeenth Edition - 2002)	^
RC T-Beam - At Location = 78.	0000 (ft) - Left	
Cross Sec	tion Properties	
Total height = 78.00(in) Flange Width = 72.00(in) Flange Thick = 6.50(in) No fillet specified. Area = 2184.00(in^2) Flexural Reinforcement As Dist. From Bottom (in^2) (in) 3.12 75.17	Web Width Top = 24.00(in) Web Width Bot = 24.00(in)	
3.12       75.17         4.68       75.17         6.24       75.17         3.12       75.17         9.36       75.17         3.12       6.50         9.36       3.00		~
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