
AASHTOWare BrDR 7.5.0
Steel Tutorial
Steel Fishbelly Web Examples

STL9 – Steel Fishbelly Web

Topics Covered

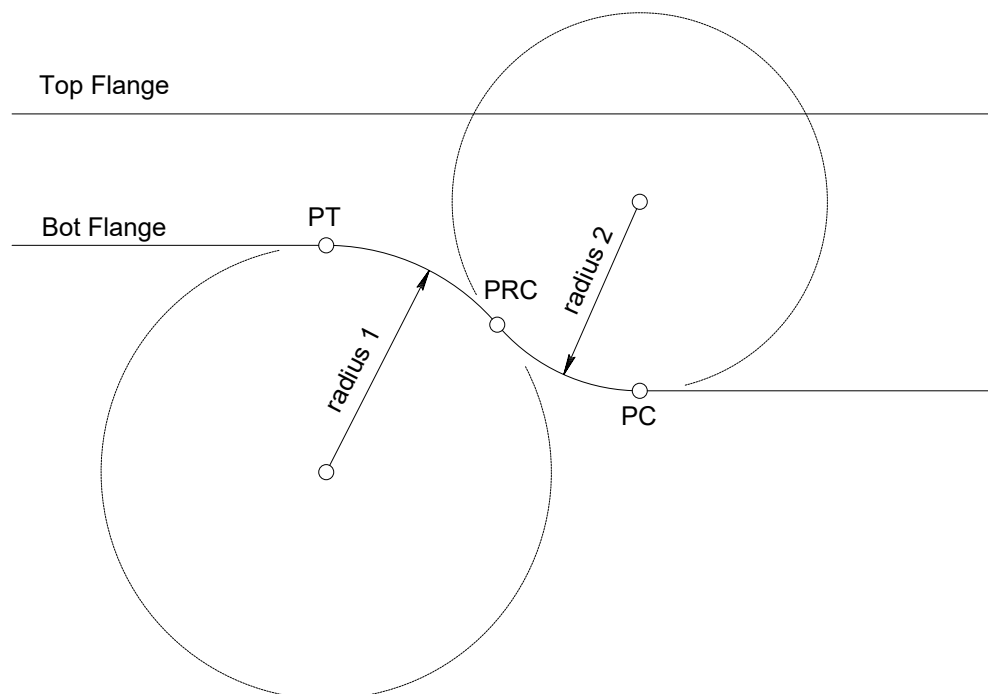
- Steel plate girder fishbelly web profiles
- Reverse parabolic
- Reverse circular curve
- Analyze with AASHTO LFR engine

Fishbelly web profiles are either reverse circular or reverse parabolic web profiles. Fishbelly web profiles can be modeled in BrDR for steel plate or built-up girders. This example reviews the input of reverse parabolic and reverse circular web profiles.

Fishbelly Web Profiles

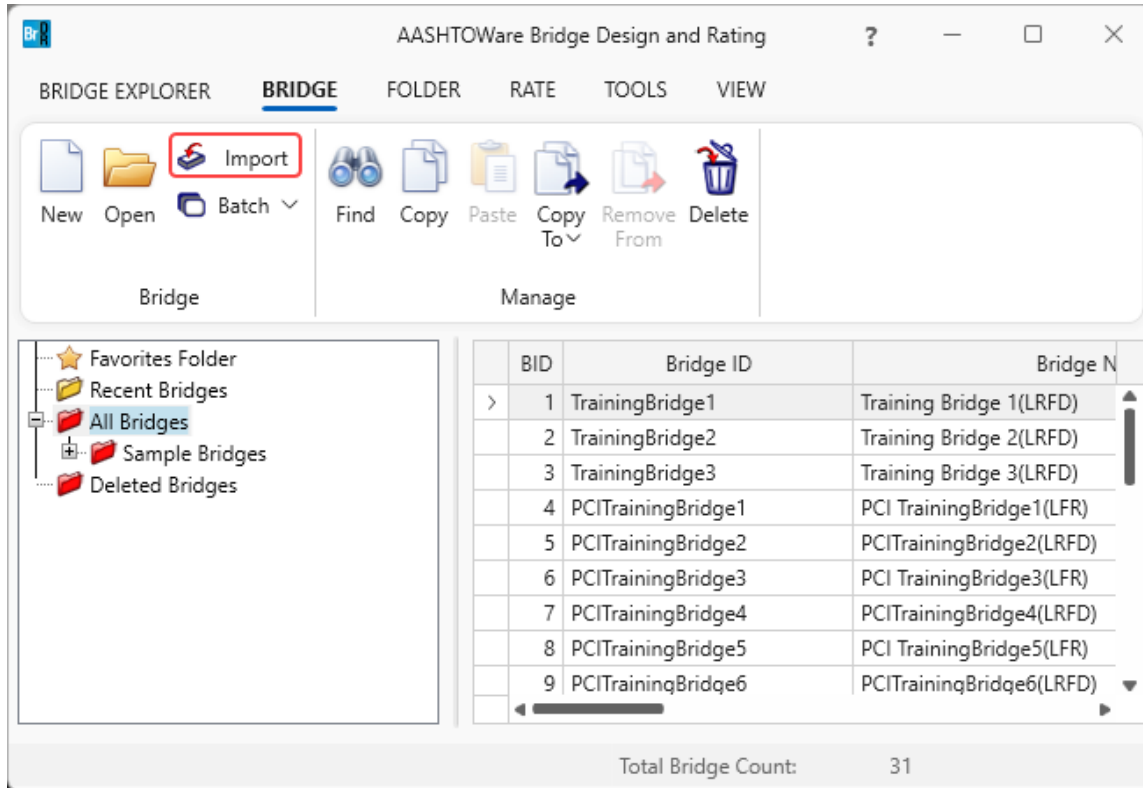
- Only available for steel plate and built-up girders
- Available for both schedule based and cross section based input
- Fishbelly profiles must be either totally parabolic or totally circular. Adjacent parabolic and circular sections are not allowed.
- BrDR LFR engine is the only analysis engine currently available for rating

The following sketch illustrates a reverse circular web profile:

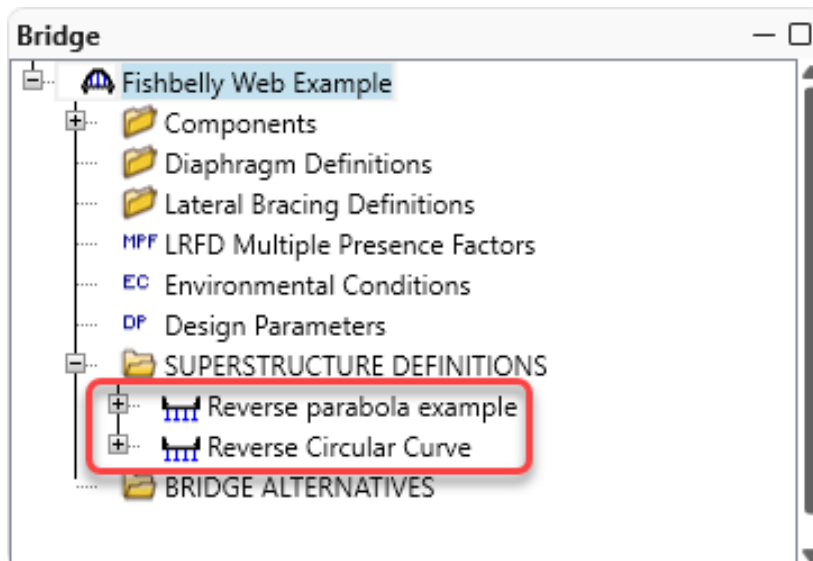


STL9 – Steel Fishbelly Web

Using the **Import** option from Bridge Explorer, import the STL9 bridge provided with this tutorial.



Open the Bridge Workspace for **Fishbelly Web Example**. This bridge contains a reverse parabolic and a reverse circular curve web profile example.

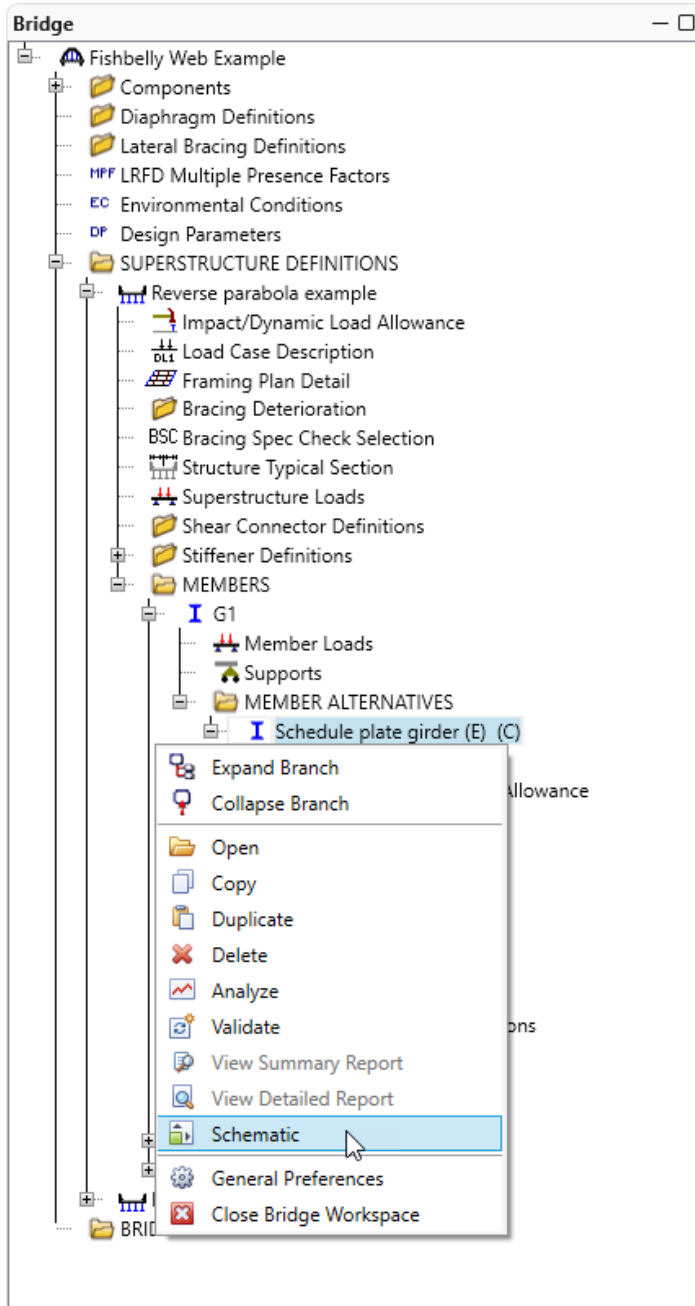


STL9 – Steel Fishbelly Web

Reverse Parabolic

Schematic

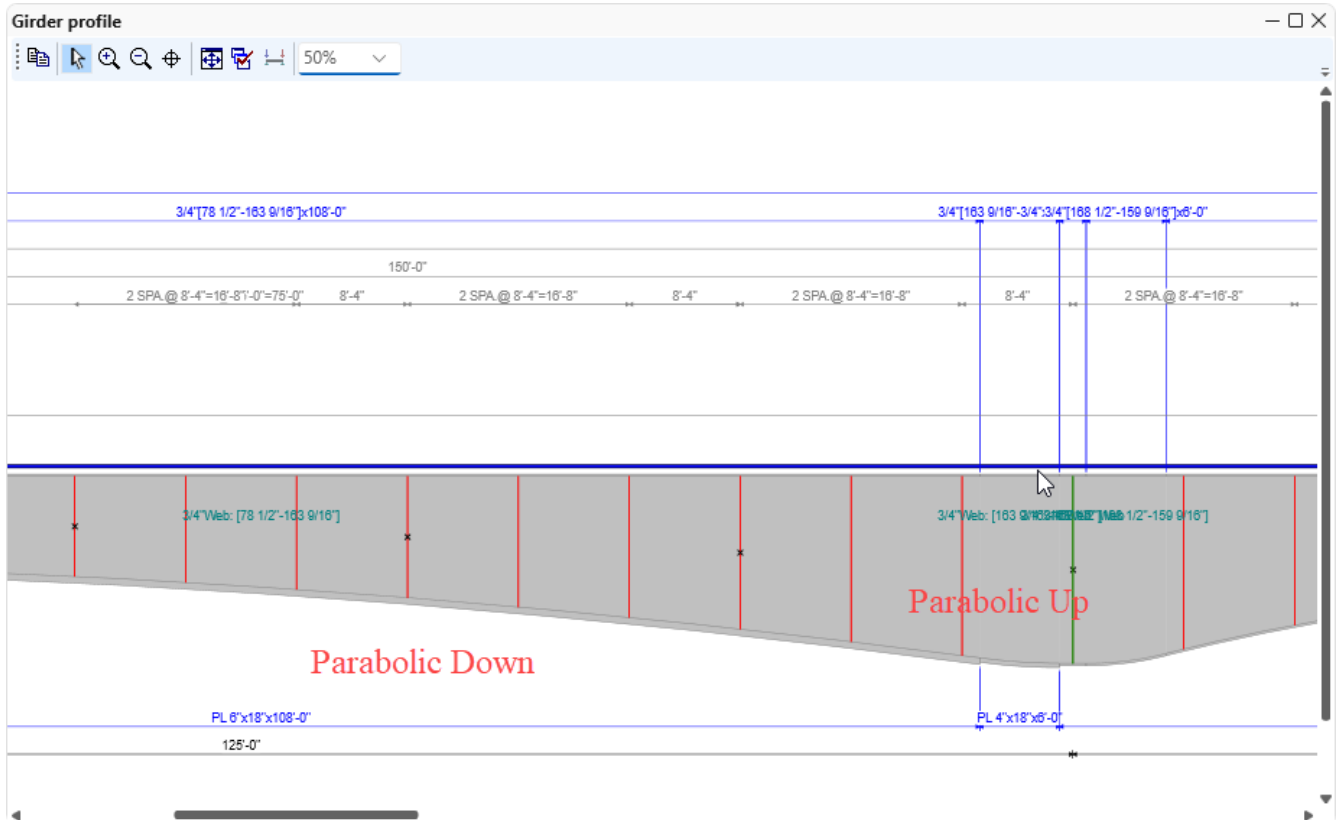
Using the **Reverse parabola example**, navigate to **G1, Schedule Plate Girder** member alternative, **right click** and select **Schematic** for the member alternative on the Bridge Workspace.



STL9 – Steel Fishbelly Web

The following shows the **Girder profile** schematic with some additional text shown to describe where the reverse parabolic web profile exists. (The display of stiffeners in the schematic has been turned off.)

Note: The **Parabolic Down** and **Parabolic Up** labels shown below do not show up in BrDR, they have been added to the schematic for this training example only.



STL9 – Steel Fishbelly Web

Girder Profile

Double click on the Girder Profile node in the Bridge Workspace tree. The input data describing the web profile is shown below:

The screenshot shows a software window titled "Girder Profile" with a "Type: Plate Girder" dropdown. Below the title bar are three tabs: "Web", "Top flange", and "Bottom flange". The "Web" tab is active, displaying a table with 12 columns: "Begin depth (in)", "Depth vary", "End depth (in)", "Thickness (in)", "Support number", "Start distance (ft)", "Length (ft)", "End distance (ft)", "Material", "Weld at right", and an empty column. The table contains 14 rows of data. The first row is highlighted with a blue selection bar. Below the table are three buttons: "New", "Duplicate", and "Delete". At the bottom of the window are three buttons: "OK", "Apply", and "Cancel".

	Begin depth (in)	Depth vary	End depth (in)	Thickness (in)	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Material	Weld at right	
>	78.504	None	78.504	0.75	1	0	10	10	Grade 50W	-- None --	
	78.504	Para...	163.572	0.75	1	10	108	118	Grade 50W	-- None --	
	163.572	Para...	168.504	0.75	1	118	6	124	Grade 50W	-- None --	
	168.504	None	168.504	0.75	1	124	2	126	Grade 50W	-- None --	
	168.504	Para...	159.576	0.75	2	1	6	7	Grade 50W	-- None --	
	159.576	Para...	102.504	0.75	2	7	37.5	44.5	Grade 50W	-- None --	
	102.504	None	102.504	0.75	2	44.5	161	205.5	Grade 50W	-- None --	
	102.504	Para...	159.576	0.75	2	205.5	37.5	243	Grade 50W	-- None --	
	159.576	Para...	168.504	0.75	2	243	6	249	Grade 50W	-- None --	
	168.504	None	168.504	0.75	2	249	2	251	Grade 50W	-- None --	
	168.504	Para...	163.572	0.75	3	1	6	7	Grade 50W	-- None --	
	163.572	Para...	78.504	0.75	3	7	108	115	Grade 50W	-- None --	
	78.504	None	78.504	0.75	3	115	10	125	Grade 50W	-- None --	

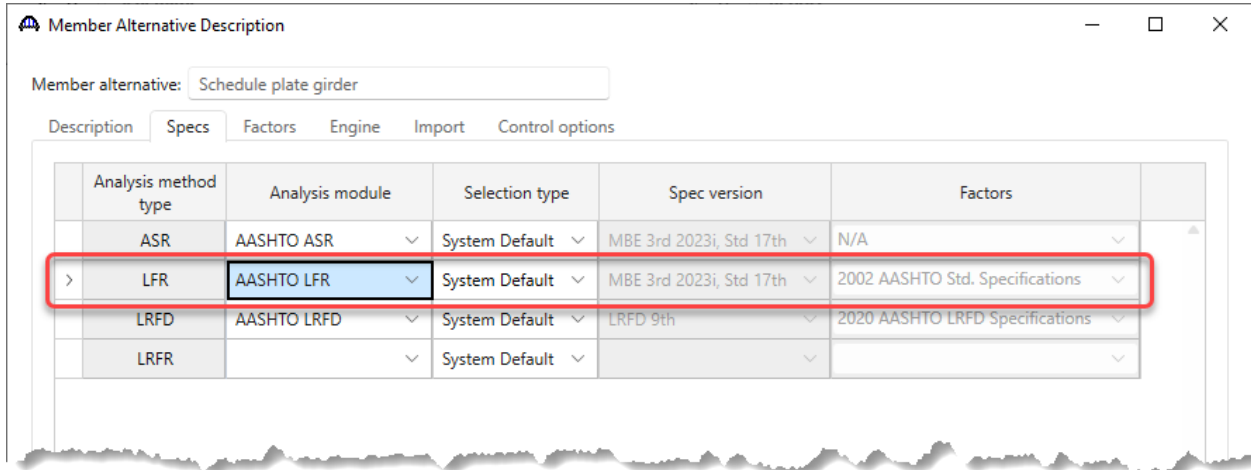
Click **OK** to close the window.

STL9 – Steel Fishbelly Web

Analyze with AASHTO LFR engine

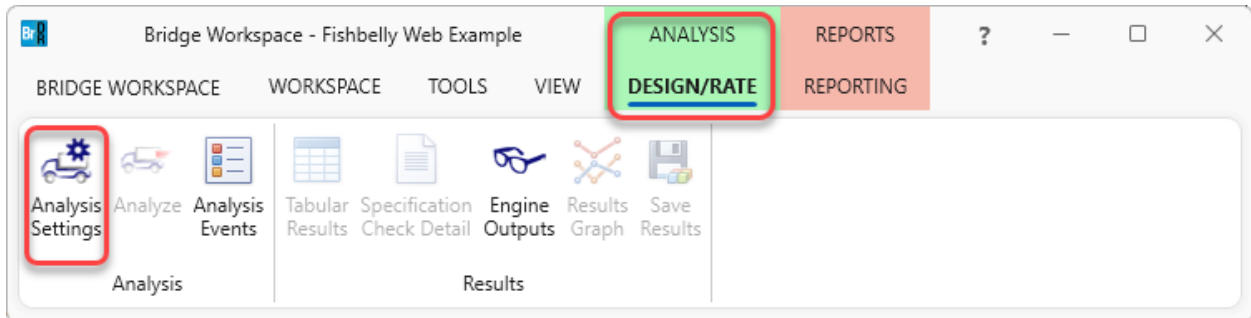
[Member Alternative - Specs](#)

Open the **Schedule plate girder** member alternative **Specs** tab and be sure the **AASHTO LFR** Analysis module is selected as the **LFR Analysis method type**. This is the only analysis engine available for fishbelly web profiles.



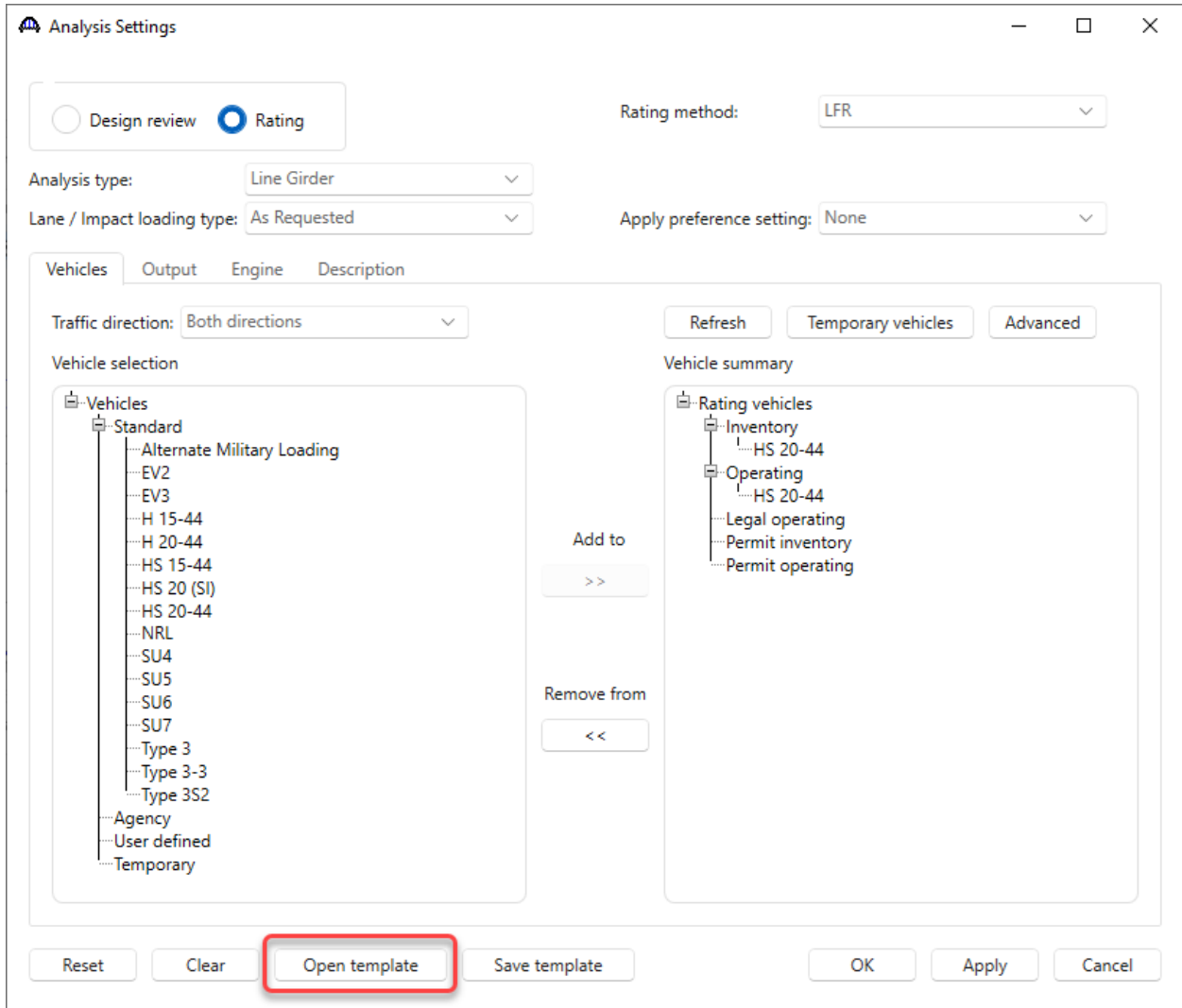
[Analysis Settings](#)

With the focus on the **G1 Schedule plate girder** member alternative click on the **Analysis Settings** button from the **Analysis** group of the **DESIGN/RATE** in the ribbon.



STL9 – Steel Fishbelly Web

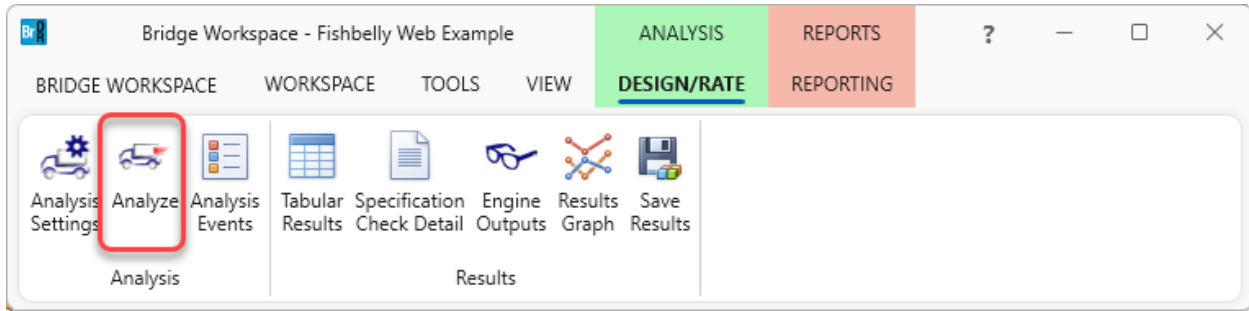
In the **Analysis Settings** window select the **HS 20 LFR Rating** template.



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

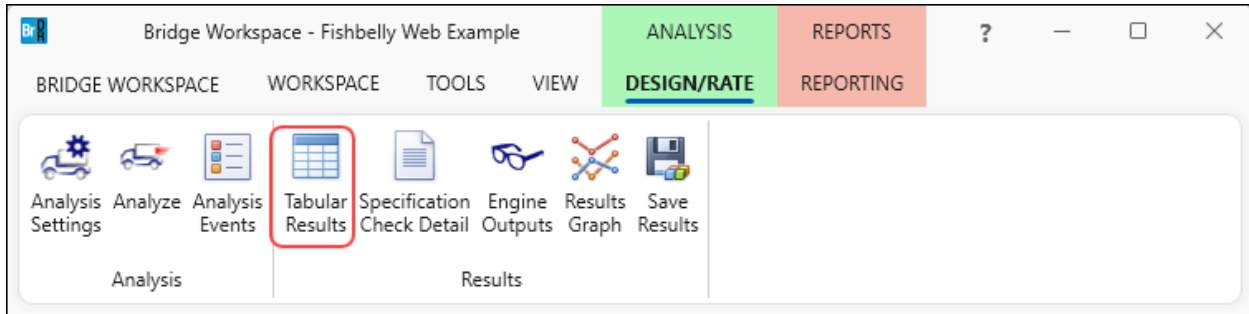
STL9 – Steel Fishbelly Web

With the focus still on the **G1 Schedule plate girder** member alternative click on the **Analyze** button.



Tabular Results

When the analysis rating is finished, click on the **Tabular Results** button from the **Results** group of the **DESIGN/RATE** ribbon. The rating results are shown below.



Analysis Results - Schedule plate girder

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	75.85	2.107	125.00	1 - (100.0)	Service - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFR	Operating	126.67	3.519	125.00	1 - (100.0)	Service - Steel	As Requested	As Requested
HS 20-44	Lane	LFR	Inventory	42.50	1.181	125.00	1 - (100.0)	Service - Steel	As Requested	As Requested
HS 20-44	Lane	LFR	Operating	70.97	1.971	125.00	1 - (100.0)	Service - Steel	As Requested	As Requested

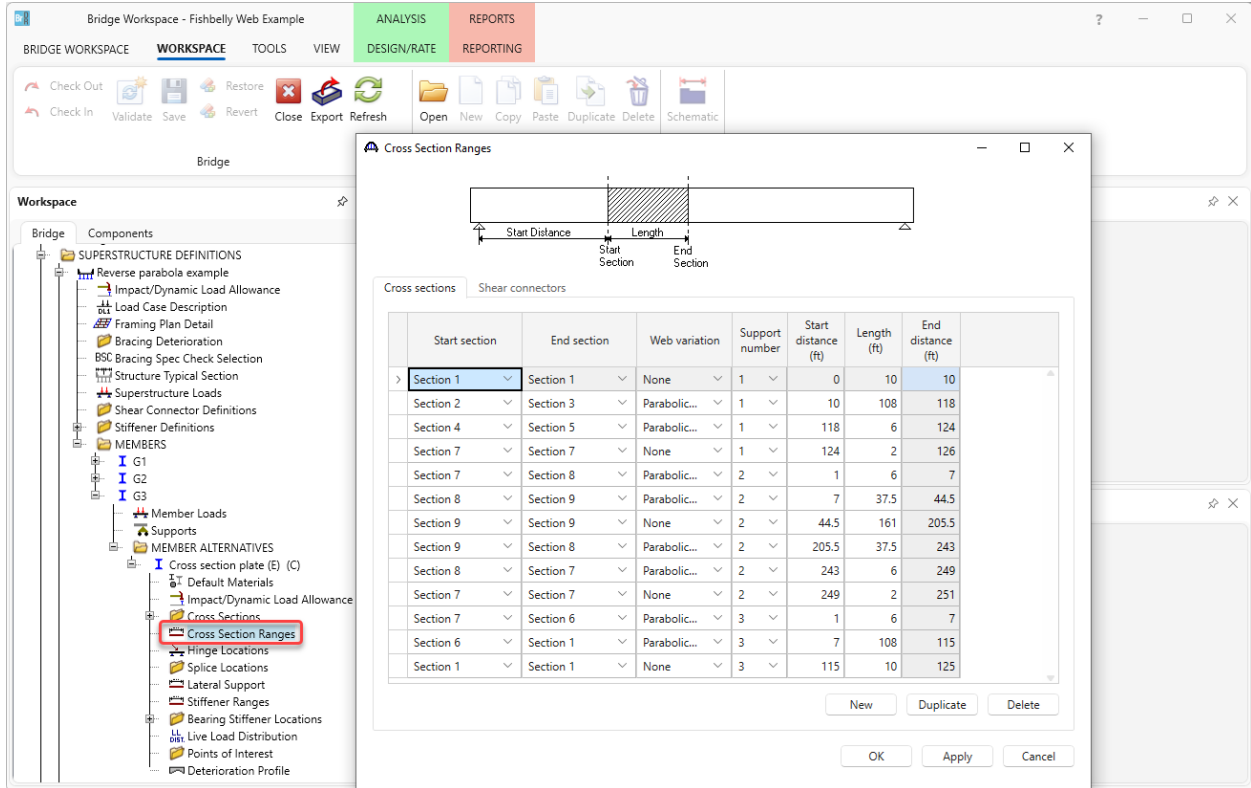
AASHTO LFR Engine Version 7.5.0.3001
Analysis preference setting: None

Close

STL9 – Steel Fishbelly Web

Reverse Parabolic - Cross Section Ranges

This superstructure definition also contains the reverse parabola described as a cross-section plate girder. Open the **Cross Section Ranges** window for the member alt in member **G3** as shown below:

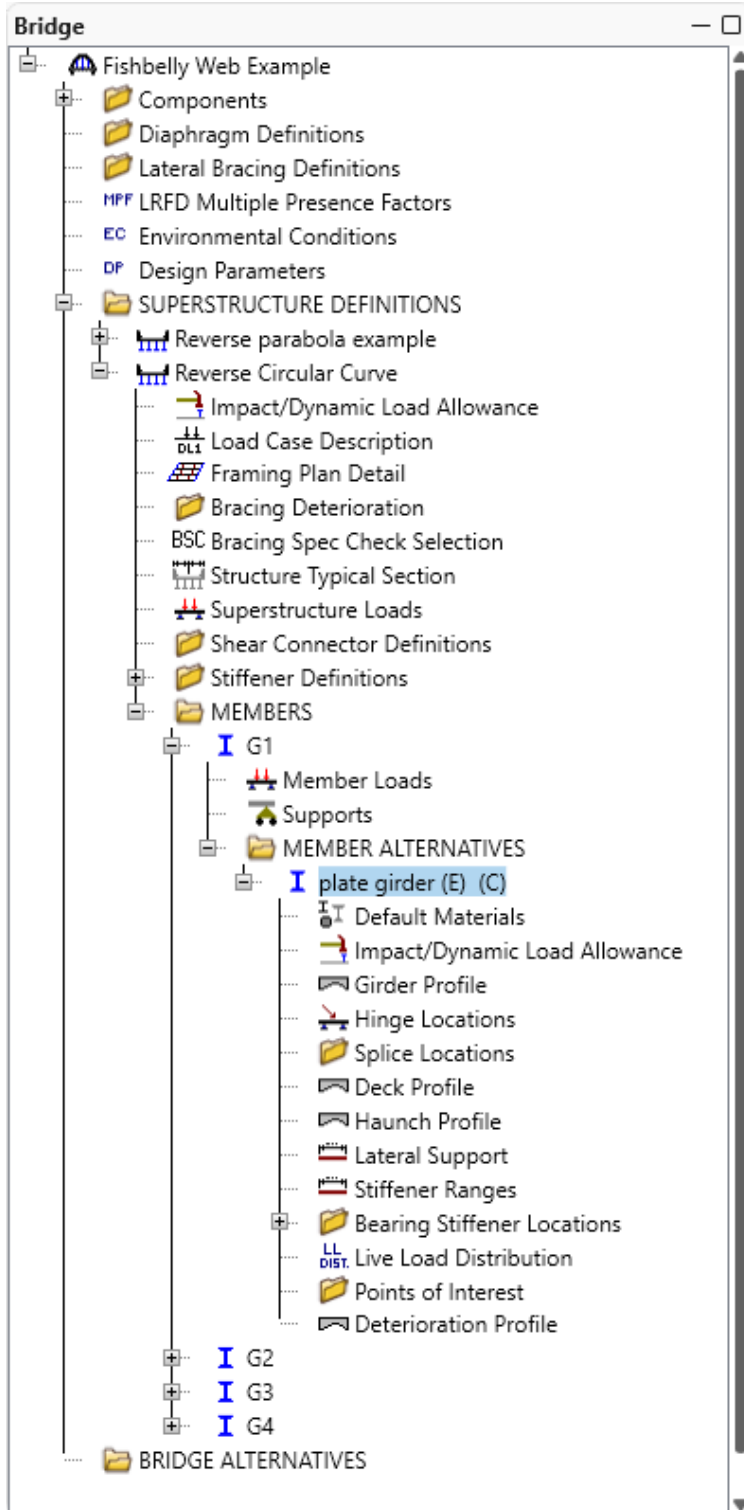


Rating this member alternative gives the same rating results as the schedule based alternative for member **G1**.

STL9 – Steel Fishbelly Web

Reverse Circular Curve

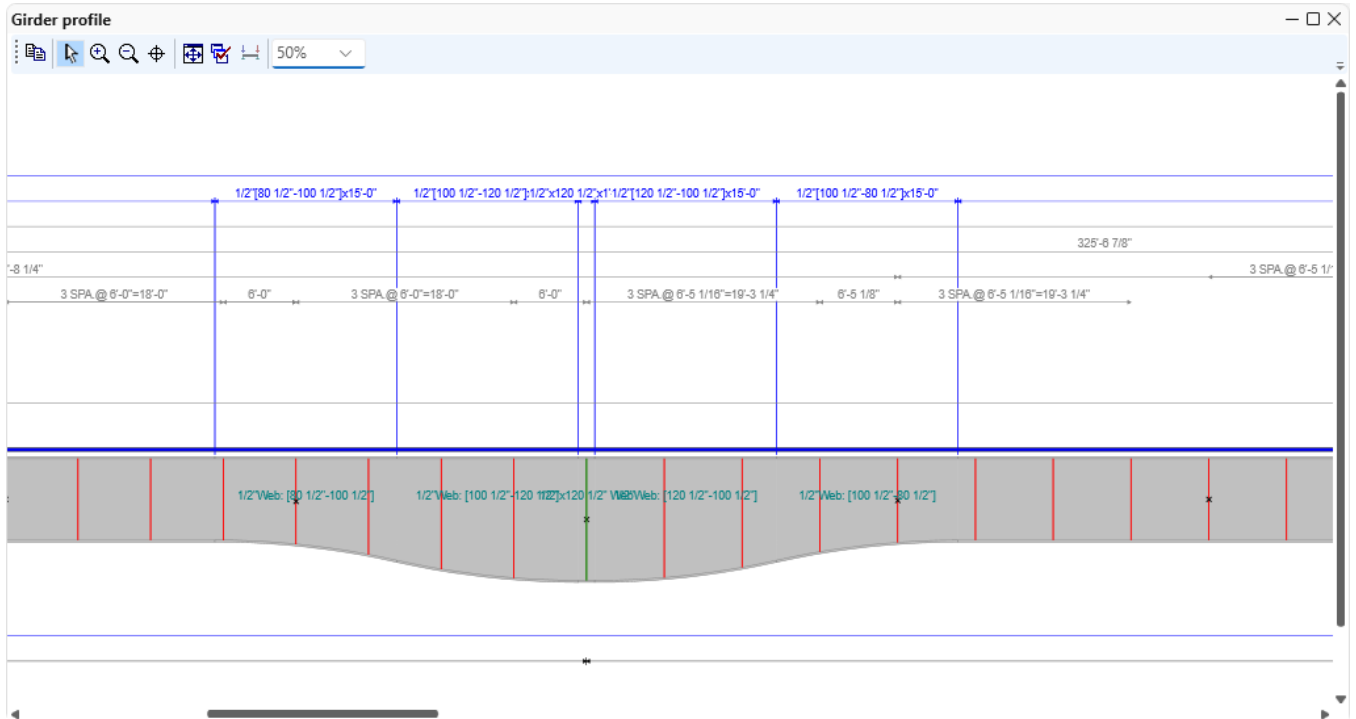
A reverse circular curve web profile is included in this bridge as well. Open the **plate girder** member alternative for **G1** in the **Reverse Circular Curve** superstructure definition.



STL9 – Steel Fishbelly Web

Schematic

The member alternative schematic is shown below.



STL9 – Steel Fishbelly Web

Girder Profile

The **Girder Profile** window describing the reverse circular webs is shown below along with the BrDR LFR ratings for an HS20 vehicle.

Girder Profile
— □ ×

Type: Plate Girder

Web Top flange Bottom flange

	Begin depth (in)	Depth vary	End depth (in)	Thickness (in)	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Material	Weld at right
>	80.5	None	80.5	0.5	1	0	89.30...	89.3073	Grade 50W	-- None --
	80.5	Circular Concave	100.5	0.5	1	89.3073	15	104.3073	Grade 50W	-- None --
	100.5	Circular Convex	120.5	0.5	1	104.30...	15	119.3073	Grade 50W	-- None --
	120.5	None	120.5	0.5	1	119.30...	1.375	120.6823	Grade 50W	-- None --
	120.5	Circular Convex	100.5	0.5	2	0.68751	15	15.68751	Grade 50W	-- None --
	100.5	Circular Concave	80.5	0.5	2	15.687...	15	30.68751	Grade 50W	-- None --
	80.5	None	80.5	0.5	2	30.687...	118.5...	149.19791	Grade 50W	-- None --
	80.5	Circular Concave	100.5	0.5	2	149.19...	15	164.19791	Grade 50W	-- None --
	100.5	Circular Convex	120.5	0.5	2	164.19...	15	179.19791	Grade 50W	-- None --
	120.5	None	120.5	0.5	2	179.19...	1.375	180.57291	Grade 50W	-- None --
	120.5	Circular Convex	100.5	0.5	3	0.68751	15	15.68751	Grade 50W	-- None --
	100.5	Circular Concave	80.5	0.5	3	15.687...	15	30.68751	Grade 50W	-- None --
	80.5	None	80.5	0.5	3	30.687...	118.5...	149.19791	Grade 50W	-- None --
	80.5	Circular Concave	100.5	0.5	3	149.19...	15	164.19791	Grade 50W	-- None --
	100.5	Circular Convex	120.5	0.5	3	164.19...	15	179.19791	Grade 50W	-- None --
	120.5	None	120.5	0.5	3	179.19...	1.375	180.57291	Grade 50W	-- None --
	120.5	Circular Convex	100.5	0.5	4	0.68751	15	15.68751	Grade 50W	-- None --
	100.5	Circular Concave	80.5	0.5	4	15.687...	15	30.68751	Grade 50W	-- None --
	80.5	None	80.5	0.5	4	30.687...	89.30...	119.99481	Grade 50W	-- None --

New Duplicate Delete

OK Apply Cancel


Click **OK** to close the window.

STL9 – Steel Fishbelly Web

Tabular Results

Run an LFR analysis using the **HS 20 LFR Rating** template as discussed in the previous section. The rating results are shown below.

Analysis Results - plate girder
— □ ×



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	69.35	1.926	299.88	2 - (100.0)	Service - Steel	As Requested	As Requested
HS 20-44	Axle Load	LFR	Operating	115.81	3.217	299.88	2 - (100.0)	Service - Steel	As Requested	As Requested
HS 20-44	Lane	LFR	Inventory	26.46	0.735	299.88	2 - (100.0)	Service - Steel	As Requested	As Requested
HS 20-44	Lane	LFR	Operating	44.20	1.228	299.88	2 - (100.0)	Service - Steel	As Requested	As Requested

AASHTO LFR Engine Version 7.5.0.3001

Analysis preference setting: None

Close