

AASHTOWare BrD/BrR 6.8

Steel Structure Tutorial

STL5 - Two Span Rolled Beam Example

BrD and BrR Training

STL5 - Two Span Rolled Beam Example

Topics Covered

- Steel rolled beam with cover plates input as girder system.
- Schedule based input.
- Skewed framing plan.

From the Bridge Explorer create a new bridge and enter the following description data:

The screenshot shows the 'RollBeamBridge' dialog box with the following fields and values:

- Bridge ID: RollBeamBridge
- NBI Structure ID (8): RollBeamBridge
- Template:
- Superstructures:
- Bridge Completely Defined:
- Culverts:
- Description: Rolled Beam Bridge
- Year Built: [Empty]
- Description (cont'd): 2 span, steel rolled beam bridge
- Location: [Empty]
- Length: [Empty] ft
- Facility Carried (7): [Empty]
- Route Number: -1
- Feat. Intersected (6): [Empty]
- Mi. Post: [Empty]
- Default Units: US Customary
- AASHTOWare Association...: [Button]
- BrR: BrD: BrM:
- OK: [Button] Apply: [Button] Cancel: [Button]

Close the window by clicking Ok. This saves the data to memory and closed the window.

STL5 - Two Span Rolled Beam Example

To enter the materials to be used by members of the bridge, expand the tree for Materials. To add a new structural steel material, click on Structural Steel in the tree and select File/New from the menu (or right mouse click on Structural Steel and select New). The window shown below will open.

Bridge Materials - Structural Steel

Name: Description:

Material Properties

Specified minimum yield strength (Fy) = ksi

Specified minimum tensile strength (Fu) = ksi

Coefficient of thermal expansion = 1/F

Density = kcf

Modulus of elasticity (E) = ksi

Copy To Library... Copy from Library... OK Apply Cancel

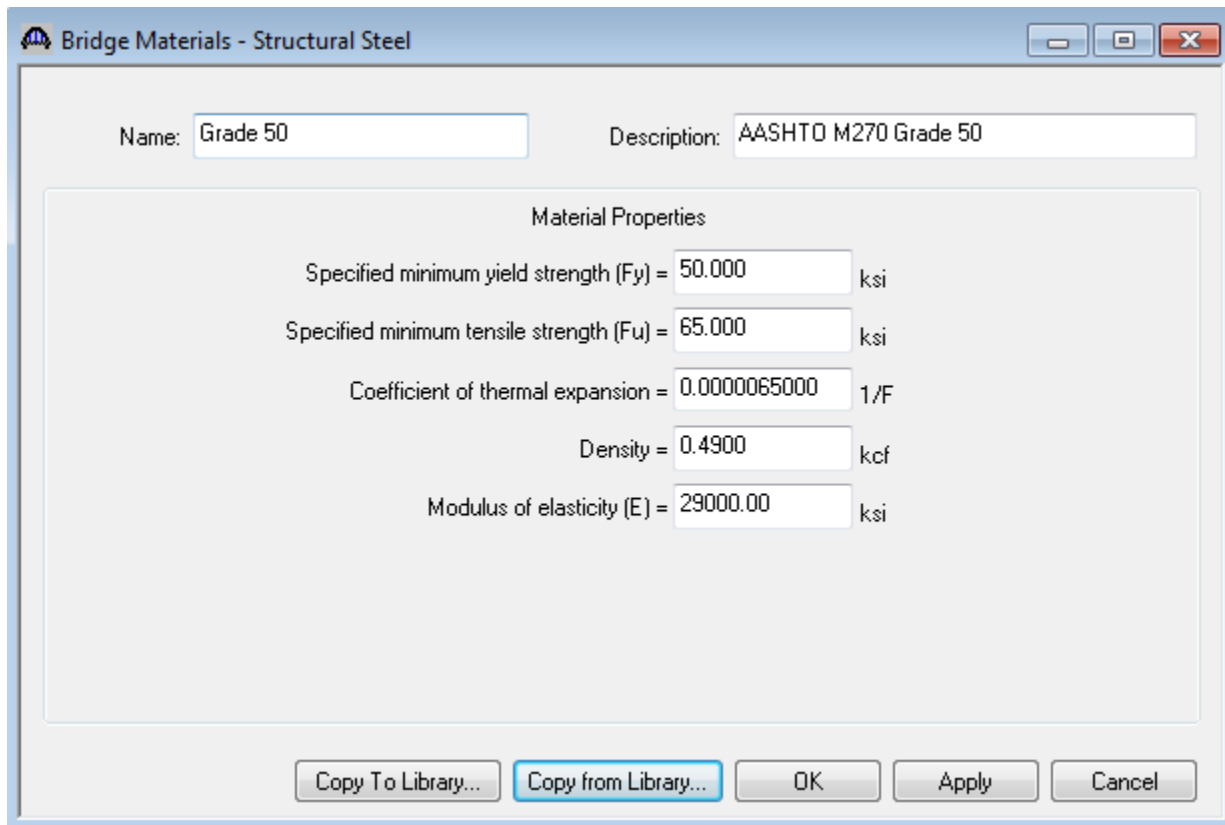
STL5 - Two Span Rolled Beam Example

Add a structural steel material by selecting from the Structural Steel Materials Library by clicking the Copy from Library button.

Name	Description	Library	Units	Fy	Fu	alpha	Density/ Unit Load	Modulus of Elasticity
1905 to 1936	Built 1905 to	Standar	US Cus	30.000	60.000	0.0000	0.4900	29000.00
1936 to 1963	Built 1936 to	Standar	US Cus	33.000		0.0000	0.4900	29000.00
AASHTO M 94(1961)	AASHTO M	Standar	US Cus	33.000	60.000	0.0000	0.4900	29000.00
AASHTO M 95(1961)	AASHTO M	Standar	US Cus	45.000	70.000	0.0000	0.4900	29000.00
AASHTO M 96(1961)	AASHTO M	Standar	US Cus	55.000	90.000	0.0000	0.4900	29000.00
AASHTO M188	AASHTO M	Standar	US Cus	40.000	60.000	0.0000	0.4900	29000.00
After 1963	Built after 19	Standar	US Cus	36.000		0.0000	0.4900	29000.00
ASTM A242 - <= 3/4"	ASTM A 242	Standar	US Cus	50.000	70.000	0.0000	0.4900	29000.00
ASTM A242 - > 1 1/2" to 4" incl.	ASTM A 242	Standar	US Cus	42.000	63.000	0.0000	0.4900	29000.00
ASTM A242 - > 3/4" to 1 1/2" incl.	ASTM A 242	Standar	US Cus	46.000	67.000	0.0000	0.4900	29000.00
ASTM A36	ASTM A 36	Standar	US Cus	36.000	58.000	0.0000	0.4900	29000.00
ASTM A440 - <= 3/4"	ASTM A 440	Standar	US Cus	50.000	70.000	0.0000	0.4900	29000.00
ASTM A440 - > 1 1/2" to 4" incl.	ASTM A 440	Standar	US Cus	42.000	63.000	0.0000	0.4900	29000.00
ASTM A440 - > 3/4" to 1 1/2" incl.	ASTM A 440	Standar	US Cus	46.000	67.000	0.0000	0.4900	29000.00
ASTM A441 - > 3/4" to 1 1/2" incl.	ASTM A 441	Standar	US Cus	46.000	67.000	0.0000	0.4900	29000.00
ASTM A441 - <= 3/4"	ASTM A 441	Standar	US Cus	50.000	70.000	0.0000	0.4900	29000.00
ASTM A441 - > 1 1/2" to 4" incl.	ASTM A 441	Standar	US Cus	42.000	63.000	0.0000	0.4900	29000.00
ASTM A441 - > 4" to 8" incl.	ASTM A 441	Standar	US Cus	40.000	60.000	0.0000	0.4900	29000.00
ASTM A514 - over 2 1/2" to 4" incl.	ASTM A 514	Standar	US Cus	90.000	105.00	0.0000	0.4900	29000.00
ASTM A514 - to 2 1/2" incl.	ASTM A 514	Standar	US Cus	100.00	115.00	0.0000	0.4900	29000.00
ASTM A517	ASTM A 517	Standar	US Cus	100.00	115.00	0.0000	0.4900	29000.00
ASTM A572 - <= 3/4", Fy = 50 ksi	ASTM A572	Standar	US Cus	50.000	70.000	0.0000	0.4900	29000.00
ASTM A572 - > 1 1/2" to 4" incl.	ASTM A 572	Standar	US Cus	42.000	63.000	0.0000	0.4900	29000.00

STL5 - Two Span Rolled Beam Example

Select the AASHTO M270 Grade 50 material and click Ok. The selected material properties are copied to the Bridge Materials – Structural Steel window as shown below.



The screenshot shows a software window titled "Bridge Materials - Structural Steel". At the top, there are standard window controls (minimize, maximize, close). Below the title bar, there are two text input fields: "Name:" containing "Grade 50" and "Description:" containing "AASHTO M270 Grade 50". The main area of the window is titled "Material Properties" and contains five rows of property labels and values in text boxes, each followed by a unit:

- Specified minimum yield strength (Fy) = 50.000 ksi
- Specified minimum tensile strength (Fu) = 65.000 ksi
- Coefficient of thermal expansion = 0.0000065000 1/F
- Density = 0.4900 kcf
- Modulus of elasticity (E) = 29000.00 ksi

At the bottom of the window, there are five buttons: "Copy To Library...", "Copy from Library..." (which is highlighted with a blue border), "OK", "Apply", and "Cancel".

STL5 - Two Span Rolled Beam Example

Add concrete and reinforcement materials using the same techniques. The windows will look like these:

Bridge Materials - Concrete

Name: Description:

Compressive strength at 28 days (f'c) = ksi

Initial compressive strength (f'ci) = ksi

Coefficient of thermal expansion = 1/F

Density (for dead loads) = kcf

Density (for modulus of elasticity) = kcf

Std Modulus of elasticity (Ec) = ksi

LRFD Modulus of elasticity (Ec) = ksi

Std Initial modulus of elasticity = ksi

LRFD Initial modulus of elasticity = ksi

Poisson's ratio =

Composition of concrete =

Modulus of rupture = ksi

Shear factor =

Splitting tensile strength (fct) = ksi

STL5 - Two Span Rolled Beam Example

Bridge Materials - Reinforcing Steel

Name: Description:

Material Properties

Specified yield strength (F_y) = ksi

Modulus of elasticity (E_s) = ksi

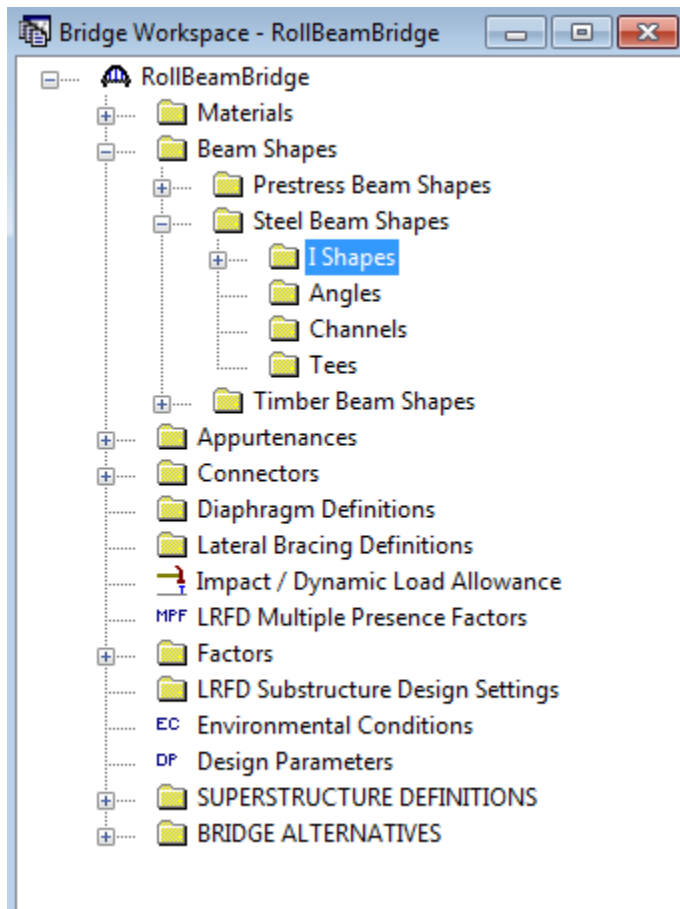
Ultimate strength (F_u) = ksi

Type

Plain
 Epoxy
 Galvanized
 Other

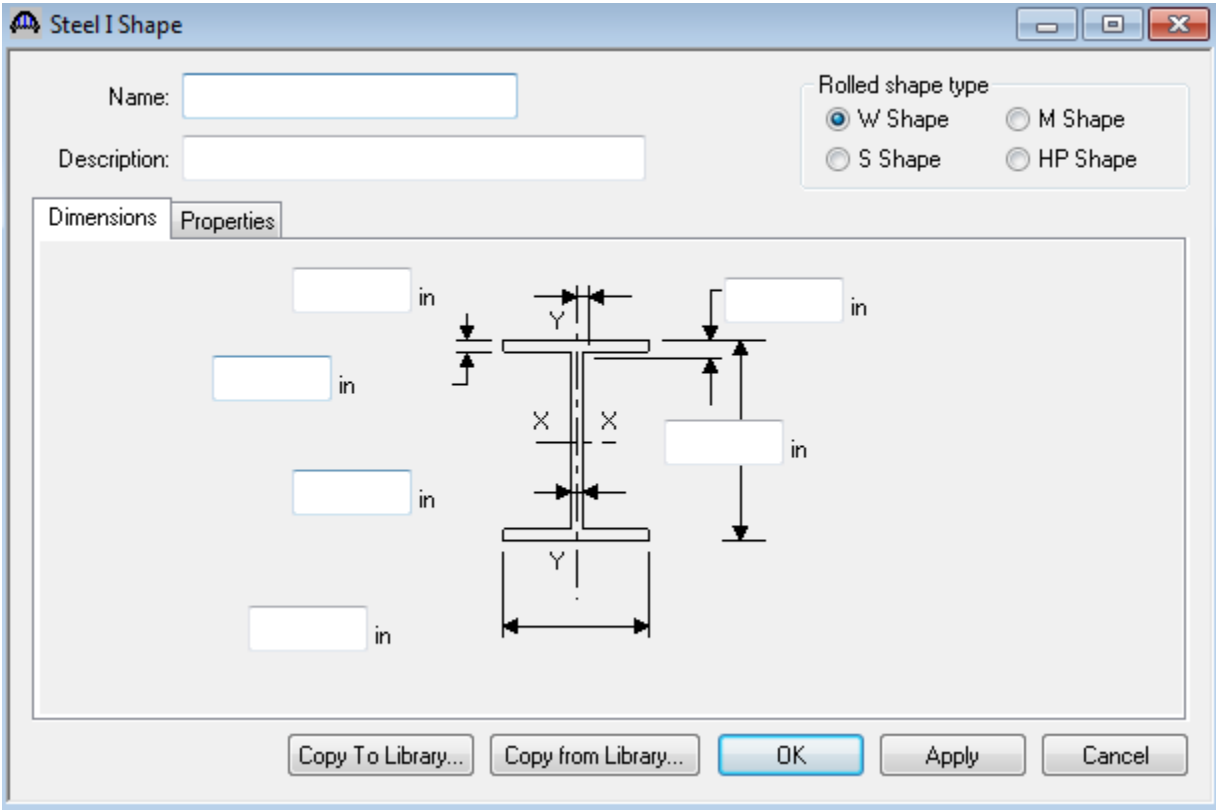
STL5 - Two Span Rolled Beam Example

To enter a steel rolled beam shape to be used in this bridge expand the tree labeled Beam Shapes as shown below:



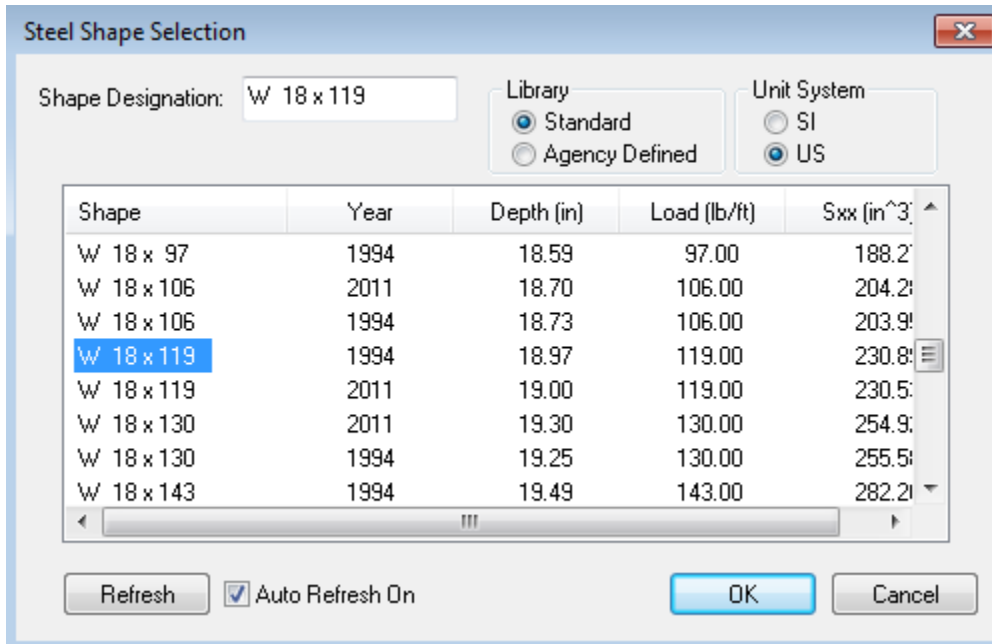
STL5 - Two Span Rolled Beam Example

Click on I Shapes in the tree and select File/New from the menu (or double click on I Shapes in the tree). The window shown below will open.



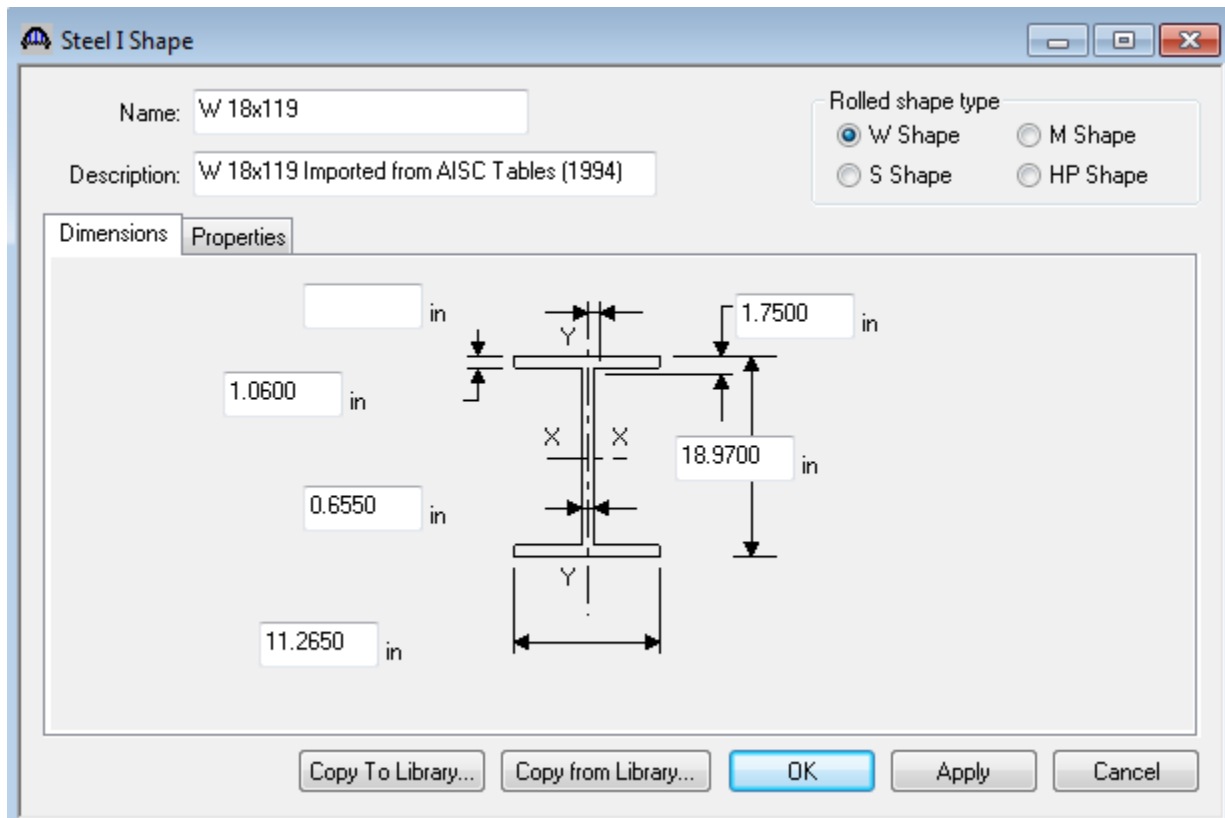
STL5 - Two Span Rolled Beam Example

Select the Rolled Shape Type as W Shape and click on the copy from Library button. The Steel Shape Selection window will appear. This window displays all of the steel shapes available in the library. The list can be sorted by clicking on the Depth, Weight or Sxx column headers. Enter “W18” in the Shape Designation field and the list of steel shapes shown in the window will filter to show the W18 shapes. Select W18x119 and click Ok.



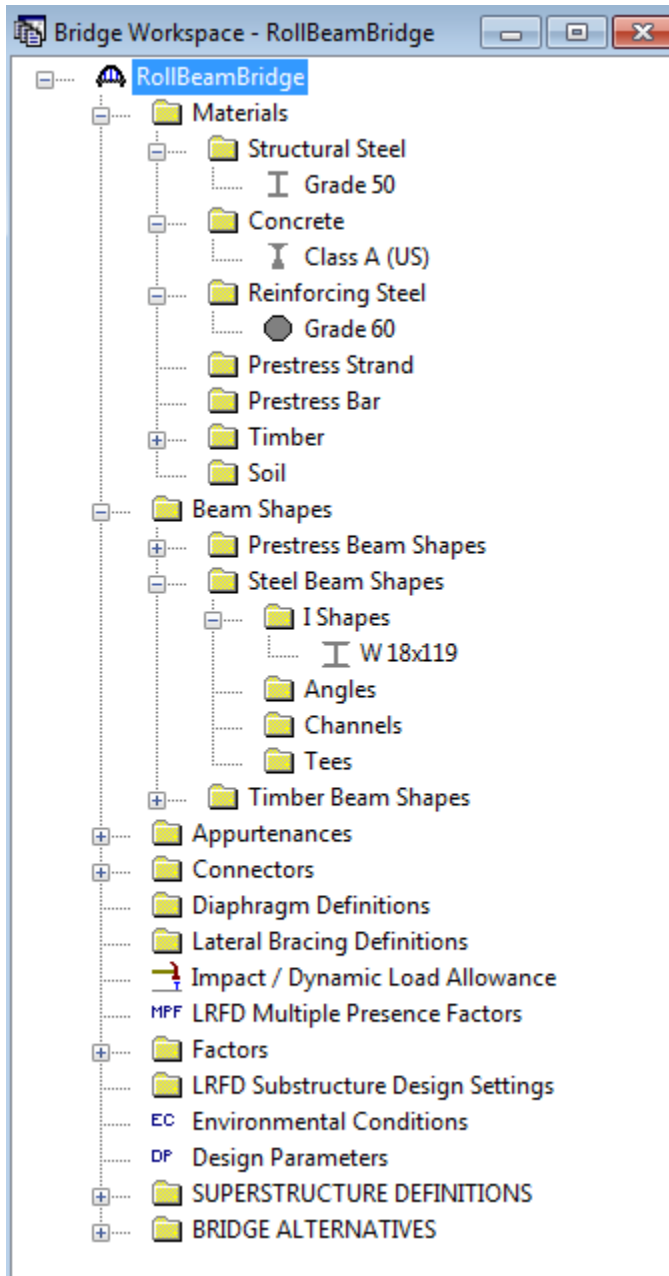
STL5 - Two Span Rolled Beam Example

The beam properties are copied to the Steel I Shape window as shown below.



STL5 - Two Span Rolled Beam Example

A partially expanded Bridge Workspace is shown below.



STL5 - Two Span Rolled Beam Example

To enter the appurtenances to be used within the bridge expand the tree branch labeled Appurtenances. To define a parapet, double click on Parapet in the tree. Click the Copy from Library button and select the New Jersey barrier from the library. Click the Ok button and the parapet details are copied to the Parapet window as shown below. Click Ok to save the data to memory and close the window.

Bridge Appurtenances - Parapet

Name:

Description:

All dimensions are in inches

Additional Load = kip/ft

2.0000

12.0000

7.0000

Reference Line

0.0000

19.0000

10.0000

3.0000

Back

Front

Roadway Surface

Parapet unit load = kcf

Calculated Properties

Net centroid (from reference line) = in

Total load = kip/ft

STL5 - Two Span Rolled Beam Example

Enter the impact to be used for the entire bridge by clicking on Impact in the tree and selecting File/Open from the menu. The Bridge Impact window shown below will open. The values shown below are default values. Click Ok to save the data to memory and close the window.

Bridge Impact / Dynamic Load Allowance

Standard Impact Factor

For structural components where impact is to be included per AASHTO 3.8.1, choose the impact factor to be used:

Standard AASHTO impact $I = \frac{50}{L + 125}$

Modified impact = [] times AASHTO impact

Constant impact override = [] %

LRFD Dynamic Load Allowance

Fatigue and fracture limit states: 15.0 %

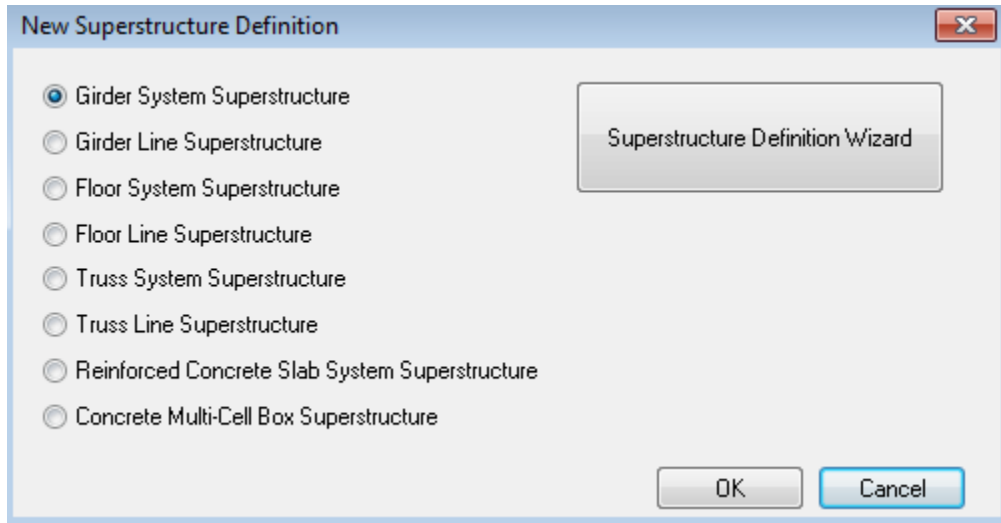
All other limit states: 33.0 %

OK Apply Cancel

For this example problem we are not going to override the standard LRFD or LRFR factors so we skip to Structure Definition. We will come back to Bridge Alternatives after entering a Structure Definition.

STL5 - Two Span Rolled Beam Example

Double click on SUPERSTRUCTURE DEFINITIONS (or click on SUPERSTRUCTURE DEFINITIONS and select File/New from the menu or right mouse click on SUPERSTRUCTURE DEFINITIONS and select New from the popup menu) to create a new structure definition. The dialog shown below will appear.



Select Girder System, click Ok and the Structure Definition window will open.

STL5 - Two Span Rolled Beam Example

Enter the appropriate data as shown below:

Girder System Superstructure Definition

Definition Analysis Specs Engine

Name: 4 Girder, 2 Span System

Description:

Default Units: US Customary

Number of spans: 2

Number of girders: 4

Enter Span Lengths Along the Reference Line:

Span	Length (ft)
1	50.00
2	50.00

Frame Structure Simplified Definition:

Deck type: Concrete

For PS only

Average humidity: %

Member Alt. Types

Steel

P/S

R/C

Timber

Horizontal Curvature Along Reference Line

Horizontal curvature

Superstructure Alignment

Curved

Tangent, curved, tangent

Tangent, curved

Curved, tangent

Distance from PC to first support line: ft

Start tangent length: ft

Radius: ft

Direction: Left

End tangent length: ft

Distance from last support line to PT: ft

Design speed: mph

Superelevation: %

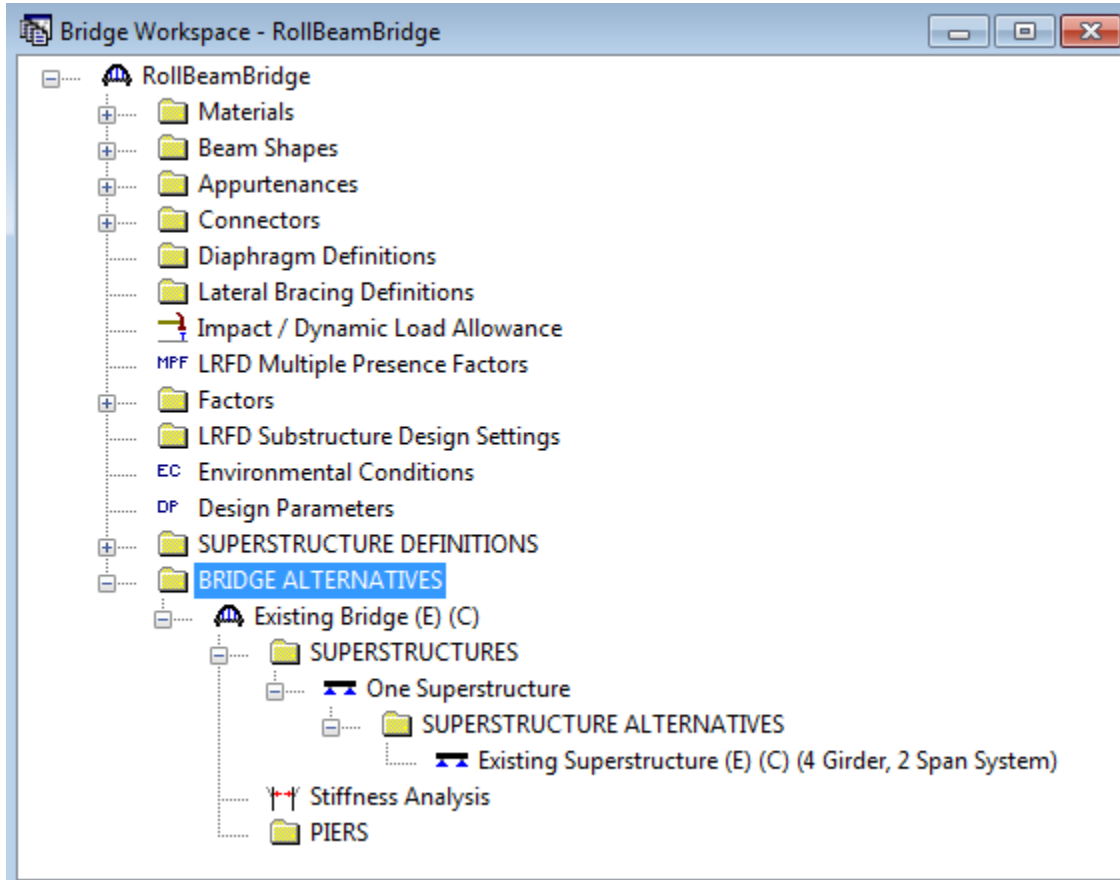
OK Apply Cancel

Click on Ok to save the data to memory and close the window.

STL5 - Two Span Rolled Beam Example

We now go back to the Bridge Alternatives and create a new Bridge Alternative, a new Structure, and a new Structure Alternative as we did previously.

The partially expanded Bridge Workspace tree showing these alternatives is shown below:



STL5 - Two Span Rolled Beam Example

Click Load Case Description to define the dead load cases. The completed Load Case Description window is shown below.

Load Case Name	Description	Stage	Type	Time* (Days)
DL2	Parapets	Composite (long term) (Stage 2)	D,DC	

*Prestressed members only

Add Default Load Case Descriptions

New Duplicate Delete

OK Apply Cancel

STL5 - Two Span Rolled Beam Example

Double-click on Framing Plan Detail to describe the framing plan. Enter the appropriate data as shown below.

Structure Framing Plan Details

Number of spans = 2 Number of girders = 4

Layout Diaphragms Lateral Bracing Ranges

Girder Spacing Orientation

- Perpendicular to girder
- Along support

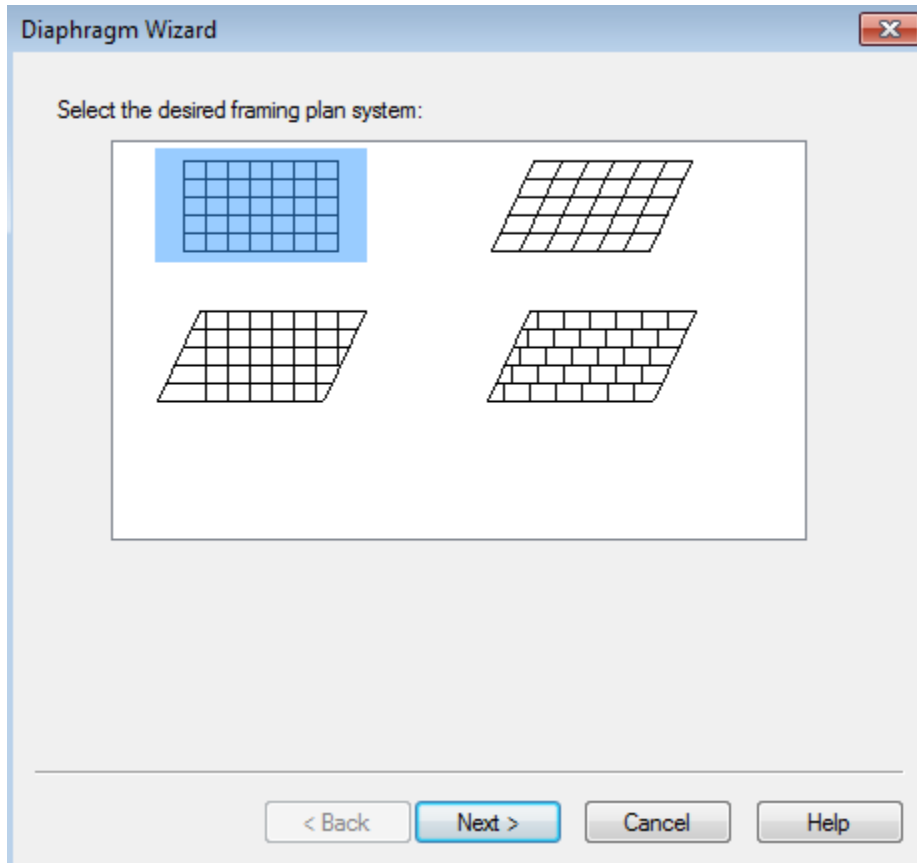
Support	Skew (Degrees)
1	10.0000
2	10.0000
3	10.0000

Girder Bay	Girder Spacing (ft)	
	Start of Girder	End of Girder
1	8.00	8.00
2	8.00	8.00
3	8.00	8.00

OK Apply Cancel

STL5 - Two Span Rolled Beam Example


Click the Apply button to save this data to memory and switch to the Diaphragms tab to enter diaphragm spacing. Click the Diaphragm Wizard button to add diaphragms for the entire structure. Select the following Framing Plan System and Click the Next button.



STL5 - Two Span Rolled Beam Example

Enter the following data on the dialog shown below.

Diaphragm Wizard



Diaphragm Spacing

Enter number of equal spaces per span
 Enter equal spacing per span

Support diaphragm load: kip

Interior diaphragm load: kip

Span	Length (ft)	Number of Equal Spaces
1	50.00	2
2	50.00	2

< Back Finish Cancel Help

STL5 - Two Span Rolled Beam Example

Click the Finish button to add the diaphragms and loads. The Diaphragm Wizard will create diaphragms and loads for all of the girder bays in the structure.

The diaphragms and loads created for Girder Bay 1 are shown below.

Structure Framing Plan Details

Number of spans = 2 Number of girders = 4

Layout Diaphragms Lateral Bracing Ranges

Girder Bay: 1 Copy Bay To... Diaphragm Wizard...


Support Number	Start Distance (ft)		Diaphragm Spacing (ft)	Number of Spaces	Length (ft)	End Distance (ft)		Load (kip)	Diaphragm
	Left Girder	Right Girder				Left Girder	Right Girder		
1	0.00	0.00	0.00	1	0.00	0.00	0.00	0.250	-- Not Assigned --
1	0.00	0.00	25.00	1	25.00	25.00	25.00	0.100	-- Not Assigned --
2	0.00	0.00	0.00	1	0.00	0.00	0.00	0.250	-- Not Assigned --
2	0.00	0.00	25.00	1	25.00	25.00	25.00	0.100	-- Not Assigned --
2	50.00	50.00	0.00	1	0.00	50.00	50.00	0.250	-- Not Assigned --

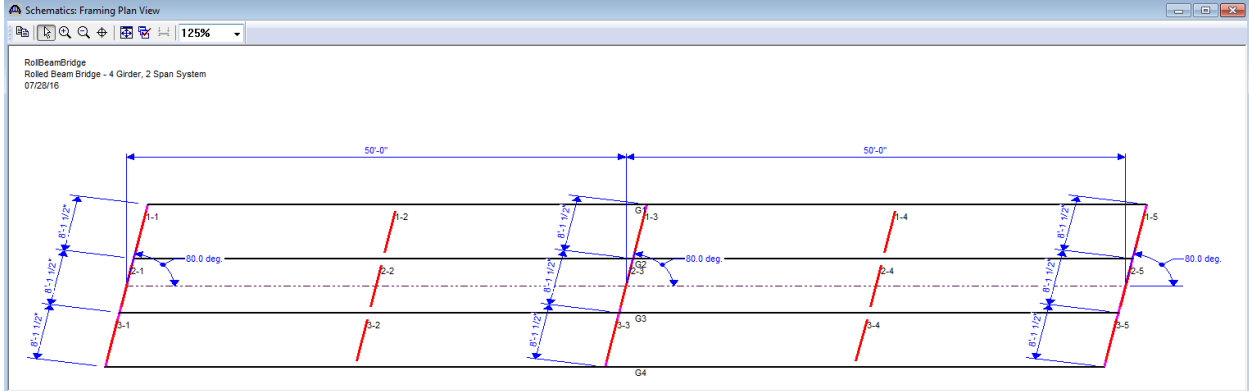
New Duplicate Delete

OK Apply Cancel

Click Ok to save this data to memory and close the window.

STL5 - Two Span Rolled Beam Example

While Framing Plan Details is selected in the BWS tree, select the View Schematic toolbar button . The following schematic will be displayed.



STL5 - Two Span Rolled Beam Example

Next define the structure typical section by double-clicking on Structure Typical Section in the Bridge Workspace tree. Input the data describing the typical section as shown below.

Basic deck geometry:

The screenshot shows the 'Structure Typical Section' dialog box with the 'Deck' tab selected. At the top, a diagram illustrates the deck geometry with labels: 'Distance from left edge of deck to superstructure definition ref. line', 'Distance from right edge of deck to superstructure definition ref. line', 'Deck thickness', 'Superstructure Definition Reference Line', 'Left overhang', and 'Right overhang'. Below the diagram, the 'Deck' tab is active, and the 'Superstructure definition reference line is' dropdown is set to 'within'. The input fields are as follows:

	Start	End
Distance from left edge of deck to superstructure definition reference line =	16.00 ft	16.00 ft
Distance from right edge of deck to superstructure definition reference line =	16.00 ft	16.00 ft
Left overhang =	4.00 ft	4.00 ft
Computed right overhang =	4.00 ft	4.00 ft

Buttons at the bottom: OK, Apply, Cancel.

STL5 - Two Span Rolled Beam Example

The Deck (cont'd) tab is used to enter information about the deck concrete and thickness. The material to be used for the deck concrete is selected from the list of bridge materials described above.

Structure Typical Section

Distance from left edge of deck to superstructure definition ref. line

Distance from right edge of deck to superstructure definition ref. line

Deck thickness

Superstructure Definition Reference Line

Left overhang

Right overhang

Deck Deck (Cont'd) Parapet Median Railing Generic Sidewalk Lane Position Striped Lanes Wearing Surface

Deck concrete: Class A (US)

Total deck thickness: 9.0000 in

Load case: Engine Assigned

Deck crack control parameter: 130.000 kip/in

Sustained modular ratio factor: 3.000

Deck exposure factor:

OK Apply Cancel

STL5 - Two Span Rolled Beam Example

Parapets:

The two parapets are described using the Parapet tab. Click New to add a row to the table. The name of the parapet defaults to the only barrier described for the bridge. Change the “Load Case” to “DL2” and “Measure To” to “Back” (we are locating the parapet on the deck by referencing the back of the parapet to the left edge of the deck). Enter 0.0 for the “Distance at Start” and “Distance at End”. Change the “Front Face Orientation” to “Right”. The completed tab is shown below.

The screenshot shows the 'Structure Typical Section' window with the 'Parapet' tab selected. A diagram of a parapet cross-section is shown with 'Back' and 'Front' labels. Below the diagram is a table with the following data:

Name	Load Case	Measure To	Edge of Deck Dist. Measured From	Distance At Start (ft)	Distance At End (ft)	Front Face Orientation
Jersey Barrier	DL2	Back	Left Edge	0.00	0.00	Right
Jersey Barrier	DL2	Back	Right Edge	0.00	0.00	Left

Buttons for 'New', 'Duplicate', 'Delete', 'OK', 'Apply', and 'Cancel' are visible at the bottom of the window.

STL5 - Two Span Rolled Beam Example

Lane Positions:

Select the Lane Position tab. Click the Compute... button to automatically compute the lane positions. A dialog showing the results of the computation opens. Click Apply to apply the computed values. The Lane Position tab is populated as shown below.

Travelway Number	Distance From Left Edge of Travelway to Superstructure Definition Reference Line At Start (A) (ft)	Distance From Right Edge of Travelway to Superstructure Definition Reference Line At Start (B) (ft)	Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (A) (ft)	Distance From Right Edge of Travelway to Superstructure Definition Reference Line At End (B) (ft)
1	-14.25	14.25	-14.25	14.25


LRFD Fatigue
 Lanes available to trucks:
 Override Truck fraction:

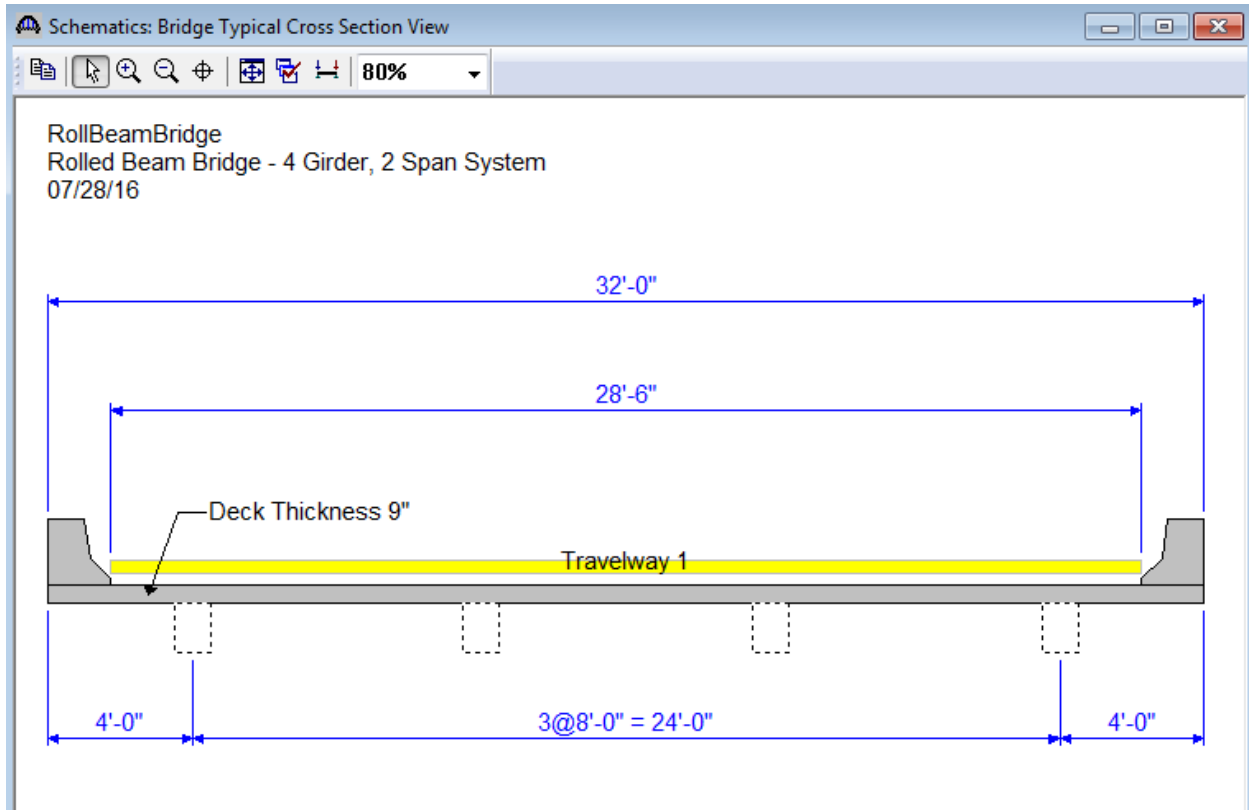
Buttons: Compute..., New, Duplicate, Delete, OK, Apply, Cancel

Click Ok to save the data to memory and close the window.

STL5 - Two Span Rolled Beam Example

While Structure Typical Section is selected in the BWS tree, open the schematic for the typical section by selecting

the View Schematic toolbar button  or Bridge/Schematic from the menu. The following schematic will be displayed. The girders are displayed as dashed boxes since we have not yet defined what type of girder we will have.



STL5 - Two Span Rolled Beam Example

Define stiffeners to be used by the girders. Expand the Stiffener Definitions tree item and double click on Transverse. Select the stiffener type as Plate and click Ok. Define the stiffener as shown below. Click Ok to save to memory and close the window.

Transverse Stiffener Definition

Name:

Stiffener Type
 Single
 Pair

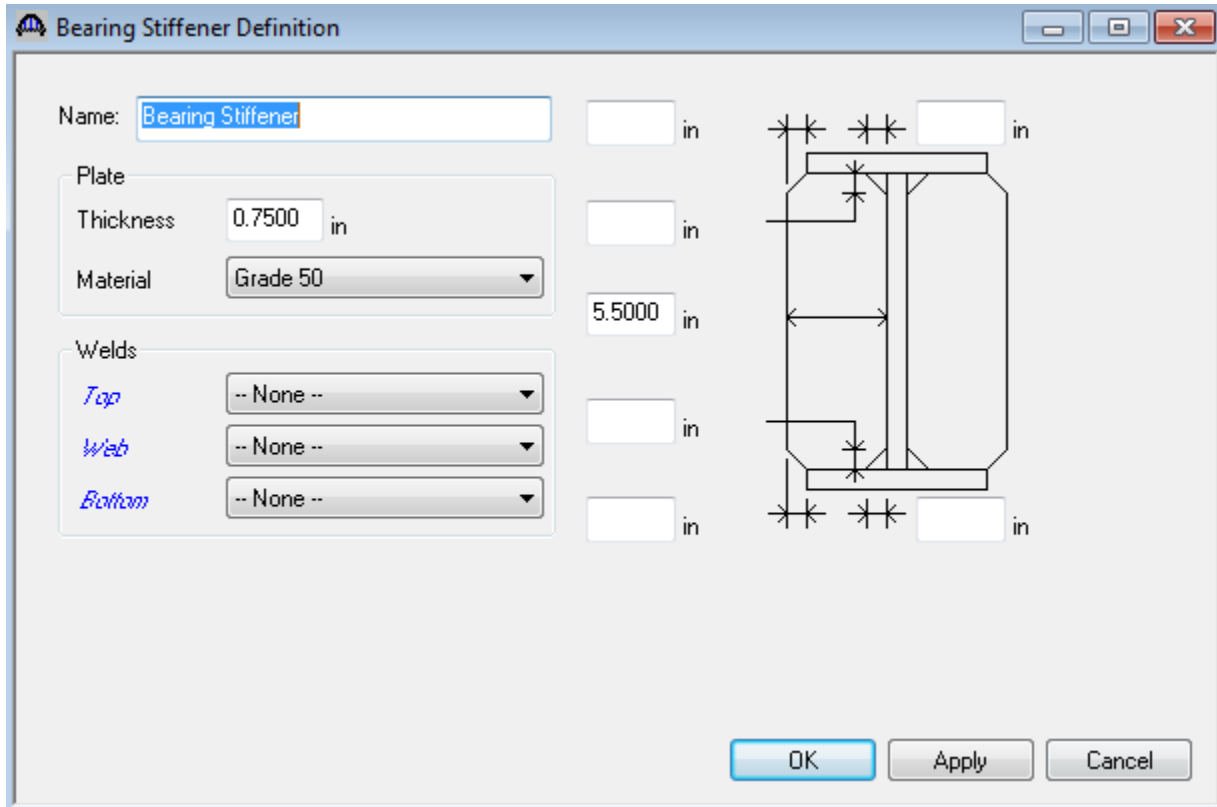
Plate
Thickness: in
Material:

Welds
Top:
Web:
Bottom:

Top Gap: in
 in
Bottom Gap: in

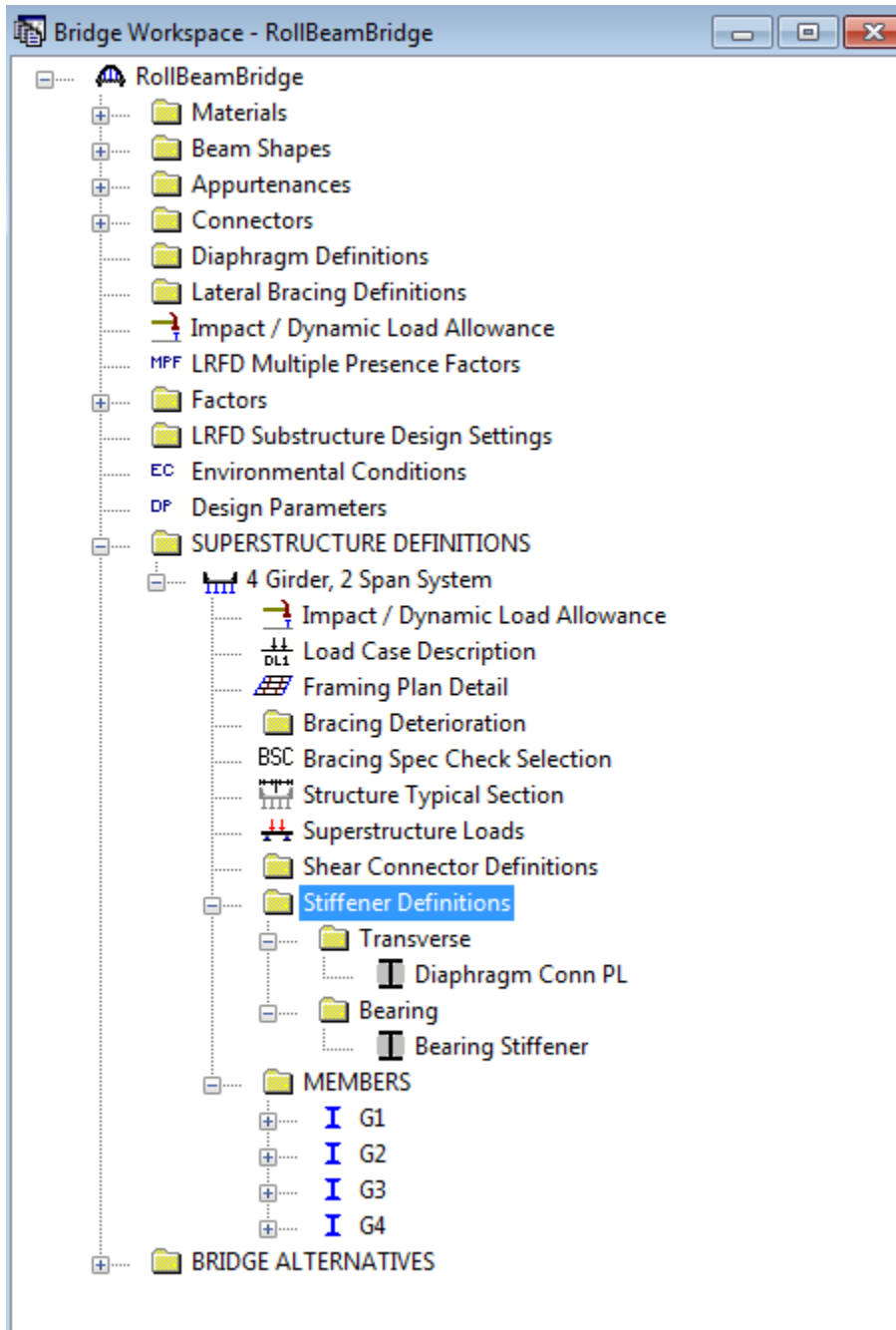
STL5 - Two Span Rolled Beam Example

Now define the bearing stiffeners by double clicking on Bearing (under Stiffener Definitions in the tree). Select the type of stiffener as plate and click Ok. Define the stiffener as shown below. Click Ok to save to memory and close the window.



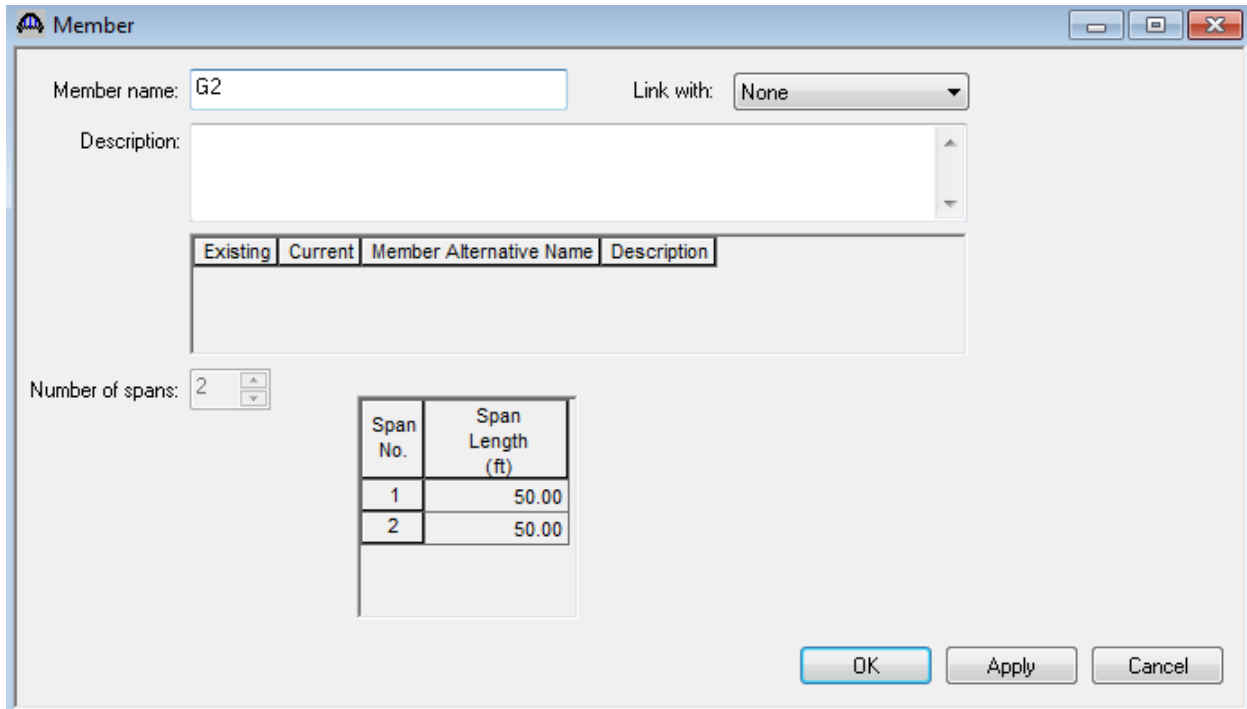
STL5 - Two Span Rolled Beam Example

The partially expanded BWS tree is shown below:



STL5 - Two Span Rolled Beam Example

Open the window for member G2 by double clicking on “G2” in the BWS tree. The member window shows the data that was generated when the structure definition was created. No changes are required at this time. The first Member Alternative that we create will automatically be assigned as the Existing and Current Member alternative for this Member.



The screenshot shows the 'Member' dialog box with the following details:

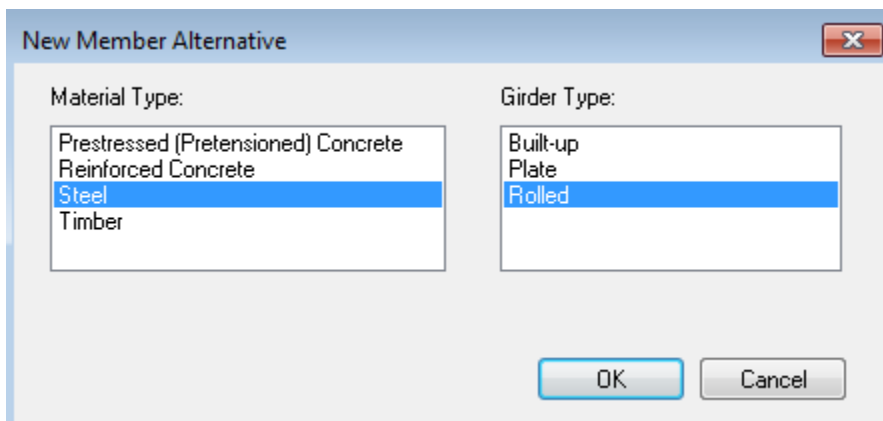
- Member name: G2
- Link with: None
- Description: (empty text area)
- Number of spans: 2
- Span table:

Span No.	Span Length (ft)
1	50.00
2	50.00

Buttons: OK, Apply, Cancel

Defining a Member Alternative:

Double-click MEMBER ALTERNATIVES in the tree to create a new alternative. The New Member Alternative dialog shown below will open. Select Steel for the Material Type and Rolled for the Girder Type.



The screenshot shows the 'New Member Alternative' dialog box with the following details:

- Material Type: Steel (selected)
- Girder Type: Rolled (selected)
- Buttons: OK, Cancel

Click Ok to close the dialog and create a new member alternative.

STL5 - Two Span Rolled Beam Example

The Member Alternative Description window will open. Enter the appropriate data as shown below. Select Schedule-based Girder property input method.

Member Alternative: Rolled Beam with Cover Plates

Description Specs Factors Engine Import Control Options

Description:

Material Type: Steel

Girder Type: Rolled

Default Units: US Customary

Girder property input method

Schedule based

Cross-section based

End bearing locations

Left: 6.0000 in

Right: 6.0000 in

Simple DL, continuous LL

Default rating method: LFD

Self Load

Load case: Engine Assigned

Additional self load = kip/ft

Additional self load = %

OK Apply Cancel

STL5 - Two Span Rolled Beam Example

Distribution Factors (Standard):

Use the Compute from Typical Section button to compute the following Standard (LFD) distribution factors.

Distribution factor calculation details can be viewed by clicking View Calcs button.

Standard | LRFD

Distribution Factor Input Method

Use Simplified Method Use Advanced Method Use Advanced Method with 1994 Guide Specs

Allow distribution factors to be used to compute effects of permit loads with routine traffic

Lanes Loaded	Distribution Factor (Wheels)			
	Shear	Shear at Supports	Moment	Deflection
1 Lane	1.143	1.250	1.143	0.500
Multi-Lane	1.455	1.750	1.455	1.000

Compute from Typical Section... View Calcs

OK Apply Cancel

STL5 - Two Span Rolled Beam Example

Next describe the girder profile by double clicking on Girder Profile in the tree. The window is shown below with the data describing the rolled shape.

The 'Girder Profile' dialog box is shown with the following configuration:

- Type: Rolled Shape
- Shape: Top Cover Plate

Shape	Support Number	Start Distance (ft)	Length (ft)	End Distance (ft)	Material
W 18x119	1	0.00	100.00	100.00	Grade 50

Buttons: New, Duplicate, Delete, OK, Apply, Cancel

STL5 - Two Span Rolled Beam Example

Describe the cover plates as shown below.

The screenshot shows the 'Girder Profile' dialog box with the 'Top Cover Plate' tab selected. The 'Type' is set to 'Rolled Shape'. The 'Welded' radio button is selected. A table lists the cover plate details:

Relative Position	Begin Width (in)	End Width (in)	Thickness (in)	Support Number	Start Distance (ft)	Length (ft)	End Distance (ft)	Material	Side Weld	End Weld at Right
1	9.0000	9.0000	1.0000	1	35.00	30.00	65.00	Grade 50	-- None --	-- None --

Buttons at the bottom include 'Copy to Bottom Cover Plate', 'New', 'Duplicate', 'Delete', 'OK', 'Apply', and 'Cancel'.

Click Copy to Bottom Cover Plate button, Bottom Cover Plate tab will look as below.

The screenshot shows the 'Girder Profile' dialog box with the 'Bottom Cover Plate' tab selected. The 'Type' is set to 'Rolled Shape'. The 'Welded' radio button is selected. A table lists the cover plate details:

Relative Position	Begin Width (in)	End Width (in)	Thickness (in)	Support Number	Start Distance (ft)	Length (ft)	End Distance (ft)	Material	Side Weld	End Weld at Right
1	9.000	9.000	1.0000	1	35.00	30.00	65.00	Grade 50	-- None	-- None

Buttons at the bottom include 'Copy to Top Cover Plate', 'New', 'Duplicate', 'Delete', 'OK', 'Apply', and 'Cancel'.

Click Ok to save to the memory and close the window.

STL5 - Two Span Rolled Beam Example

Next open the Deck Profile and enter the data describing the structural properties of the deck. The deck concrete and reinforcement windows are shown below.

Deck Profile

Type: Rolled

Deck Concrete | Reinforcement | Shear Connectors

Material	Support Number	Start Distance (ft)	Length (ft)	End Distance (ft)	Structural Thickness (in)	Start Effective Flange Width (Std) (in)	End Effective Flange Width (Std) (in)	Start Effective Flange Width (LRFD) (in)	End Effective Flange Width (LRFD) (in)	n
Class A (US)	1	0.00	100.00	100.00	8.5000	96.0000	96.0000	96.0000	96.0000	8.000

Compute from Typical Section...

New Duplicate Delete

OK Apply Cancel

Deck Profile

Type: Rolled

Deck Concrete | Reinforcement | Shear Connectors

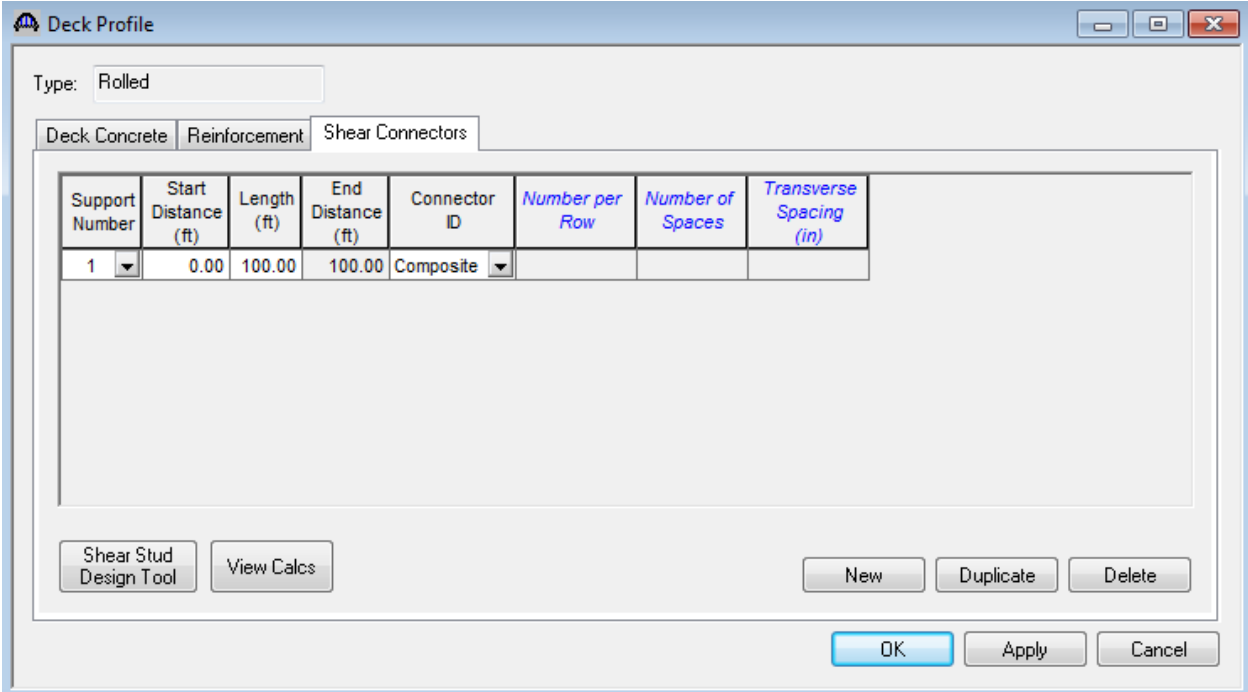
Material	Support Number	Start Distance (ft)	Length (ft)	End Distance (ft)	Std Bar Count	LRFD Bar Count	Bar Size	Distance (in)	Row	Bar Spacing (in)
Grade 60	1	35.00	30.00	65.00	8.00	8.00	6	2.5000	Top of Slab	
Grade 60	1	35.00	30.00	65.00	8.00	8.00	6	2.9375	Bottom of Slab	

New Duplicate Delete

OK Apply Cancel

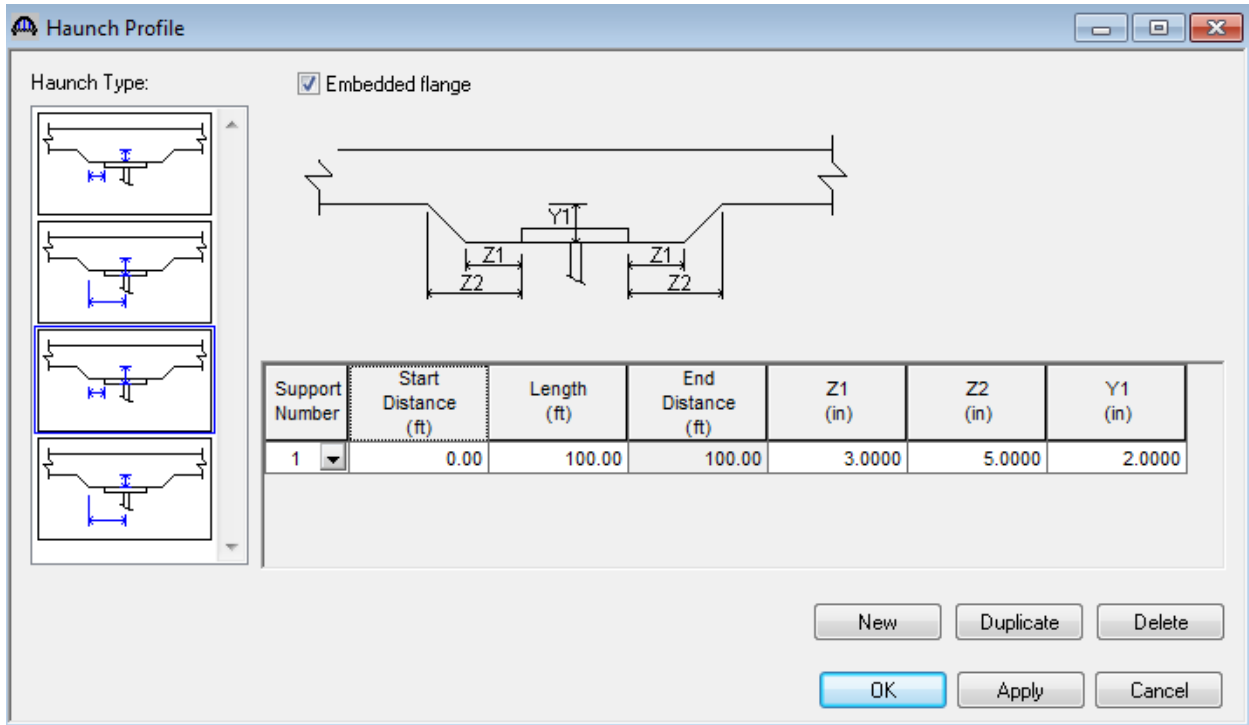
STL5 - Two Span Rolled Beam Example

Composite regions are described using the Shear Connectors tab as shown below.



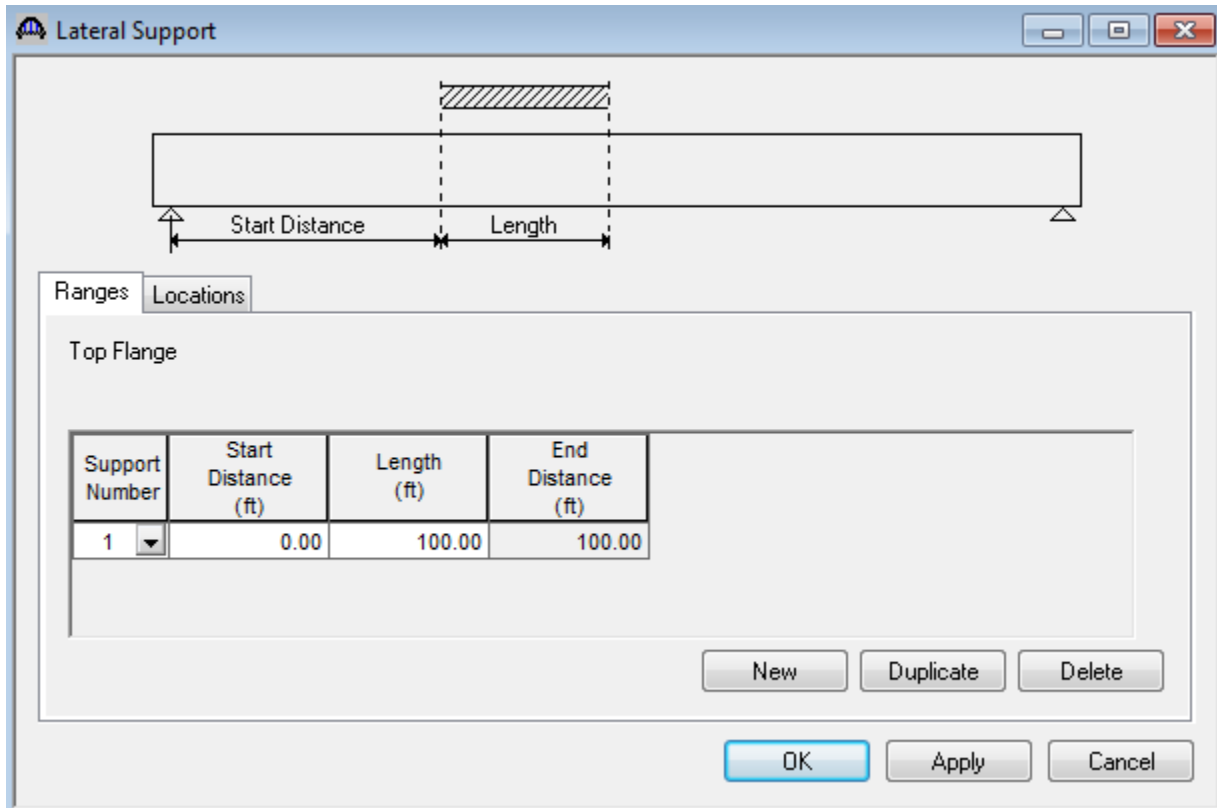
STL5 - Two Span Rolled Beam Example

The haunch profile is defined by double clicking on Haunch Profile in the tree. The window is shown below.



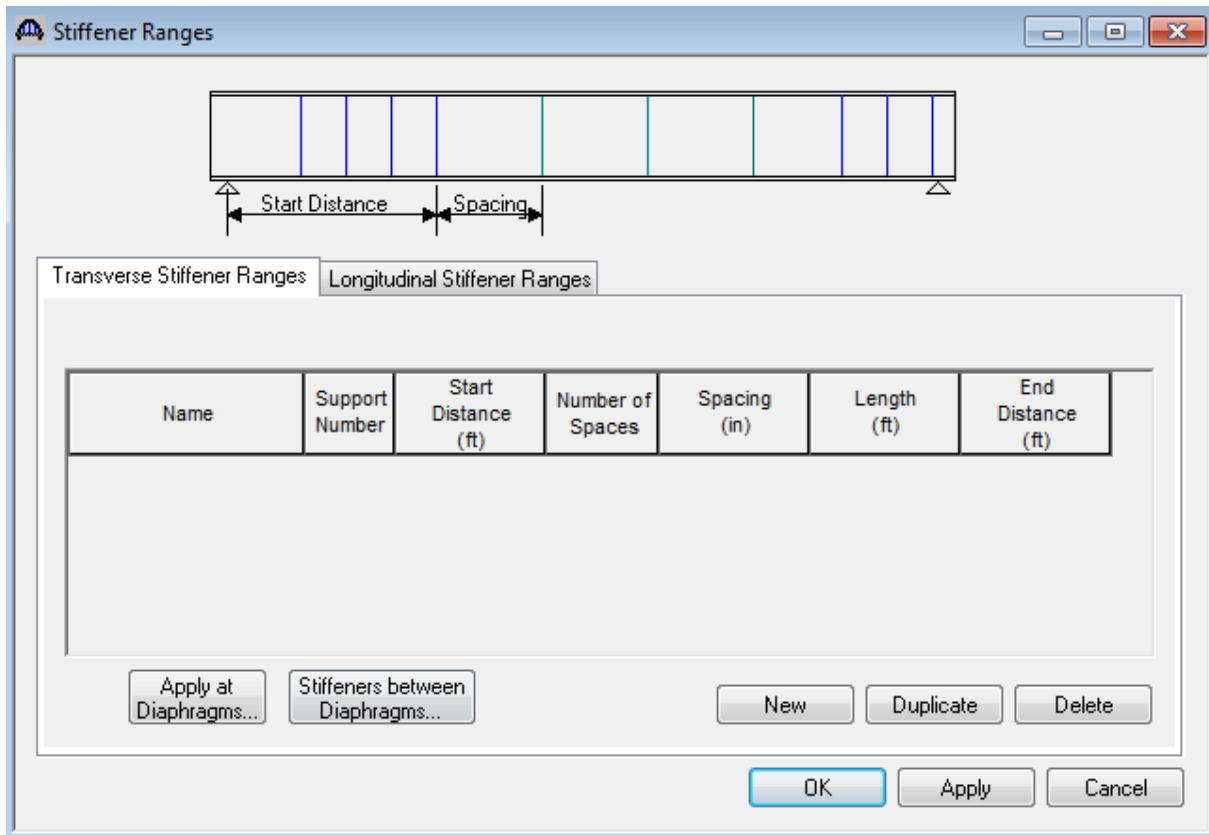
STL5 - Two Span Rolled Beam Example

Regions where the slab is considered to provide lateral support for the top flange are defined using the Lateral Support window shown below. It can be opened by double clicking on Lateral Support in the tree.



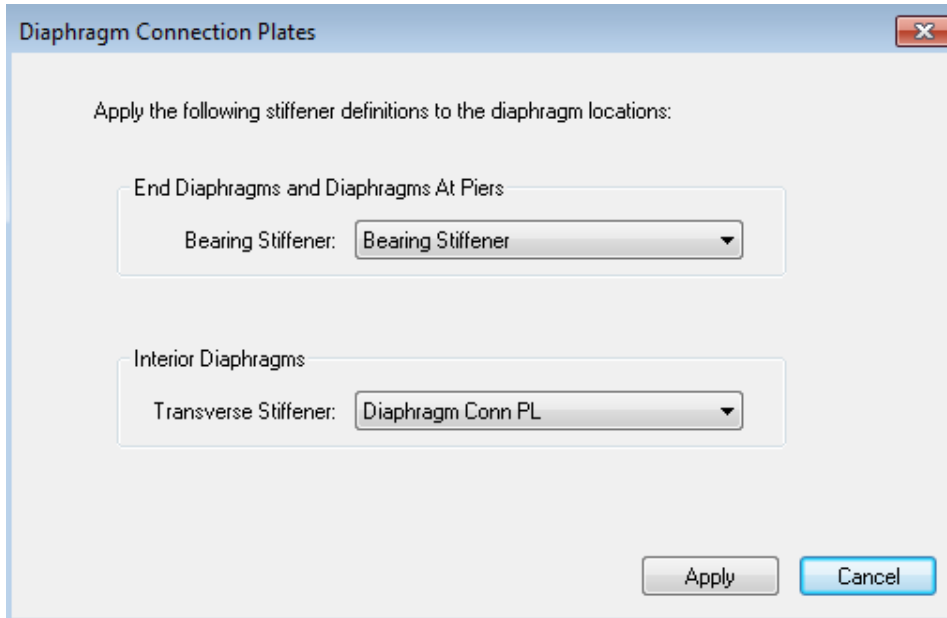
STL5 - Two Span Rolled Beam Example

Stiffener locations are described using the Stiffener Ranges window shown below.

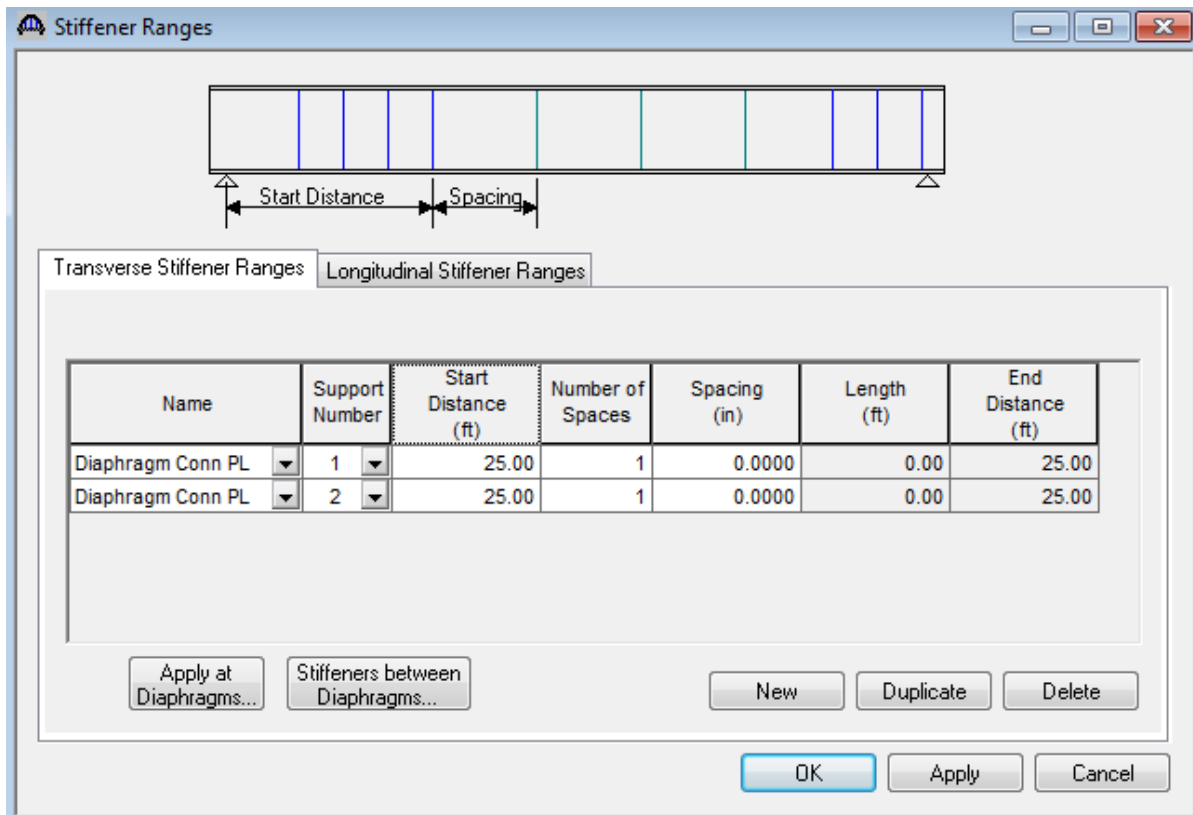


STL5 - Two Span Rolled Beam Example

Click on the Apply at Diaphragms... button to open the following dialog.



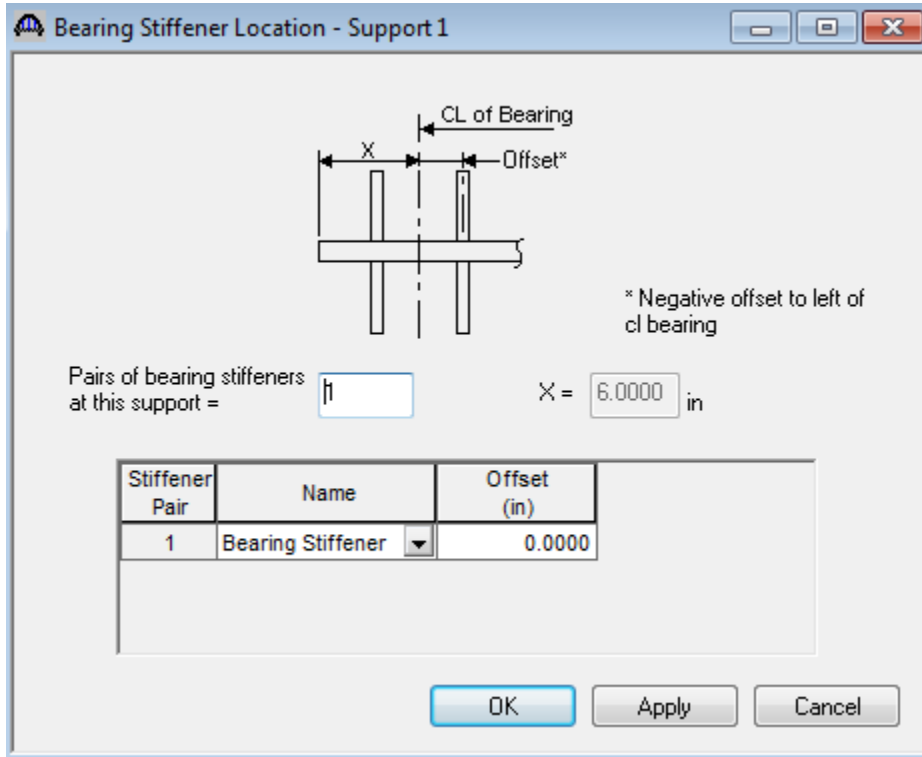
Selecting Apply will create the following transverse stiffener locations.



This example does not have any intermediate transverse stiffeners so we can click Ok to close this window

STL5 - Two Span Rolled Beam Example


Bearing stiffener definitions were assigned to locations when we used the Apply at Diaphragms... button on the Transverse Stiffener Ranges window. The Bearing Stiffener Location window is opened by expanding the Bearing Stiffener Locations branch in the tree and double clicking on each support. The assignment for Support 1 is shown below.

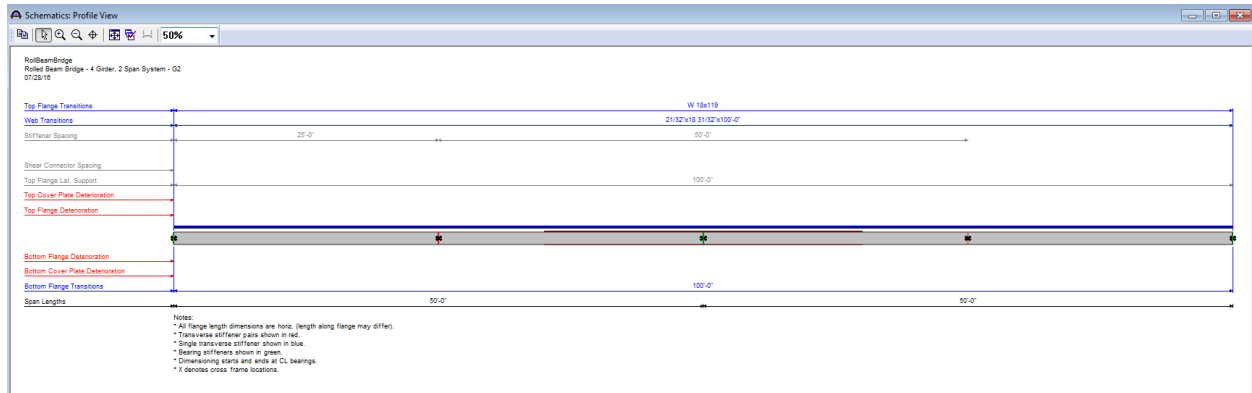


The description of an interior beam for a structure definition is complete.

STL5 - Two Span Rolled Beam Example

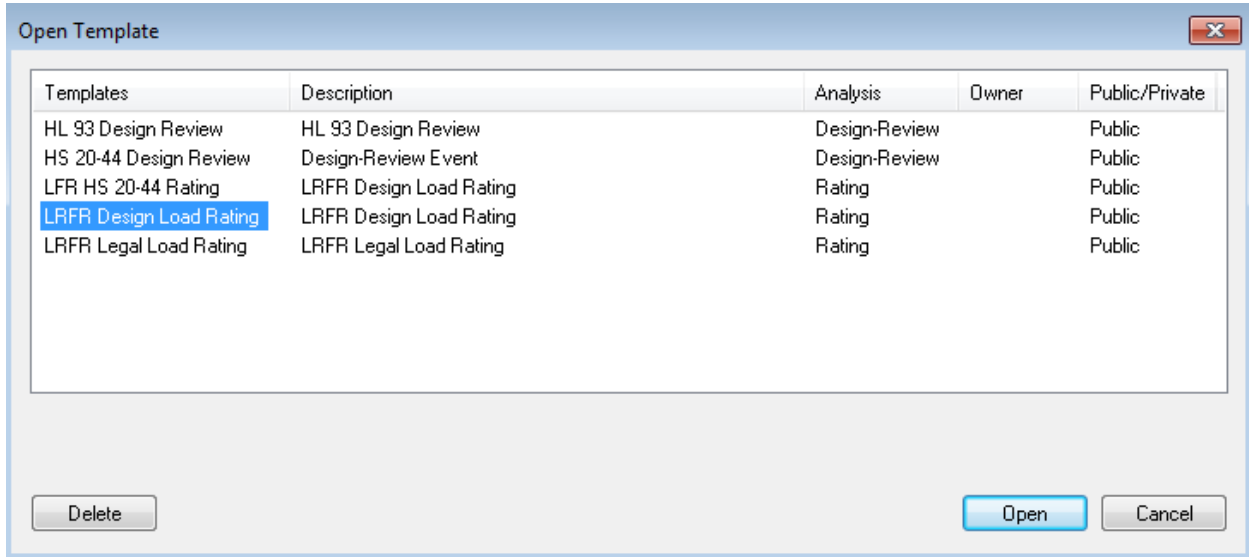
While “Rolled Beam with Cover Plates” is selected in the BWS tree, open the schematic for the girder profile by

selecting the View Schematic toolbar button  or Bridge/Schematic from the menu. The following schematic will be displayed.



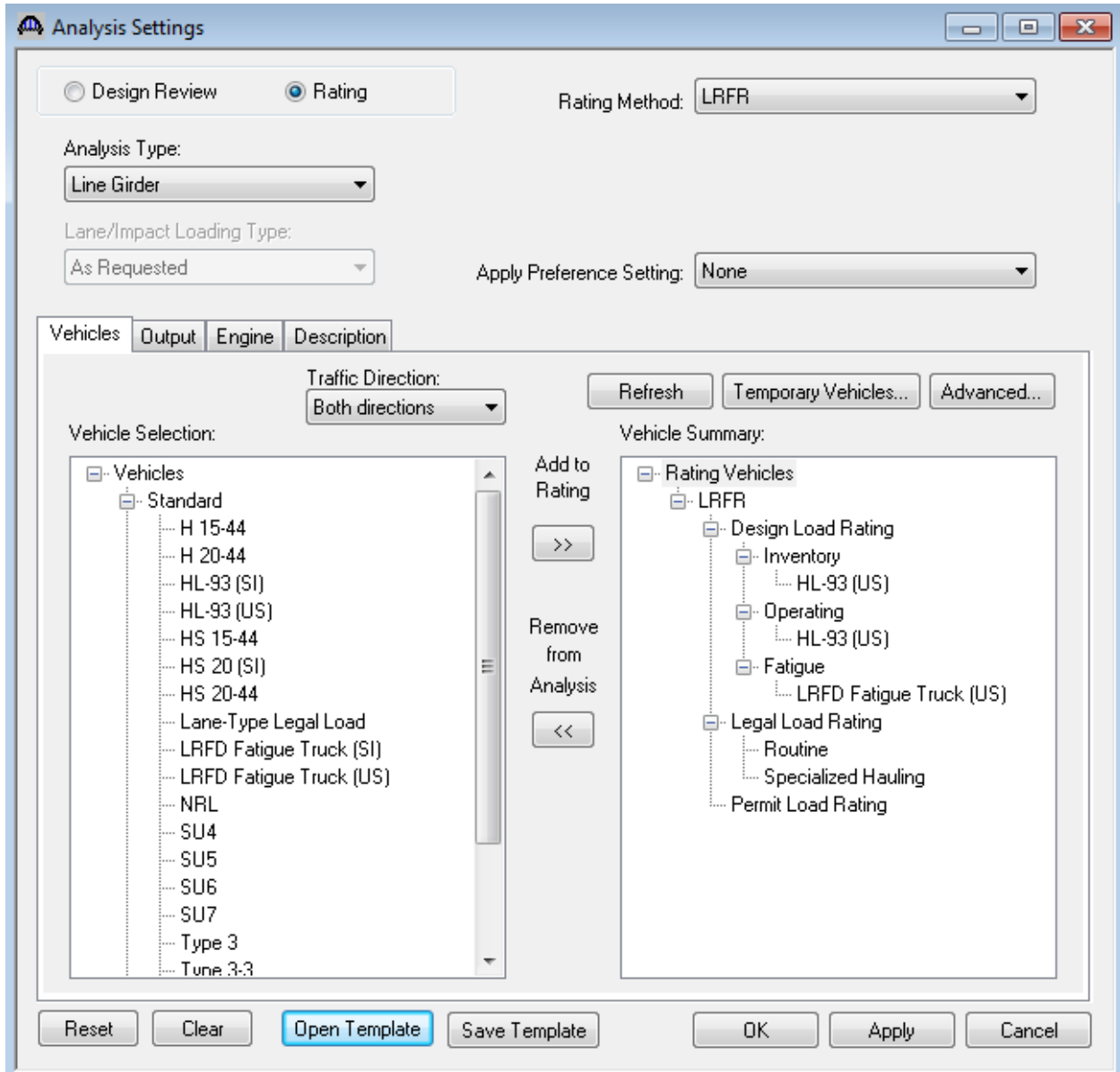
STL5 - Two Span Rolled Beam Example

To perform AASHTO LRFR rating, select the name of the “Rolled Beam with Cover Plates” member alternative in the tree. Click the View Analysis Settings button on the toolbar. The Analysis Settings window will open. Select the “Open Template” button to open the following window. Select the LRFR Design Load rating template and click the Open button.



STL5 - Two Span Rolled Beam Example

The Analysis Settings window with the selected vehicles is shown below. Click Ok to close the window.



STL5 - Two Span Rolled Beam Example

Next click the Analyze button on the toolbar to perform the rating. When the rating is finished you can review the results by clicking the View Analysis Report button on the toolbar. The window shown below will open.

Analysis Results - Rolled Beam with Cover Plates

Report Type: Rating Results Summary
 Lane/Impact Loading Type: As Requested Detailed
 Display Format: Single rating level per row

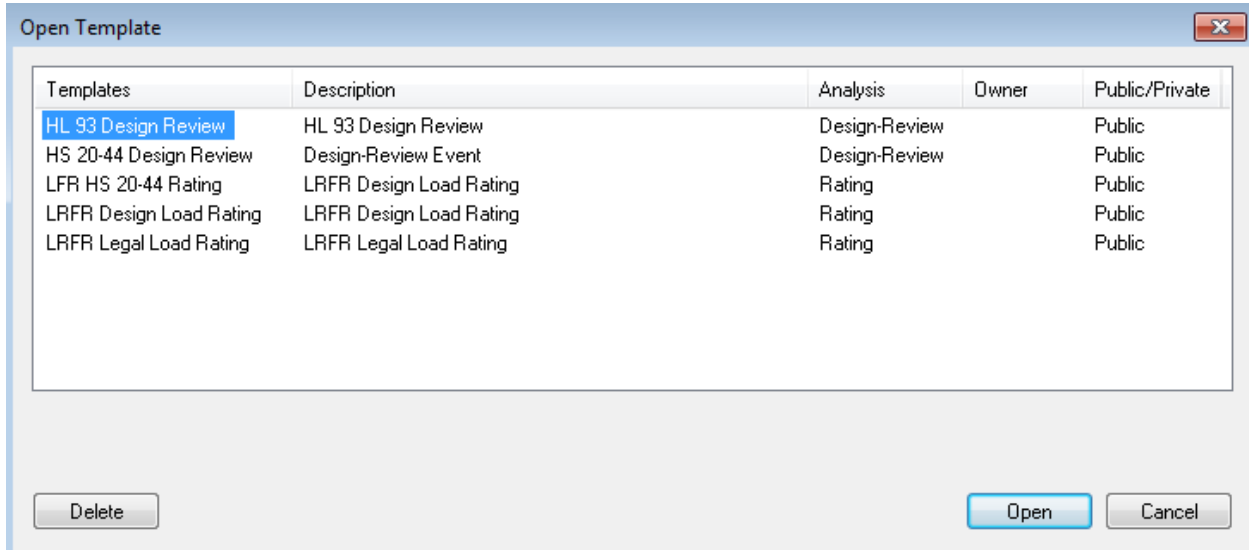
Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HL-93 (US)	Truck + L	LRFR	Inventory	37.49	1.041	50.00	1 - (100.0)	STRENGTH-I Steel Fi	As Requested	As Requested
HL-93 (US)	Truck + L	LRFR	Operating	53.76	1.493	50.00	1 - (100.0)	STRENGTH-I Steel Fi	As Requested	As Requested
HL-93 (US)	Tandem +	LRFR	Inventory	47.18	1.311	50.00	1 - (100.0)	STRENGTH-I Steel Fi	As Requested	As Requested
HL-93 (US)	Tandem +	LRFR	Operating	67.52	1.875	50.00	1 - (100.0)	STRENGTH-I Steel Fi	As Requested	As Requested
HL-93 (US)	90%(Truc	LRFR	Inventory	54.46	1.513	50.00	1 - (100.0)	STRENGTH-I Steel Fi	As Requested	As Requested
HL-93 (US)	90%(Truc	LRFR	Operating	70.60	1.961	50.00	1 - (100.0)	STRENGTH-I Steel Fi	As Requested	As Requested
LRFD Fatigue Truck (US)	Axle Load	LRFR	Inventory	16.19	0.540	65.00	2 - (30.0)	FATIGUE Steel Flexu	As Requested	As Requested

AASHTO LRFR Engine Version 6.8.0.3001
 Analysis Preference Setting: None

Close

STL5 - Two Span Rolled Beam Example

To perform AASHTO LRFD analysis, select the name of the “Rolled Beam with Cover Plates” member alternative in the tree. Click the View Analysis Settings button on the toolbar. The Analysis Settings window will open. Select the “Open Template” button to open the following window. Select the HL 93 Design Review template and click the Open button.



STL5 - Two Span Rolled Beam Example

The Analysis Settings window with the selected vehicles is shown below. Click Ok to close the window.

Analysis Settings

Design Review Rating Design Method: LRFD

Analysis Type: Line Girder

Lane/Impact Loading Type: As Requested Apply Preference Setting: None

Vehicles Output Engine Description

Traffic Direction: Both directions

Refresh Temporary Vehicles... Advanced...

Vehicle Selection:

- Vehicles
 - Standard
 - Alternate Military Loading
 - HL-93 (SI)
 - HL-93 (US)
 - HS 20 (SI)
 - HS 20-44
 - LRFD Fatigue Truck (SI)
 - LRFD Fatigue Truck (US)
 - Agency
 - User Defined
 - Temporary

Add to Design >>


Remove from Analysis <<

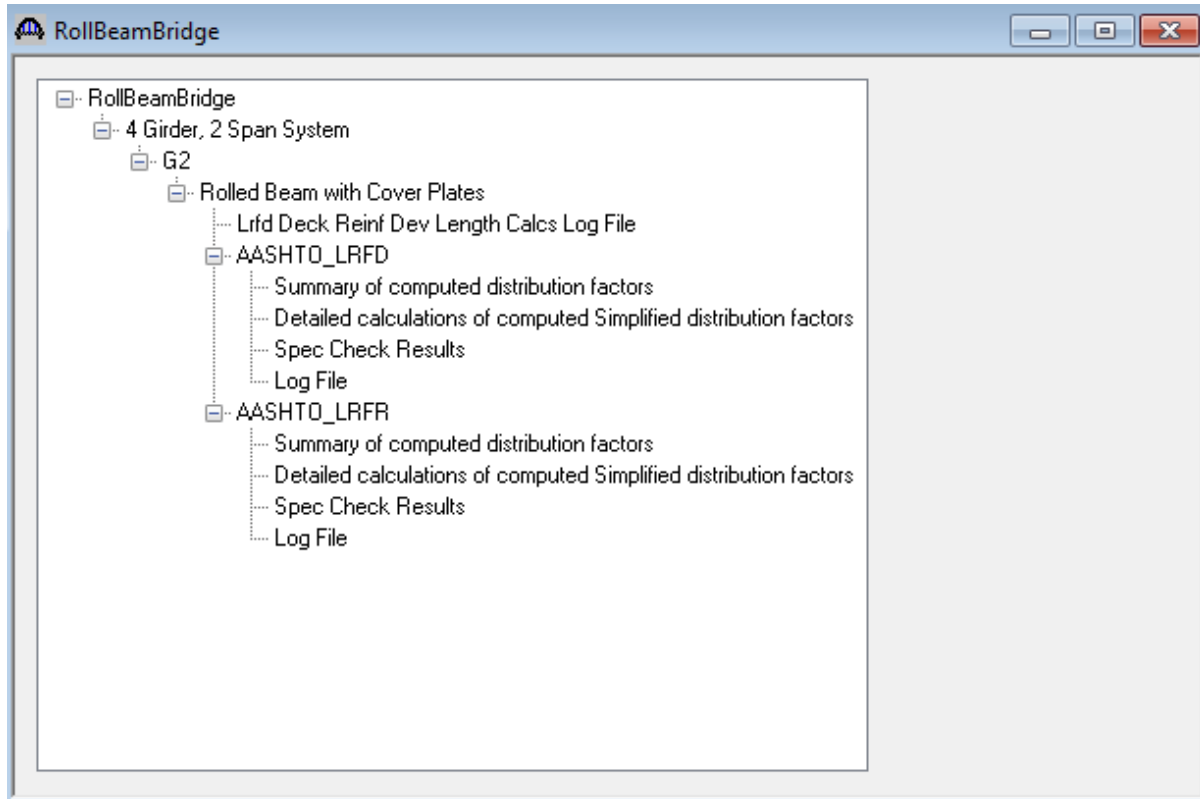
Vehicle Summary:

- Design Vehicles
 - Design Loads
 - HL-93 (US)
 - Permit Loads
 - Fatigue Loads
 - LRFD Fatigue Truck (US)

Reset Clear **Open Template** Save Template OK Apply Cancel

STL5 - Two Span Rolled Beam Example

Next click the Analyze button on the toolbar to perform the rating. When the analysis is finished you can review the results by clicking the  button on the toolbar. The window shown below will open.



STL5 - Two Span Rolled Beam Example

You can view spec check results by double clicking spec check results. Spec check results window will open as below.

Bridge ID : 60
 Bridge : Rolled Beam Bridge
 Superstructure Def : 4 Girder, 2 Span System
 Member : G2
 Analysis Preference Setting : None

NBI Structure ID : RollBeamBridge
 Bridge Alt :
 Member Alt : Rolled Beam with Cover Plates

AASHTO LRFD Specification, Edition 7, Interim 2016

Specification Check Summary

Article	Status
Flexure (6.10.7.1.1, 6.10.7.2.1)	Pass
Shear (6.10.9)	Pass
Fatigue (6.10.5.3)	NA
Serviceability (6.10.4.2.2)	Pass
Constructability (6.10.3.2.1, 6.10.3.2.2, 6.10.3.2.3)	Pass
Transverse Stiffeners (6.10.11.1.2, 6.10.11.1.3)	Pass
Longitudinal Stiffeners (6.10.11.3.1, 6.10.11.3.2, 6.10.11.3.3)	NA
Bearing Stiffeners (6.10.11.2.2, 6.10.11.2.3, 6.10.11.2.4)	Pass
Shear Connector (6.10.10.1, 6.10.10.4)	NA
Field Splice (6.13.6.1.4a, 6.13.2.6, 6.13.2.7, 6.13.6.1.4b, 6.13.6.1.4c)	NA

Girder Member Proportions and Compactness (Stage 3)

Location (ft)	Composite	Proportion Code	Code Check	Compact	Code Check
0.000	Yes	Pass	---	Compact	E
5.000	Yes	Pass	---	Compact	E