

AASHTOWare BrDR 7.5.0

Timber Structure Tutorial

TMBR3- Single Span Timber Beam - Glulam Example

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BrDR Training

TMBR3- Single Span Timber Beam Example

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

Timber Example Glulam

Bridge ID: NBI structure ID (8):

Template Superstructures
 Bridge completely defined Culverts
 Substructures

Description Description (cont'd) Alternatives Global reference point Traffic Custom agency fields

Name: Year built:

Description:

Location: Length: ft

Facility carried (7): Route number:

Feat. intersected (6): Mi. post:

Default units:

Bridge association... BrR BrD BrM

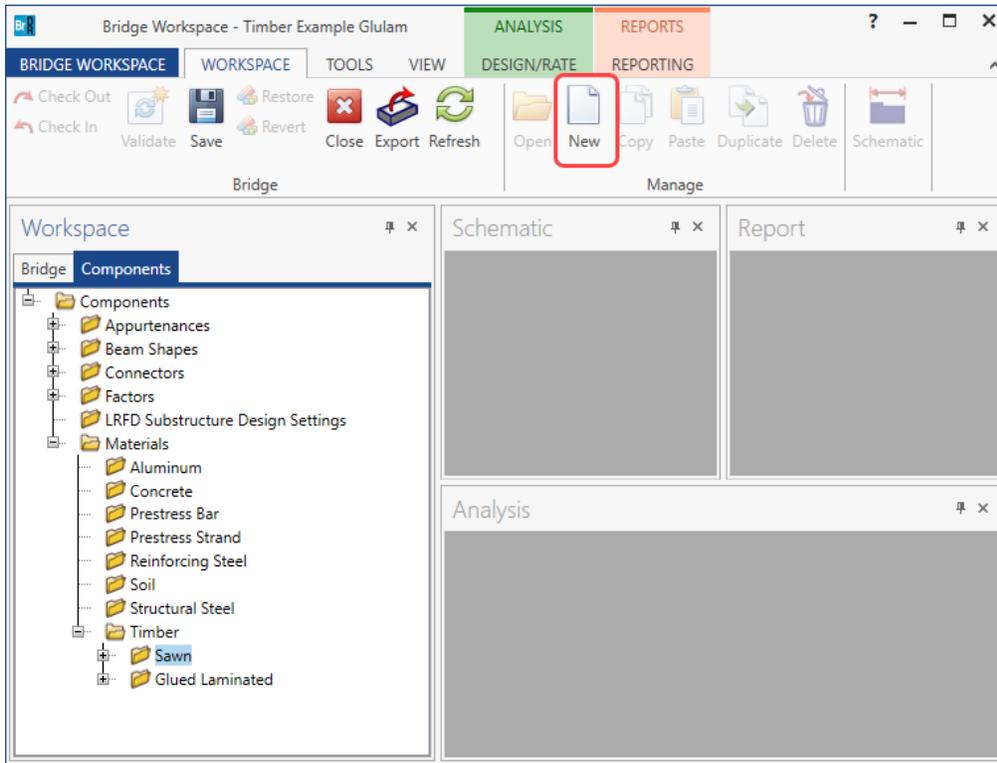
OK Apply Cancel

Close the window by clicking **OK**. This saves the data to memory and closes the window.

TMBR3- Single Span Timber Beam – Glulam Example

Bridge – Materials

To add a new timber material for timber deck, in the **Components** tab of the Bridge Workspace, click on **Materials**, **Timber**, **Sawn** and select **New** from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **Sawn** and select **New**).



Click the **Copy from Library** button and select the following material from the library.

Name	Description	Library	Units	Grading method	Species	Commercial grade	Size class	Grading rule agency
Southern Pine	Southern Pine	Standard	US Customary	Visual	Southern Pine	No. 1	2" - 4" thick, 5" - 6" wide	SPIB
Southern Pine	Southern Pine	Standard	US Customary	Visual	Southern Pine	Select Structural	2" - 4" thick, 5" - 6" wide	SPIB
Southern Pine	Southern Pine	Standard	US Customary	Visual	Southern Pine	No. 2	2" - 4" thick, 2" - 4" wide	SPIB
Southern Pine	Southern Pine	Standard	US Customary	Visual	Southern Pine	No. 1	2" - 4" thick, 2" - 4" wide	SPIB
Southern Pine	Southern Pine	Standard	US Customary	Visual	Southern Pine	Select Structural	2" - 4" thick, 2" - 4" wide	SPIB
Southern Pine (Dry...	Southern Pine (Dry o...	Standard	US Customary	Visual	Southern Pine (Dry o...	Select Structural	5" x 5" & larger	SPIB

Click **OK** and the **Bridge Materials – Timber - Sawn** window will be populated with the library data. Change the **Name** field of the material to **Deck Timber** from Southern Pine. The ASD Tabulated Design Values in the **ASD** tab of this window and the LRFD Reference design values in the **LRFD** tab of this window are based on dry conditions and do not include any adjustment factors based on usage conditions. Click **OK** to save this timber material to memory and close the window.

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Bridge Materials - Timber - Sawn

Name: Deck Timber

Description: Southern Pine

General ASD LRFD

Grading method: Visual

Species: Southern Pine

Commercial grade: No. 2

Size classification: 2" - 4" thick, 2" - 4" wide

Grading rules agency: SPIB

Density: 0.05 kcf

Copy to library... Copy from library... OK Apply Cancel

Bridge Materials - Timber - Sawn

Name: Deck Timber

Description: Southern Pine

General ASD LRFD

Bending: 1.5 ksi

Tension (parallel): 0.825 ksi

Shear (parallel): 0.090 ksi

Compr. (perp): 0.565 ksi

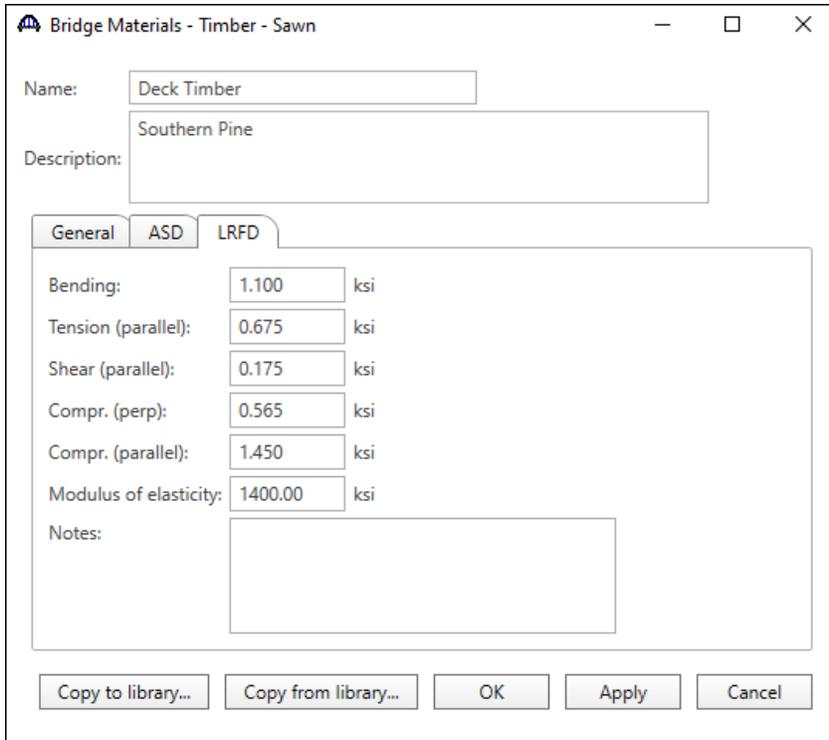
Compr. (parallel): 1.650 ksi

Modulus of elasticity: 1600.00 ksi

Notes:

Copy to library... Copy from library... OK Apply Cancel

TMBR3- Single Span Timber Beam – Glulam Example



Bridge Materials - Timber - Sawn

Name:

Description:

General ASD LRFD

Bending: ksi

Tension (parallel): ksi

Shear (parallel): ksi

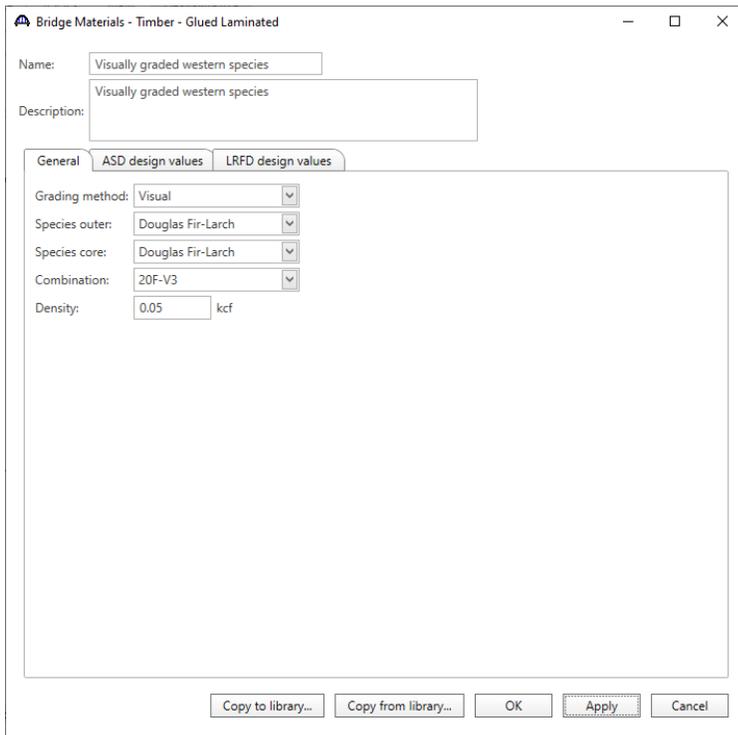
Compr. (perp): ksi

Compr. (parallel): ksi

Modulus of elasticity: ksi

Notes:

To add a new timber material for the timber beam, in the **Components** tab of the Bridge Workspace, click on **Materials, Timber, Glued Laminated** and select **New** from the **Manage** group of the Workspace ribbon (or right mouse click on Glued Laminated and select New). Enter the details of this material as shown in images below:



Bridge Materials - Timber - Glued Laminated

Name:

Description:

General ASD design values LRFD design values

Grading method:

Species outer:

Species core:

Combination:

Density: kcf

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Bridge Materials - Timber - Glued Laminated

Name:

Description:

General ASD design values LRF design values

Loaded perpendicular to wide faces of lamination

Tension zone stressed in tension: ksi

Compr. zone stressed in tension: ksi

Compr. perp. to grain (tension): ksi

Compr. perp. to grain (compr.): ksi

Shear parallel to grain: ksi

Modulus of elasticity: ksi

Loaded parallel to wide faces of lamination

Bending: ksi

Compr. perp. to grain: ksi

Shear parallel to grain: ksi

Shear parallel to grain (not edge glued): ksi

Modulus of elasticity: ksi

Axially loaded

Tension parallel to grain: ksi

Compr. parallel to grain: ksi

Modulus of elasticity: ksi

Notes:

Copy to library... Copy from library... OK Apply Cancel

Bridge Materials - Timber - Glued Laminated

Name:

Description:

General ASD design values LRF design values

Loaded perpendicular to wide faces of lamination

Tension zone stressed in tension: ksi

Compr. zone stressed in tension: ksi

Compr. perp. to grain (tension): ksi

Compr. perp. to grain (compr.): ksi

Shear parallel to grain: ksi

Modulus of elasticity: ksi

Loaded parallel to wide faces of lamination

Extreme fiber in bending: ksi

Compr. perp. to grain: ksi

Shear parallel to grain (horz.): ksi

Modulus of elasticity: ksi

Axially loaded

Tension parallel to grain: ksi

Compr. parallel to grain: ksi

Modulus of elasticity: ksi

Fasteners

Specific gravity top or bottom face: ksi

Specific gravity side face: ksi

Notes:

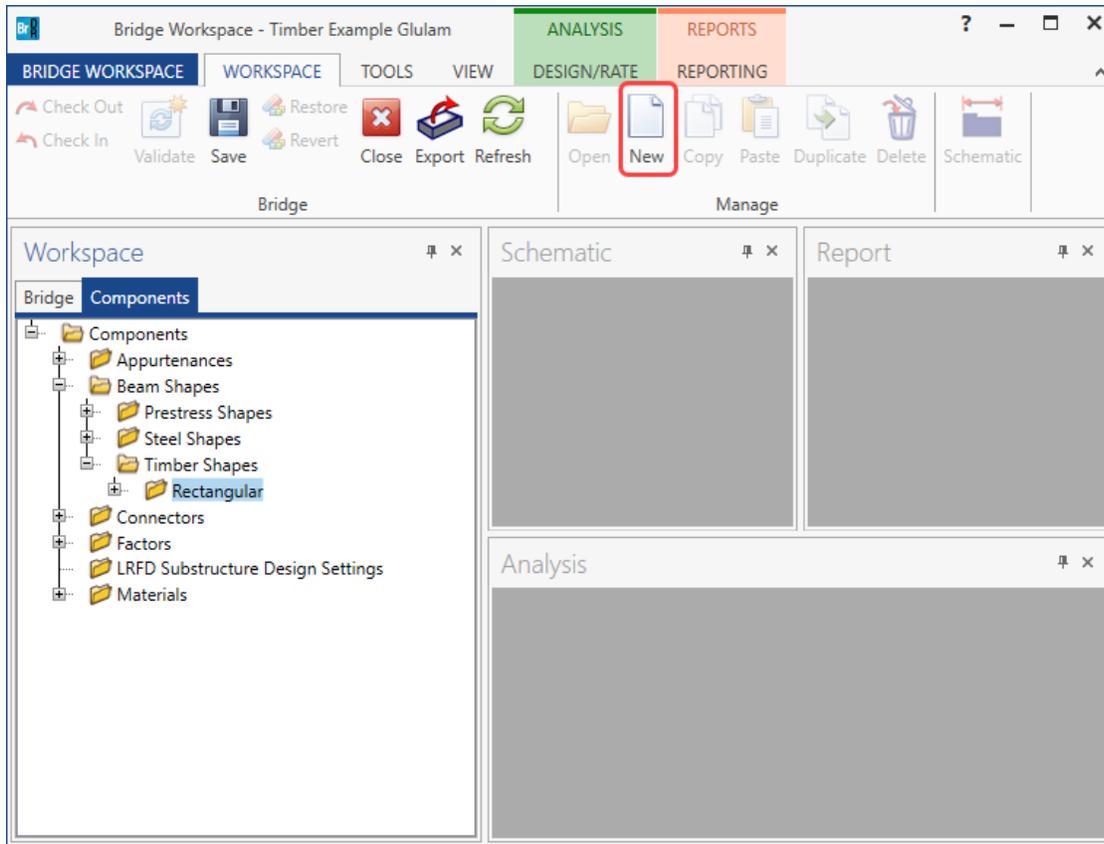
Copy to library... Copy from library... OK Apply Cancel

The input values in the **ASD design values** tab of this window and in the **LRF design values** tab of this window are based on dry conditions and do not include any adjustment factors based on usage conditions. Click **OK** to save this timber material to memory and close the window.

TMBR3- Single Span Timber Beam – Glulam Example

Timber – Shape

Add a new timber beam shape by clicking on **Beam Shapes, Timber Shapes, Rectangular** in the **Components** tree and selecting **New** from the **Manage** group of the **WORKSPACE** ribbon (or double click on **Rectangular**).



Enter the following data. Enter the actual beam dimensions to be used to calculate section properties on the **Dimensions** tab. Enter the nominal dimensions of the beam on the **Properties** tab and click on the **Compute** button to compute the section properties. Click **OK** to save the data to memory and close the window.

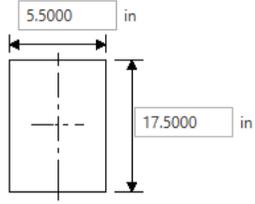
TMBR3- Single Span Timber Beam – Glulam Example

Timber Shape - Rectangular

Name:

Description:

Dimensions **Properties**



5.5000 in

17.5000 in

Timber Shape - Rectangular

Name:

Description:

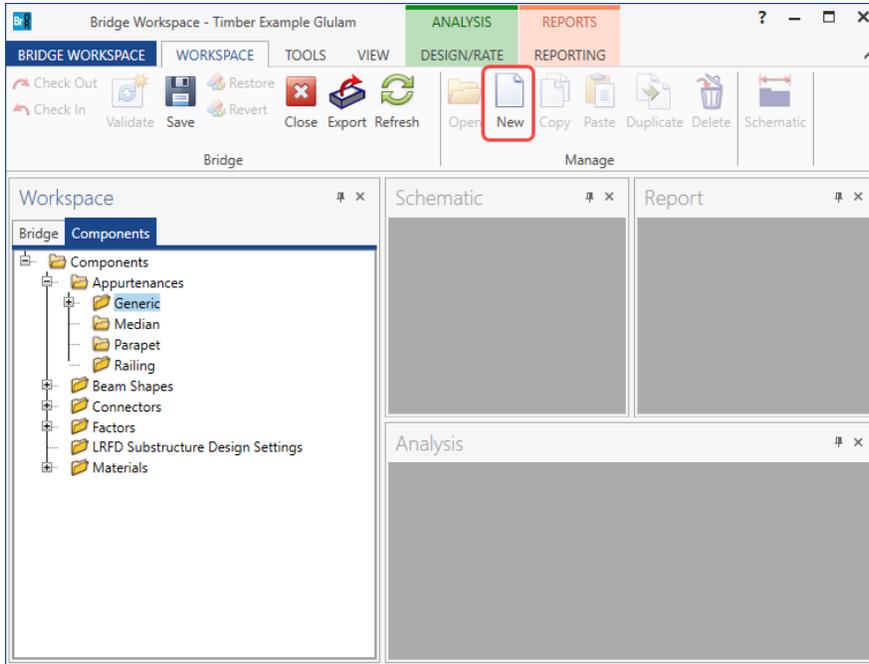
Dimensions Properties

Area:	<input type="text" value="96.25"/>	in ²
Nominal load:	<input type="text" value="33.40"/>	lb/ft
Moment of inertia:	<input type="text" value="2456.4"/>	in ⁴
CG from bottom:	<input type="text" value="8.7500"/>	in
Section modulus, top:	<input type="text" value="280.7"/>	in ³
Section modulus, bottom:	<input type="text" value="280.7"/>	in ³
Nominal width:	<input type="text" value="6.00"/>	in
Nominal depth:	<input type="text" value="18.0000"/>	in

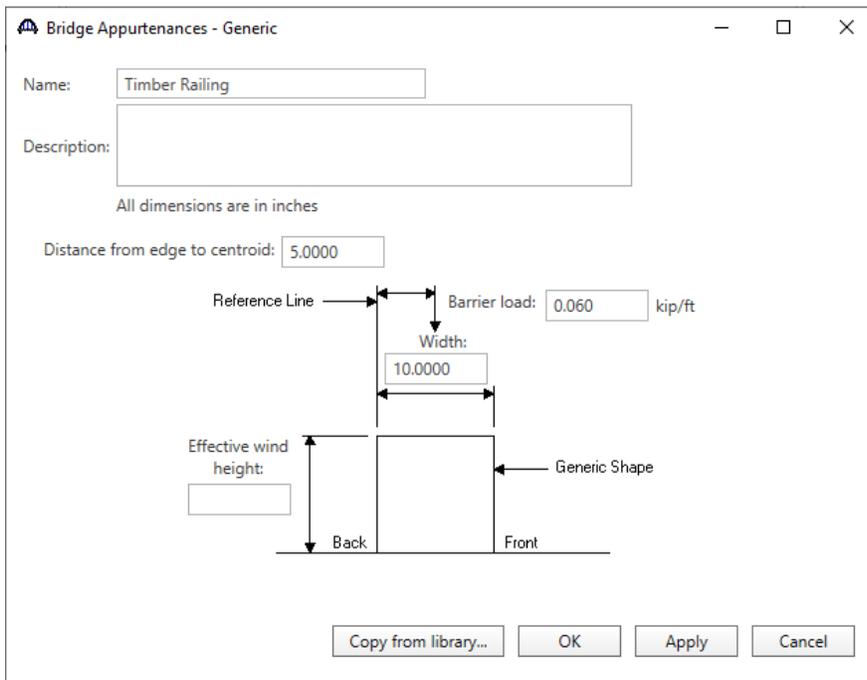
TMBR3- Single Span Timber Beam – Glulam Example

Bridge Appurtenances

To enter the appurtenances to be used within the bridge, expand the **Components** tree branch labeled **Appurtenances**. To define a generic railing, select **Generic** in the **Components** tree and click **New** from the **Manage** group of the **WORKSPACE** ribbon (or double click on **Generic**).



Input the generic railing dimensions as shown below.



Name:

Description:

All dimensions are in inches

Distance from edge to centroid:

Barrier load: kip/ft

Width:

Effective wind height:

Back Front

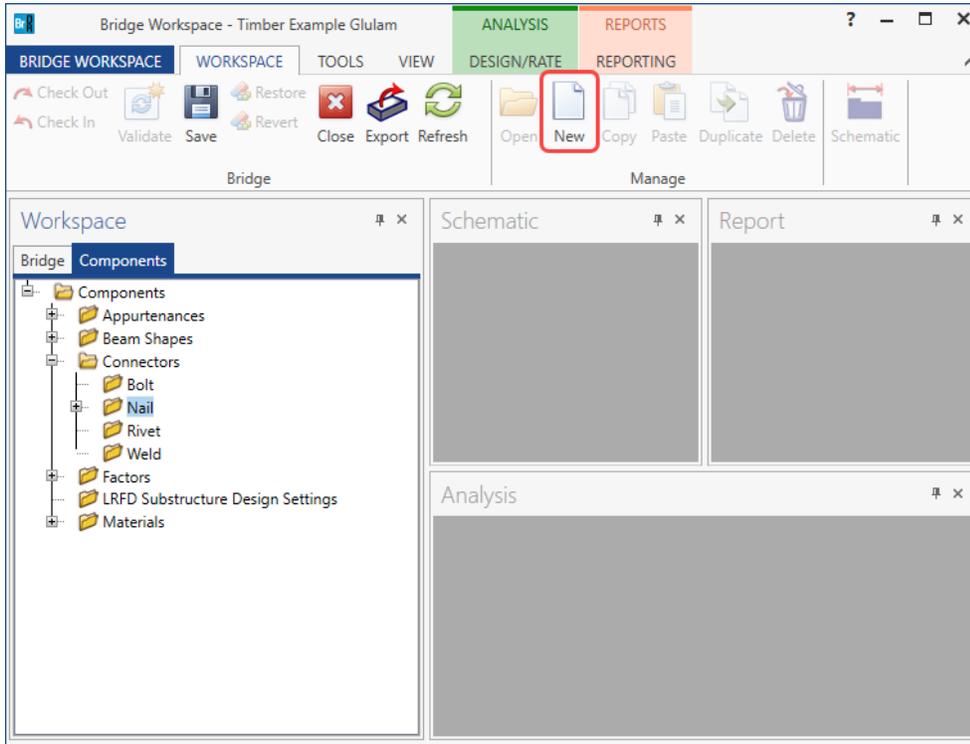
Generic Shape

Click **OK** to save the data to memory and close the window.

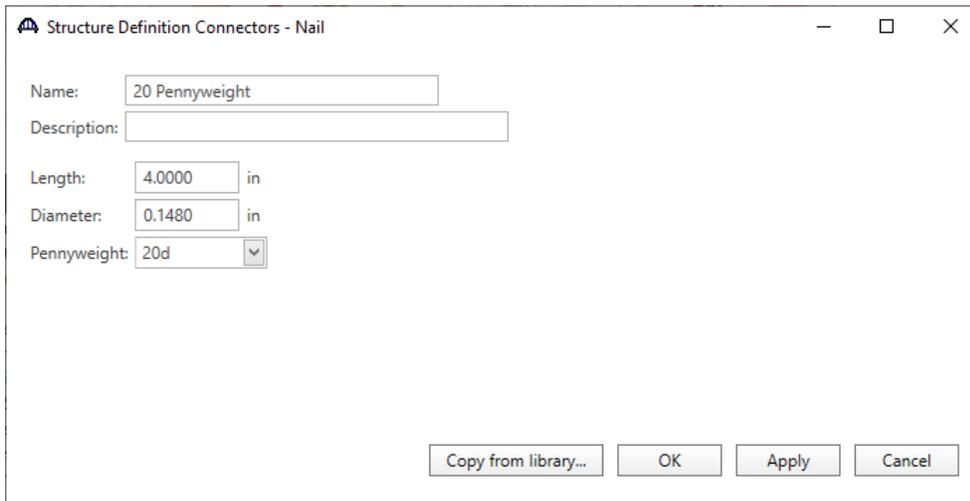
TMBR3- Single Span Timber Beam – Glulam Example

Bridge Connectors - Nail

To create a nail definition, expand the **Connectors** tree item, select **Nail** in the **Components** tree, and click **New** from the **Manage** group of the **WORKSPACE** ribbon (or double click on **Nail**).



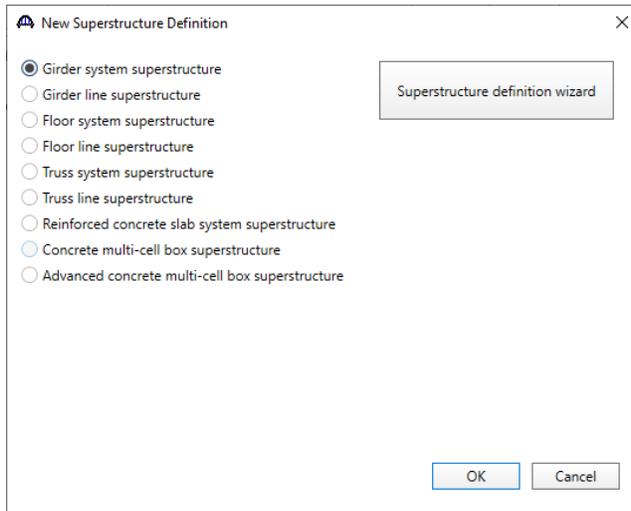
Define the nail as shown below. Click **OK** to save to memory and close the window.



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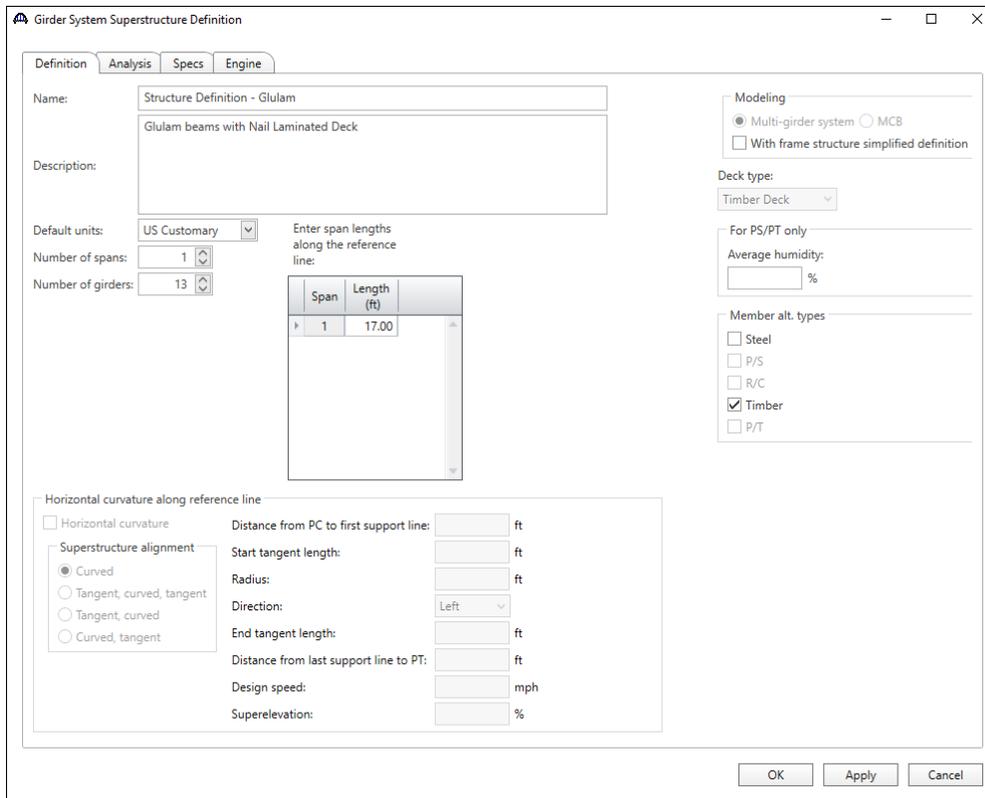
Superstructure Definition

Double click on **SUPERSTRUCTURE DEFINITIONS** (or click on **SUPERSTRUCTURE DEFINITIONS** and select **New** from the **Manage** group of the **WORKSPACE** ribbon 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.



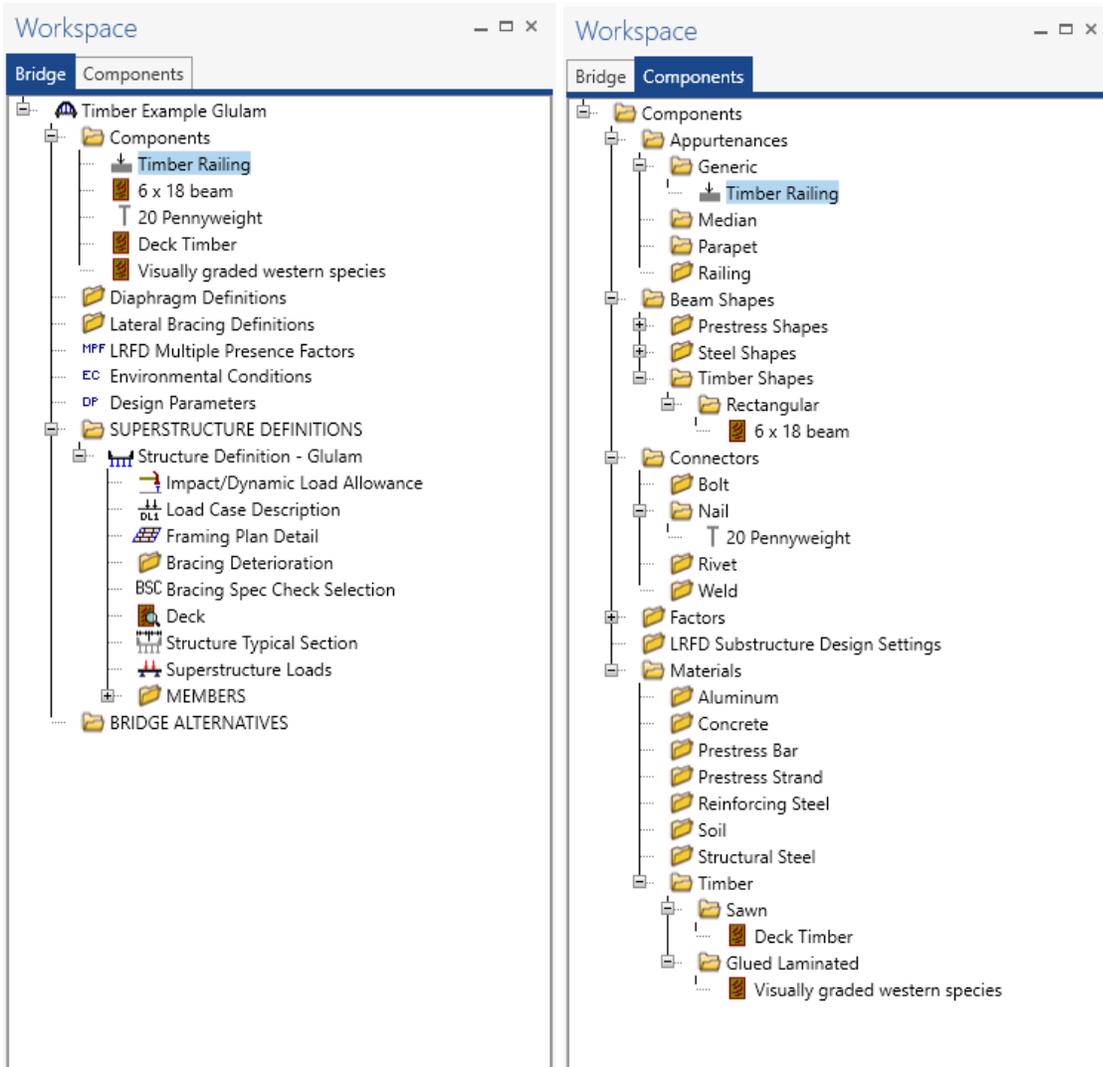
Select **Girder System Superstructure** and the **Girder System Superstructure Definition** window will open.

Enter the data as shown below.



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The partially expanded Bridge Workspace tree for each of its tabs are shown below:



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Load Case Description

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)
▶ Railing DL		Non-composite (Stage 1) ▾	D,DC ▾	
Wearing Surface DL		Non-composite (Stage 1) ▾	D,DW ▾	

*Prestressed members only Add default load case descriptions

New Duplicate Delete

OK Apply Cancel

Click **OK** to save to memory and close the window.

Framing Plan Detail

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

Number of spans: 1 Number of girders: 13

Layout Diaphragms

Girder spacing orientation
 Perpendicular to girder
 Along support

Support	Skew (degrees)
▶ 1	0.000
2	0.000

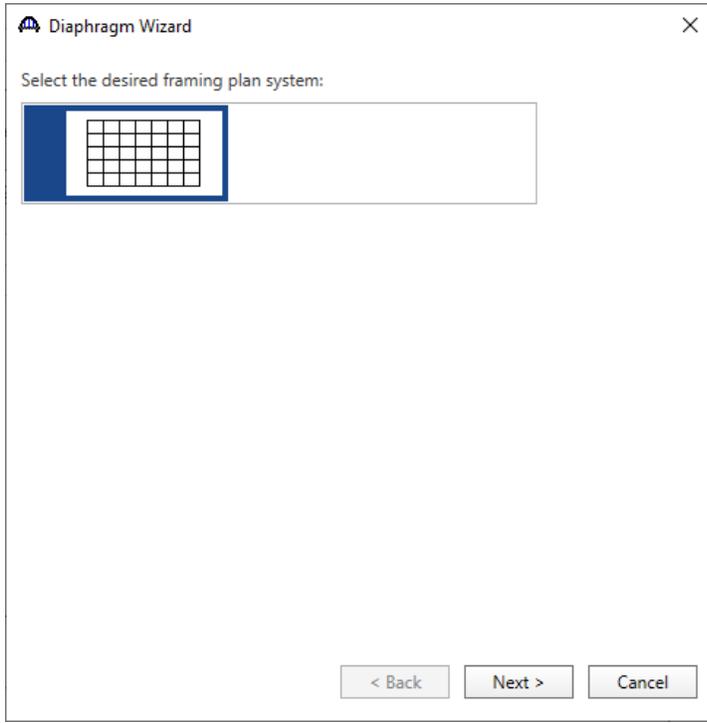
Girder bay	Girder spacing (ft)	
	Start of girder	End of girder
▶ 1	2.00	2.00
2	2.00	2.00
3	2.00	2.00
4	2.00	2.00
5	2.00	2.00
6	2.00	2.00
7	2.00	2.00
8	2.00	2.00
9	2.00	2.00
10	2.00	2.00
11	2.00	2.00
12	2.00	2.00

OK Apply Cancel

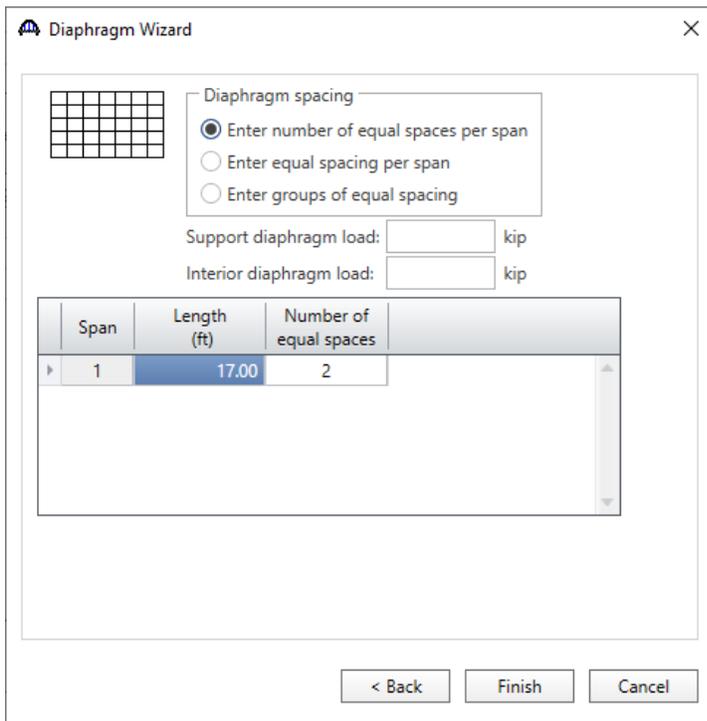
Click **OK** to save to memory and close the window.

Diaphragms

Switch to the **Diaphragms** tab to enter diaphragm spacing. Select the **Diaphragm Wizard** button to have BrDR generate the diaphragm locations. The following window appears. Select the **Next** button to continue.



Enter 2 equal spaces in the span and click the **Finish** button.



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The **Diaphragm Wizard** generates the following diaphragm locations.

Structure Framing Plan Details

Number of spans: 1 Number of girders: 13

Layout Diaphragms

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	--Not Assigned--	
1	0.00	0.00	8.50	1	8.50	8.50	8.50	--Not Assigned--	
1	17.00	17.00	0.00	1	0.00	17.00	17.00	--Not Assigned--	

New Duplicate Delete

OK Apply Cancel

Click **OK** to save to memory and close the window.

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Deck

Enter the deck description by double-clicking on **Deck** in the **Bridge Workspace** tree. BrDR only supports transverse timber decks. Select the type of deck as **Nail-Laminated**. The timber material to be used for the deck is selected from the list of bridge materials described above. Select the **20 Pennyweight** nail definition as the Nail.

The **Deck LL distribution width** is the wheel load distribution width in the direction perpendicular to the deck span as per AASHTO Standard Specifications for Highway Bridges, Article 3.25.1.1 as shown below. This value equals 18.5” for this structure.

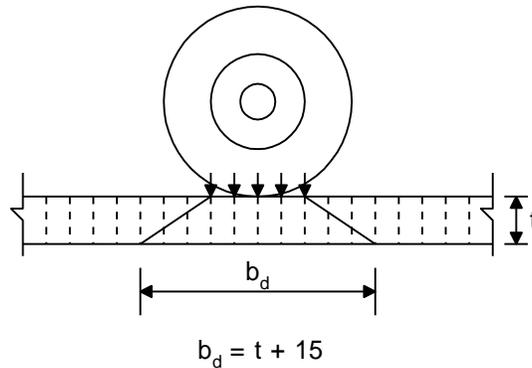


Figure – Relation between total deck thickness and deck LL distribution width as per Article 3.25.1.1

Deck

Description Specs Adjustment factors Factors Engine

Default rating method: ASD

Deck rating parameters:

- Deck continuous over more than 2 spans
- Consider axle weight reduction
- Ignore shear

Timber deck type: Nail-Laminated Deck

Timber material: Deck Timber

Total deck thickness: 3.5000 in

Lamination thickness: 1.5000 in

Deck LL distribution width: 18.5000 in

Nail: 20 Pennyweight

Nominal thick: 4.0000 in

Nominal width: 2.0000 in

OK Apply Cancel

Deck – Factors

The **Factors** tab of the **Deck** window provides entries for the **LRFR** and **ASR** factors to be used for the deck.

The screenshot shows the 'Deck' window with the 'Factors' tab selected. The window has a title bar with a minimize, maximize, and close button. Below the title bar are five tabs: 'Description', 'Specs', 'Adjustment factors', 'Factors', and 'Engine'. The 'Factors' tab is active and contains two main sections: 'LRFR' and 'ASR factors'.
In the 'LRFR' section, there are three rows of controls:
1. 'Condition factor:' followed by a dropdown menu showing 'Good or Satisfactory'.
2. A checkbox labeled 'Field measured section properties' which is currently unchecked.
3. 'System factor:' followed by a dropdown menu showing 'All Other Girder/Slab Bridges'.
4. A checkbox labeled 'System factor override:' which is currently unchecked, followed by an empty text input field.
In the 'ASR factors' section, there are two rows of controls:
1. 'OPER' followed by a dropdown menu showing 'OPER'.
2. 'Timber:' followed by a text input field containing the value '1.33'.
At the bottom right of the window, there are three buttons: 'OK', 'Apply', and 'Cancel'.

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Deck – Adjustment factors

The **Adjustment factors** tab of the **Deck** window provides entries to modify the **ASD** tabulated design values and **LFRD** reference design values that were previously entered on the **Bridge Materials – Timber – Glued Laminated** window. Use the **Compute** button to compute the adjustment factors for the deck timber material based on **Wet** usage conditions. Enter the **shear factor as 1.0**.

The screenshot shows the 'Deck' window with the 'Adjustment factors' tab selected. The window contains two columns of input fields for ASD and LFRD design values. The 'Moisture condition' dropdowns are set to 'Wet'. A 'Compute' button is located between the two columns. The ASD column includes factors for wet service (flexure, shear, bearing, modulus), shear, flat use, repetitive use, load duration, and size. The LFRD column includes factors for wet service (flexure, shear, bearing, modulus), format conversion (flexure, bearing), size (flexure, modulus), flat use, incising (flexure, shear, bearing, modulus), deck, and time effect (STRENGTH-I, STRENGTH-II).

ASD	LFRD
Wet service (flexure) (C_M):	Wet service (flexure) (C_M):
Wet service (shear) (C_M):	Wet service (shear) (C_M):
Wet service (bearing) (C_M):	Wet service (bearing) (C_M):
Wet service (modulus) (C_M):	Wet service (modulus) (C_M):
Shear (C_{jt}):	Format conversion (C_{KF}):
Flat use (C_{fu}):	Format conversion (bearing) (C_{KF}):
Repetitive use (C_r):	Size (flexure) (C_F):
Load duration (C_D):	Size (modulus) (C_F):
Size (C_F):	Flat use (C_{fu}):
	Incising (flexure, shear) (C_i):
	Incising (bearing) (C_i):
	Incising (modulus) (C_i):
	Deck (C_d):
	Time effect (STRENGTH-I) (C_λ):
	Time effect (STRENGTH-II) (C_λ):

TMBR3- Single Span Timber Beam – Glulam Example

Structure Typical Section - Deck

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.

The diagram shows a cross-section of a bridge deck with the following labels: Distance from left edge of deck to superstructure definition ref. line, Deck thickness, Superstructure Definition Reference Line, Distance from right edge of deck to superstructure definition ref. line, Left overhang, and Right overhang.

Superstructure definition reference line is the bridge deck.

Start ft End ft

Distance from left edge of deck to superstructure definition reference line: ft ft

Distance from right edge of deck to superstructure definition reference line: ft ft

Left overhang: ft ft

Computed right overhang: ft ft

Buttons: OK, Apply, Cancel

Structure Typical Section - Generic Appurtenances

Enter the railings on the **Generic** tab. Click **New** to add a row to the table. Enter the following data. The completed **Generic** tab is shown below.

The diagram shows a generic shape with labels: Generic Shape, Back, and Front.

Name	Load case	Measure to	Edge of deck dist. measured from	Distance at start (ft)	Distance at end (ft)	Front face orientation
Timber Railing	Railing DL	Back	Left Edge	0.00	0.00	Right
Timber Railing	Railing DL	Back	Right Edge	0.00	0.00	Left

Buttons: New, Duplicate, Delete

Buttons: OK, Apply, Cancel

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Structure Typical Section - Lane Positions

Select the **Lane position** tab. Enter the values shown below or click the **Compute...** button to automatically compute the lane positions. A window 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	-12.00	12.00	-12.00	12.00

Structure Typical Section - Wearing Surface

Enter the following wearing surface information on the **Wearing surface** tab.

Wearing surface material: 3" timber planks

Description:

Wearing surface thickness: 3.0000 in Thickness field measured (DW = 1.25 if checked)

Wearing surface density: 50.000 pcf

Load case: Wearing Surface DL

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Describing a Member

The **Member** window shows the data that was generated when the structure definition was created. No changes are required at this time. After a Member Alternative is defined it will appear in the list of member alternatives.

Member name: Link with:

Description:

Existing	Current	Member alternative name	Description
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Number of spans:

Span no.	Span length (ft)
1	17.00

OK Apply Cancel

Support Constraints

Support constraints were generated when the structure definition was created and are shown below.

Supports

Y
X
Z

1 2

General Elastic 3D General 3D Elastic

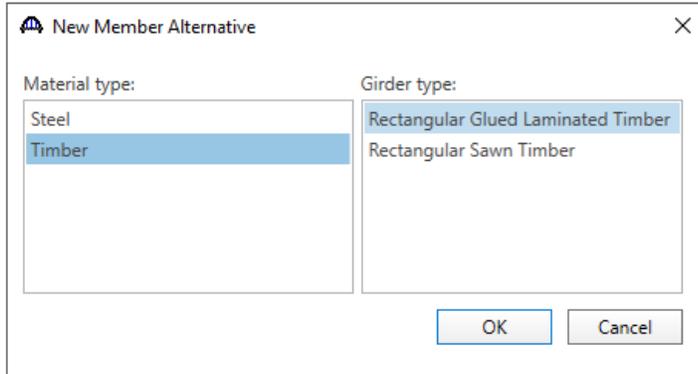
Support number	Support type	Translation constraints			Rotation constraints
		X	Y	Z	Z
1	Pinned	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Roller	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OK Apply Cancel

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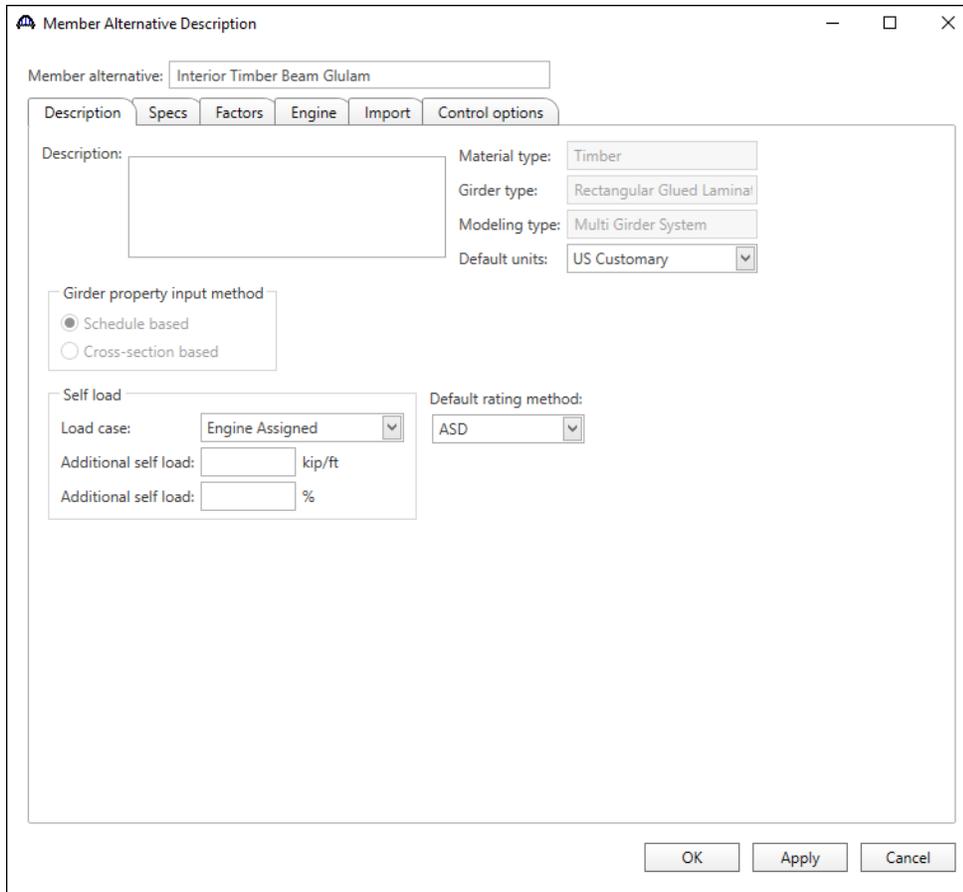
Defining a Member Alternative

For girder member **G2**, double click **MEMBER ALTERNATIVES** in the Bridge Workspace tree to create a new alternative. The **New Member Alternative** window shown below will open. Select **Timber** for the Material Type and **Rectangular Glued Laminated Timber** for the Girder Type.



The 'New Member Alternative' dialog box contains two list boxes. The 'Material type' list box has 'Steel' and 'Timber' (selected). The 'Girder type' list box has 'Rectangular Glued Laminated Timber' (selected) and 'Rectangular Sawn Timber'. At the bottom are 'OK' and 'Cancel' buttons.

Enter the following data for the Member Alternative. Click **OK** to save to memory and close the window.



The 'Member Alternative Description' dialog box shows the following configuration:

- Member alternative: Interior Timber Beam Glulam
- Description: [Empty text box]
- Material type: Timber
- Girder type: Rectangular Glued Laminated
- Modeling type: Multi Girder System
- Default units: US Customary
- Girder property input method: Schedule based, Cross-section based
- Self load: Load case: Engine Assigned; Additional self load: 0 kip/ft, 0%
- Default rating method: ASD

Buttons: OK, Apply, Cancel

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Beam Details

Open the **Beam Details** window by double clicking on Beam Details in the tree. Enter data as shown.

The image shows a software dialog box titled "Beam Details" with three tabs: "General", "Adjustment factors", and "Support lengths". The "General" tab is active. The dialog contains the following fields and options:

- Beam shape: 6 x 18 beam (dropdown)
- Material: Visually graded westerr (dropdown)
- Beam projection: Left: [] in, Right: [] in (input fields)
- Loading direction: Perpendicular to Lamination (dropdown)
- Pieces across width: Single (dropdown)
- Edge joint: Bonded (dropdown)
- Width of widest: [] in (input field)
- Number of laminations: 12 (input field)
- Wane: None (dropdown)

At the bottom of the dialog are three buttons: "OK", "Apply", and "Cancel".

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Beam Details – Adjustment factors

The **Adjustment factors** tab of the **Beam Details** window provides input entry for adjustment factors to modify the **ASD** tabulated design values and the **LRFD** Reference design values entered previously on the **Bridge Materials – Timber – Glued Laminated** window. The tabulated design values modified by these adjustment factors produce the design allowable stresses.

Select the **Wet** condition for **Shear/Flexure, Bearing** and **Modulus**. Use the **Compute** button to calculate the factors for the beam based on the Wet moisture conditions.

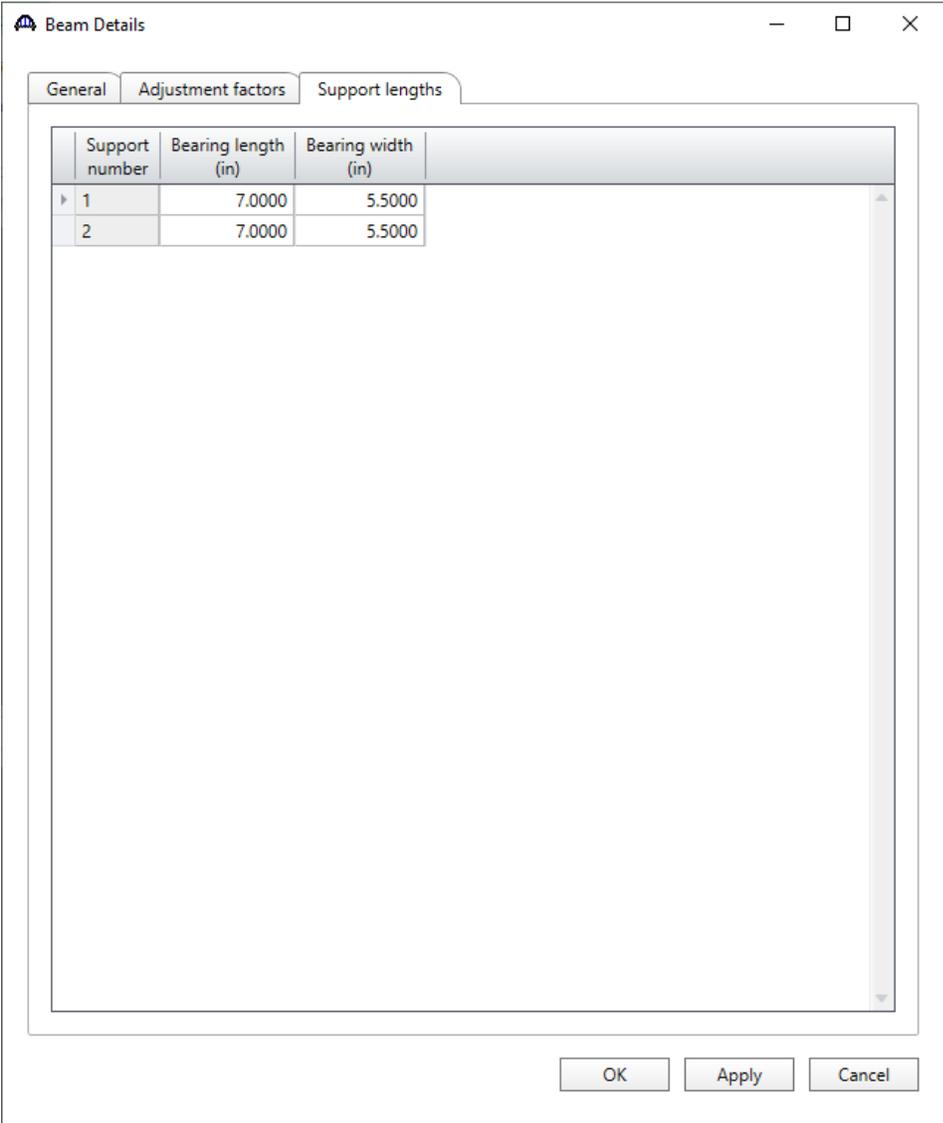
The screenshot shows the 'Beam Details' window with the 'Adjustment factors' tab selected. The 'Moisture condition' dropdowns for shear/flexure, bearing, and modulus are all set to 'Wet'. A 'Compute' button is visible. The ASD and LRFD adjustment factors are as follows:

ASD	LRFD
Wet service (flexure) (C_M): 0.800	Wet service (flexure) (C_M): 0.800
Wet service (shear) (C_M): 0.875	Wet service (shear) (C_M): 0.875
Wet service (bearing) (C_M): 0.530	Wet service (bearing) (C_M): 0.530
Wet service (modulus) (C_M): 0.833	Wet service (modulus) (C_M): 0.833
Load duration (C_D): 1.150	Format conversion (C_{KF}):
Size (C_F): 1.000	Format conversion (bearing) (C_{KF}):
Volume (C_V):	Volume (C_V):
Bearing (C_b):	Flat use (C_{fu}): 1.000
Beam stability (C_J):	Bearing (C_b):
	Time effects (STRENGTH - I) (C_D): 0.800
	Time effects (STRENGTH - II) (C_D): 1.000
	Beam stability (C_J):

TMBR3- Single Span Timber Beam – Glulam Example

Beam Details – Support lengths

Enter the following data on the **Support lengths** tab. Click **OK** to save to memory and close the **Beam Details** window.



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Live Load Distribution

Open the **Live Load Distribution** window and in the **Standard** tab, use the **Compute from typical section** button to compute the following live load distribution factors for Standard live load distribution factors.

The screenshot shows the 'Live Load Distribution' window with the 'Standard' tab selected. The 'Distribution factor input method' section has three radio buttons: 'Use simplified method' (selected), 'Use advanced method', and 'Use advanced method with 1994 guide specs'. There is also an unchecked checkbox for 'Allow distribution factors to be used to compute effects of permit loads with routine traffic'. Below this is a table with the following data:

Lanes loaded	Distribution factor (wheels)			
	Shear	Shear at supports	Moment	Deflection
▶ 1 Lane	0.522	1.000	0.444	0.154
Multi-lane	0.550	1.000	0.500	0.308

At the bottom of the window, there are buttons for 'Compute from typical section...', 'View calcs', 'OK', 'Apply', and 'Cancel'.

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The live load distribution factors are computed as follows:

Moment DF (AASHTO Table 3.23.1)

$$\text{Single Lane Moment DF} = \frac{S}{4.5} = \frac{2}{4.5} = 0.4444$$

$$\text{Multi Lane Moment DF} = \frac{S}{4.0} = \frac{2}{4.0} = 0.5000$$

Shear at Supports DF (AASHTO Article 3.23.1.2)

By simple beam distribution, both single and multi lane Shear at Support DF = 1.0000

Shear DF (AASHTO Article 3.23.1.2 refers to AASHTO Article 13.6.5.2)

$$V_{LL} = 0.50[(0.60V_{LU}) + V_{LD}] \text{ (AASHTO Eq. 13 – 10)}$$

where V_{LU} = shear due to undistributed wheel loads (i.e., one line of wheels carried by one bending member) = 1

V_{LD} = shear due to wheel loads distributed laterally as specified for moment in Article 3.23

$$\text{Single Lane Shear DF} = 0.50[(0.60(1) + 0.4444)] = 0.5222$$

$$\text{Multi Lane Shear DF} = 0.50[(0.60(1) + 0.5000)] = 0.5500$$

Deflection DF

$$\text{Single Lane Deflection DF} = \frac{1 \text{ lane} * 2 \text{ wheels/lane}}{13 \text{ beams}} = 0.1538$$

$$\text{Multi Lane Deflection DF} = \frac{2 \text{ lane} * 2 \text{ wheels/lane}}{13 \text{ beams}} = 0.3077$$

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Point of Interest

Define points of interest using the **Point of Interest** window shown below. A window for defining a point of interest is opened by double clicking on the **Points of Interest** tree item.

Point Of Interest

Distance from leftmost support: 8.50 ft or Span: Span 1 Fraction: 0.500000

Side
 Left Right

ASD design values ASD adjustment factors ASD operating stress percentage LRFD design values LRFD adjustment factors Bracing Engine

Override design values

Loaded perpendicular to wide faces of lamination

Tension zone stressed in tension: [] ksi
Compr. zone stressed in tension: [] ksi
Compr. perp. to grain (tension): [] ksi
Compr. perp. to grain (compr.): [] ksi
Shear parallel to grain: [] ksi

Loaded parallel to wide faces of lamination

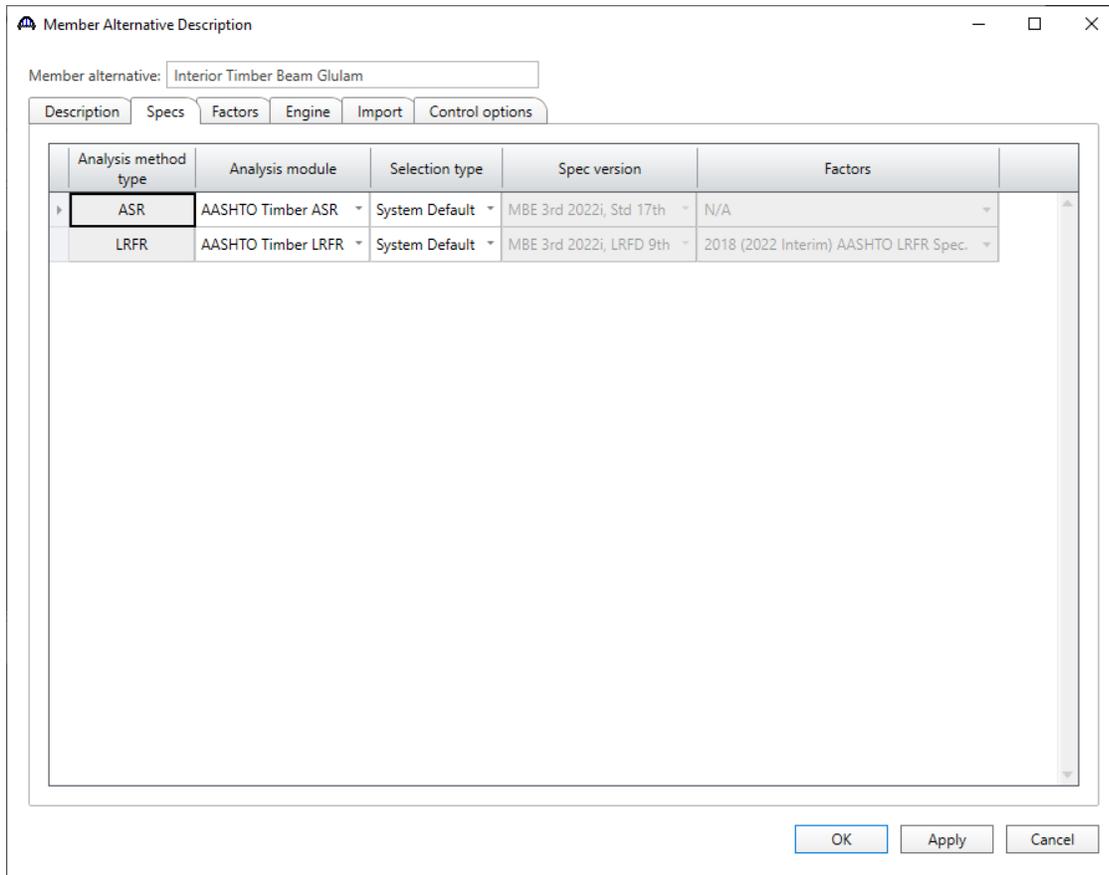
Bending: [] ksi
Compr. perp. to grain: [] ksi
Shear parallel to grain: [] ksi
Shear parallel to grain (not edge glued): [] ksi

OK Apply Cancel

TMBR3- Single Span Timber Beam – Glulam Example

Member Alternative Description – Specs

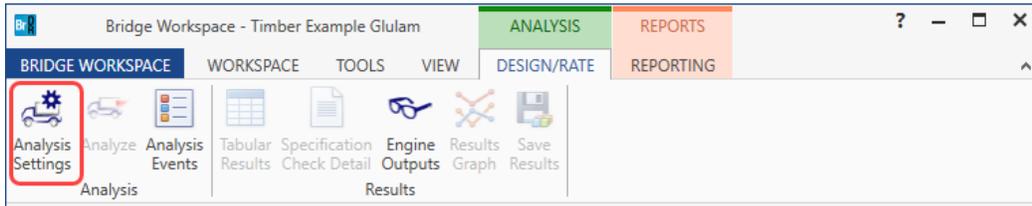
To select the analysis module for both ASR and LRFR analysis method types, double click on the member alternative **Interior Timber Beam** and click on the **Specs** tab. To set an **ASR** analysis using the AASHTO timber engine, select **AASHTO Timber ASR** option from the **Analysis module** options for **ASR** analysis method type. Similarly, to set an **LRFR** analysis using the AASHTO timber engine, select **AASHTO Timber LRFR** option from the **Analysis module** options for **LRFR** analysis method type.



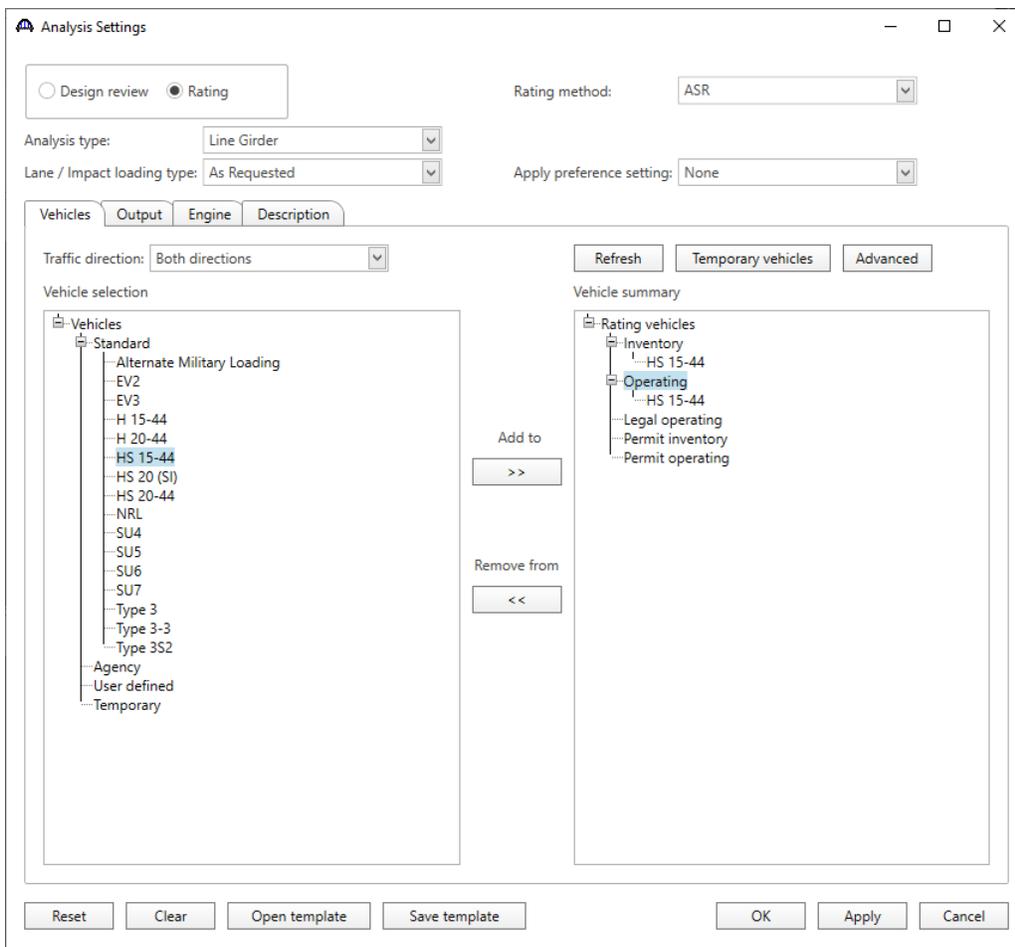
TMBR3- Single Span Timber Beam – Glulam Example

ASR Rating

To perform a rating, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon.



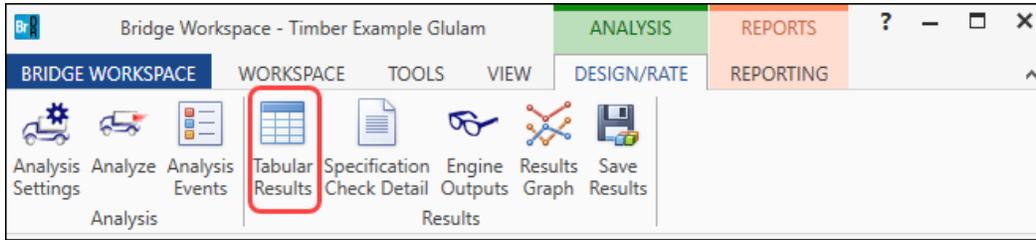
To run an ASR analysis, select **ASR** as the **Rating Method**, select the **HS 15-44** vehicle to be used in the rating in **Inventory** and **Operating** and click **OK**. Next click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.



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Tabular Results

When the rating is finished results can be reviewed by clicking the **Tabular Results** button on the **Results** group of the **DESIGN/RATE** ribbon.



The window shown below will open.

The window title is 'Analysis Results - Interior Timber Beam Glulam'. It contains a 'Print' button, a 'Report type:' dropdown set to 'Rating Results Summary', a 'Lane/Impact loading type' section with 'As requested' selected, and a 'Display Format' dropdown set to 'Single rating level per row'. Below this is a table with the following data:

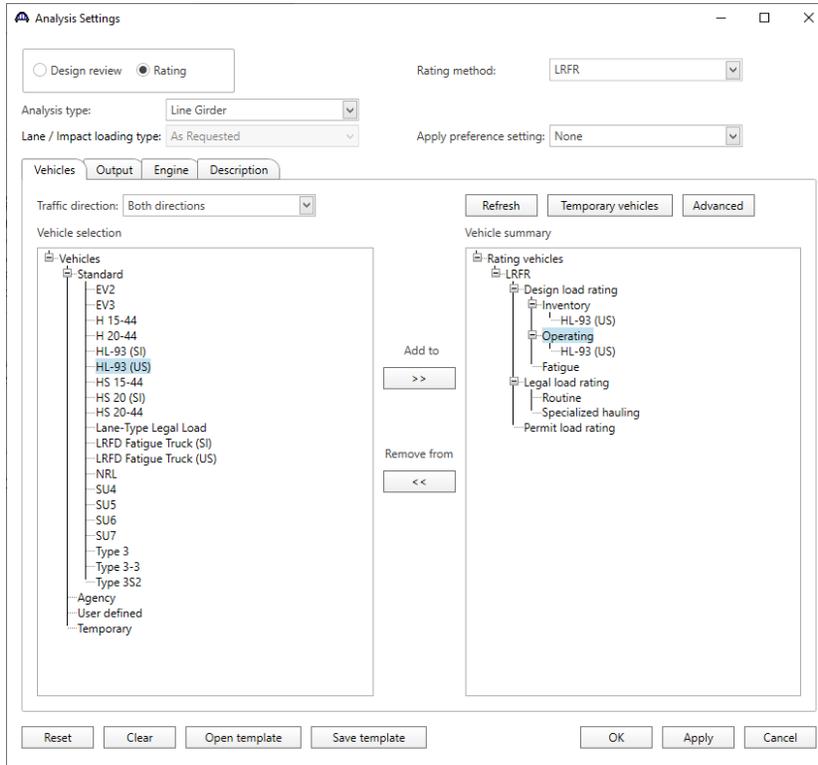
Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HS 15-44	Axle Load	ASR	Inventory	37.16	1.376	0.00	1 - (0.0)	Bearing Stress	As Requested	As Requested
HS 15-44	Axle Load	ASR	Operating	50.27	1.862	0.00	1 - (0.0)	Bearing Stress	As Requested	As Requested
HS 15-44	Lane	ASR	Inventory	44.49	1.648	0.00	1 - (0.0)	Bearing Stress	As Requested	As Requested
HS 15-44	Lane	ASR	Operating	60.19	2.229	0.00	1 - (0.0)	Bearing Stress	As Requested	As Requested

At the bottom of the window, it says 'AASHTO ASR Engine Version 7.5.0.3001' and 'Analysis preference setting: None'. There is a 'Close' button in the bottom right corner.

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LRFR Analysis

Similarly, to run an LRFR analysis, in the **Analysis Settings** window, select **LRFR** as the **Rating Method**, select the **HL-93(US)** vehicle in **Inventory** and **Operating** and click **OK**.



Tabular Results

Next click the **Analyze** button on the ribbon to perform the rating. When the rating is finished results can be reviewed by clicking the **Tabular Results** button on the toolbar. The window shown below will open.

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 + Lane	LRFR	Inventory	20.68	0.575	0.00	1 - (0.0)	STRENGTH-I Bearing	As Requested	As Requested
HL-93 (US)	Truck + Lane	LRFR	Operating	26.81	0.745	0.00	1 - (0.0)	STRENGTH-I Bearing	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Inventory	17.98	0.500	0.00	1 - (0.0)	STRENGTH-I Bearing	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Operating	23.31	0.648	0.00	1 - (0.0)	STRENGTH-I Bearing	As Requested	As Requested

AASHTO LRFR Engine Version 7.5.0.3001
Analysis preference settings: None