

AASHTOWare BrDR 7.5.0

Prestressed Concrete Structure Tutorial
PS15 – Two Span PS adjacent Box With Straight Strands

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

BrDR Training

PS15 - Two Span PS Adjacent Box With Straight Strands Example

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

PSAdjBoxTrainingBridge12

Bridge ID: PSAdjBoxTrainingBridge12 NBI structure ID (8): AdjBoxTrainin10

Template Superstructures
 Bridge completely defined Culverts
 Substructures

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

Name: PS Adj Box Training Bridge Year built: []

Description: FAP Route 840 (IL 49)
Section 120 BR-1
Vermilion County

Location: [] Length: [] ft

Facility carried (7): [] Route number: []

Feat. intersected (6): [] Mi. post: []

Default units: US Customary

Bridge association... BrR BrD BrM


OK Apply Cancel

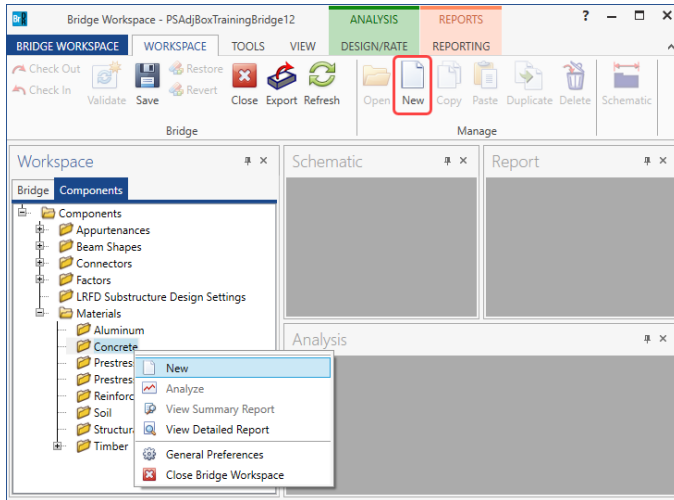
Click **OK** to apply the data and close the window.

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

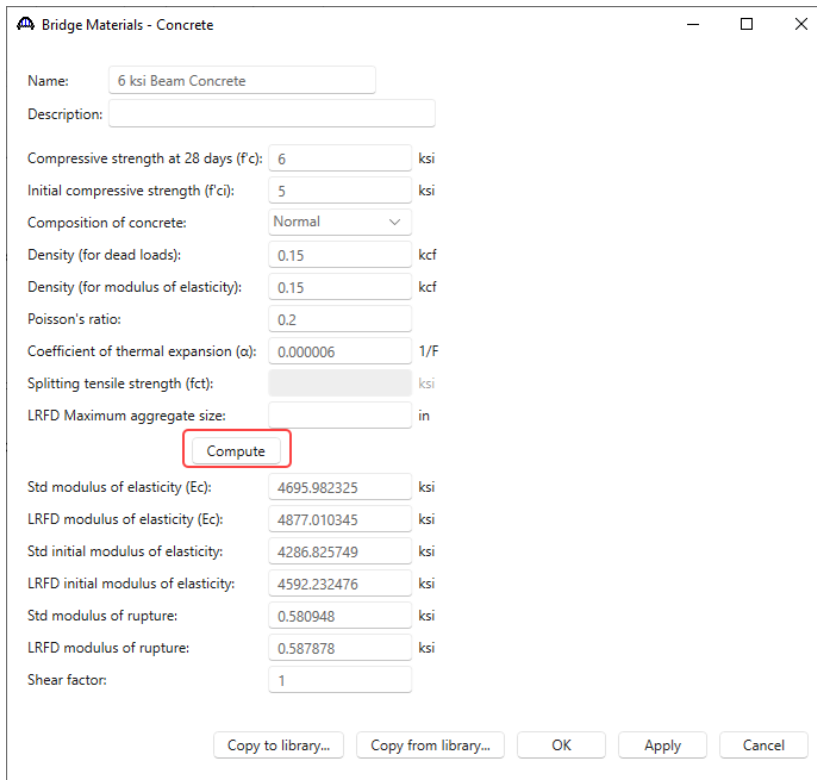
Bridge Components

Bridge Materials - Concrete

To add a new concrete material, in the **Components** tab of the **Bridge Workspace**, expand the **Materials** node by clicking the  button, select **Concrete**, and select **New** from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **Concrete** and select **New**).



The window shown below will open. Enter the values as shown above the **Compute** button and click the **Compute** button to compute the remaining values below them.



Name:	6 ksi Beam Concrete
Description:	
Compressive strength at 28 days (f'c):	6 ksi
Initial compressive strength (f'ci):	5 ksi
Composition of concrete:	Normal
Density (for dead loads):	0.15 kcf
Density (for modulus of elasticity):	0.15 kcf
Poisson's ratio:	0.2
Coefficient of thermal expansion (α):	0.000006 1/F
Splitting tensile strength (fct):	
LRFD Maximum aggregate size:	
Compute	
Std modulus of elasticity (Ec):	4695.982325 ksi
LRFD modulus of elasticity (Ec):	4877.010345 ksi
Std initial modulus of elasticity:	4286.825749 ksi
LRFD initial modulus of elasticity:	4592.232476 ksi
Std modulus of rupture:	0.580948 ksi
LRFD modulus of rupture:	0.587878 ksi
Shear factor:	1

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

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Bridge Materials – Prestress strand

To add a new prestress strand material, select **Prestress Strand** in the **Components** tree, and select **New** from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **Prestress Strand** and select **New**).

Click on the **Copy from library...** button in this window and select **½” (7W-270) LR** from the library and click **OK**.

Library Data: Materials - Prestress Strand

Name	Description	Library	Units	Fy	Fu	Modulus of elasticity	Load per unit length	Diameter	Area	Transfer length (Std)	Transfer length (LRFD)	Strand type	Epoxy coated
1/2" (7W-250) LR	Low relaxation 1/2"/Seven Wire/fpu = 250	Standard	US Customary	225.000	250.000	28500.00	0.490	0.5000	0.144	25.0000	30.0000	Low Relaxation	False
1/2" (7W-250) SR	Stress relieved 1/2"/Seven Wire/fpu = 250	Standard	US Customary	212.500	250.000	28500.00	0.490	0.5000	0.144	25.0000	30.0000	Stress Relieved	False
1/2" (7W-270) LR	Low relaxation 1/2"/Seven Wire/fpu = 270	Standard	US Customary	243.000	270.000	28500.00	0.520	0.5000	0.153	25.0000	30.0000	Low Relaxation	False
1/2" (7W-270) SR	Stress relieved 1/2"/Seven Wire/fpu = 270	Standard	US Customary	229.500	270.000	28500.00	0.520	0.5000	0.153	25.0000	30.0000	Stress Relieved	False
1/4" (3W-250) LR	Low relaxation 1/4"/Three Wire/fpu = 250	Standard	US Customary	225.000	250.000	28500.00	0.130	0.2500	0.036	12.5000	15.0000	Low Relaxation	False
1/4" (7W-250) LR	Low relaxation 1/4"/Seven Wire/fpu = 250	Standard	US Customary	225.000	250.000	28500.00	0.122	0.2500	0.036	12.5000	15.0000	Low Relaxation	False
1/4" (7W-250) SR	Stress relieved 1/4"/Seven Wire/fpu = 250	Standard	US Customary	212.500	250.000	28500.00	0.122	0.2500	0.036	12.5000	15.0000	Stress Relieved	False
3/8" (3W-250) LR	Low relaxation 3/8"/Three Wire/fpu = 250	Standard	US Customary	225.000	250.000	28500.00	0.260	0.3750	0.075	18.7500	22.5000	Low Relaxation	False
3/8" (7W-250) LR	Low relaxation 3/8"/Seven Wire/fpu = 250	Standard	US Customary	225.000	250.000	28500.00	0.272	0.3750	0.080	18.7500	22.5000	Low Relaxation	False

OK Apply Cancel

The selected material properties are copied to the **Bridge Materials – PS Strand** window as shown below.

Bridge Materials - PS Strand

Name: 1/2" (7W-270) LR

Description: Low relaxation 1/2"/Seven Wire/fpu = 270

Strand diameter: 0.5000 in

Strand area: 0.153 in²

Strand type: Low Relaxation

Ultimate tensile strength (Fu): 270.000 ksi

Yield strength (fy): 243.000 ksi

Modulus of elasticity (E): 28500.00 ksi

Compute

Transfer length (Std): 25.0000 in

Transfer length (LRFD): 30.0000 in

Unit load per length: 0.520 lb/ft

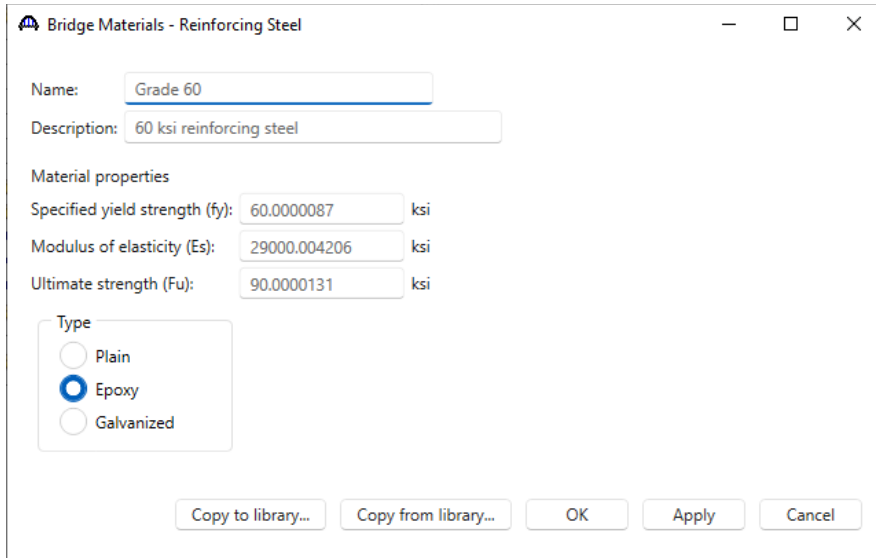
Epoxy coated

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

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

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Add the following reinforcement steel in the same manner.



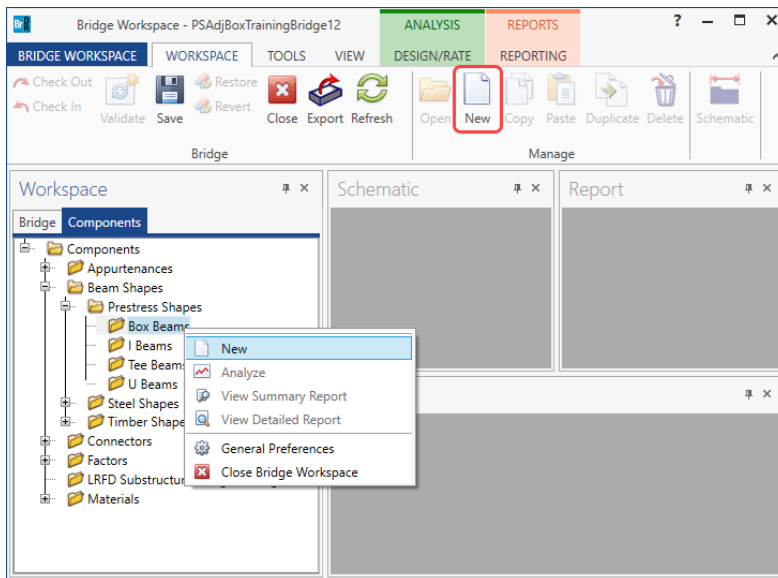
The dialog box titled "Bridge Materials - Reinforcing Steel" contains the following fields and options:

- Name: Grade 60
- Description: 60 ksi reinforcing steel
- Material properties:
 - Specified yield strength (fy): 60.0000087 ksi
 - Modulus of elasticity (Es): 29000.004206 ksi
 - Ultimate strength (Fu): 90.0000131 ksi
- Type:
 - Plain
 - Epoxy
 - Galvanized
- Buttons: Copy to library..., Copy from library..., OK, Apply, Cancel

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

Beam Shape

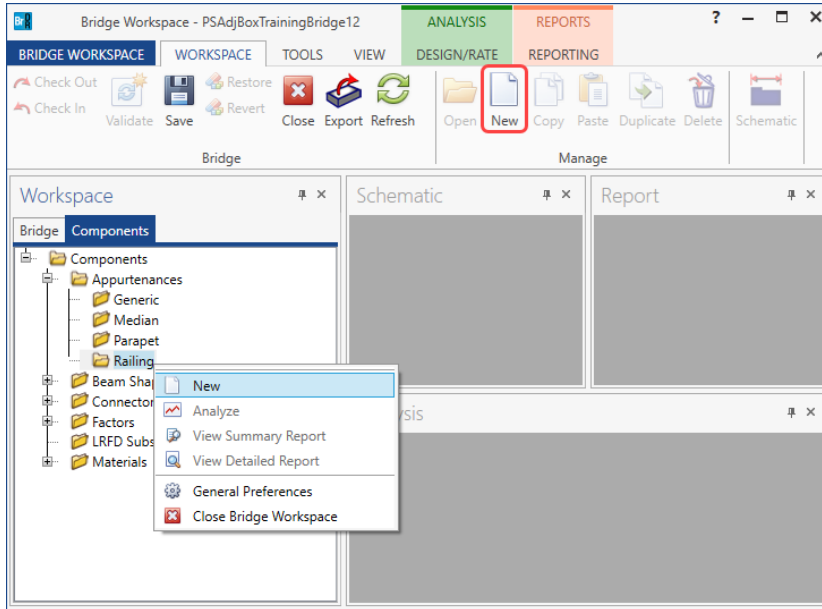
To enter a prestress beam shape to be used in this bridge expand the tree labelled **Beam Shapes** and **Prestress Shapes** as shown below and click on the **Box Beams** node in the **Components** tree, select **New** from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **Box Beams** and select **New** or double click on **Box Beams** in the **Components** tree).



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Bridge - Appurtenances

To enter the appurtenances to be used within the bridge expand the tree branch labeled **Appurtenances**. To define a steel railing, select **Railing** and click on **New** from the **Manage** button on the **WORKSPACE** ribbon (or right click on **Railing** in the **Components** tree and select **New**).



Enter the data as shown below.

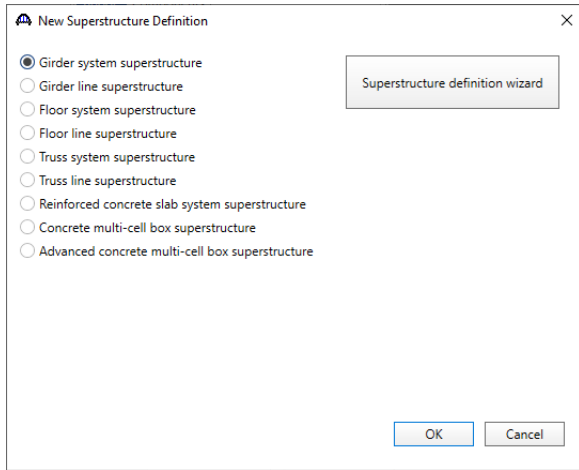
The screenshot shows the 'Bridge Appurtenances - Railing' dialog box. The 'Name' field contains 'Steel Railing' and the 'Description' field contains 'W6 X 25'. Below the fields, it states 'All dimensions are in inches'. A diagram shows a vertical railing with a 'Reference Line' at the top. The 'Distance from edge to centroid' is 5 inches. The 'Effective wind height' is 32 inches. The 'Railing load' is 0.0205 kip/ft. The 'Width' is 10.38 inches. The diagram also shows 'Back' and 'Front' directions. At the bottom, there are buttons for 'Copy from library...', 'OK', 'Apply', and 'Cancel'.

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

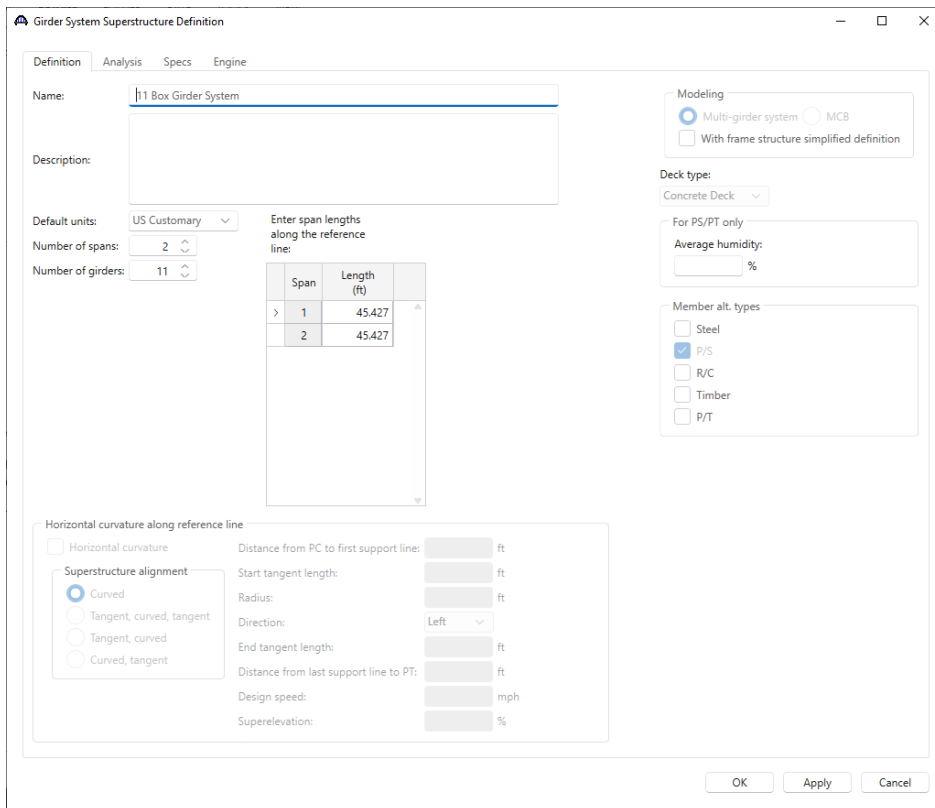
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Superstructure Definition

Returning to the **Bridge** tab of the **Bridge Workspace**, 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 window shown below will appear.



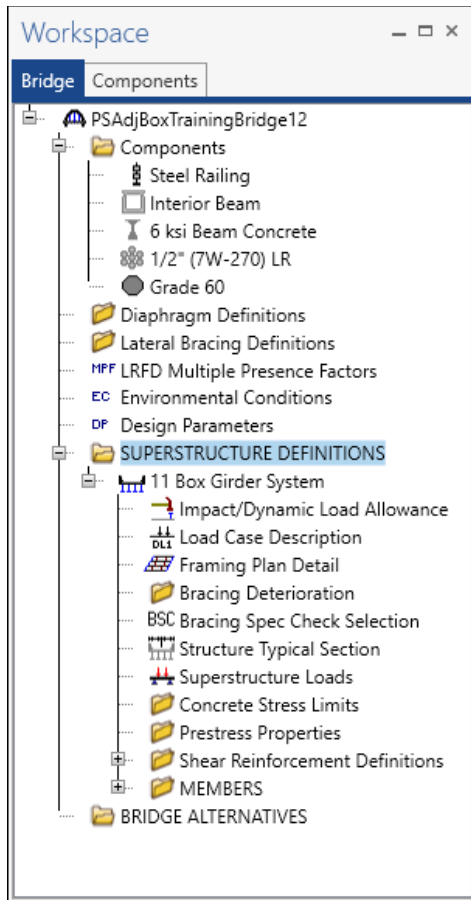
Select **Girder system superstructure**, click **OK** and the **Girder System Superstructure Definition** window will open. Enter the data as shown below.



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

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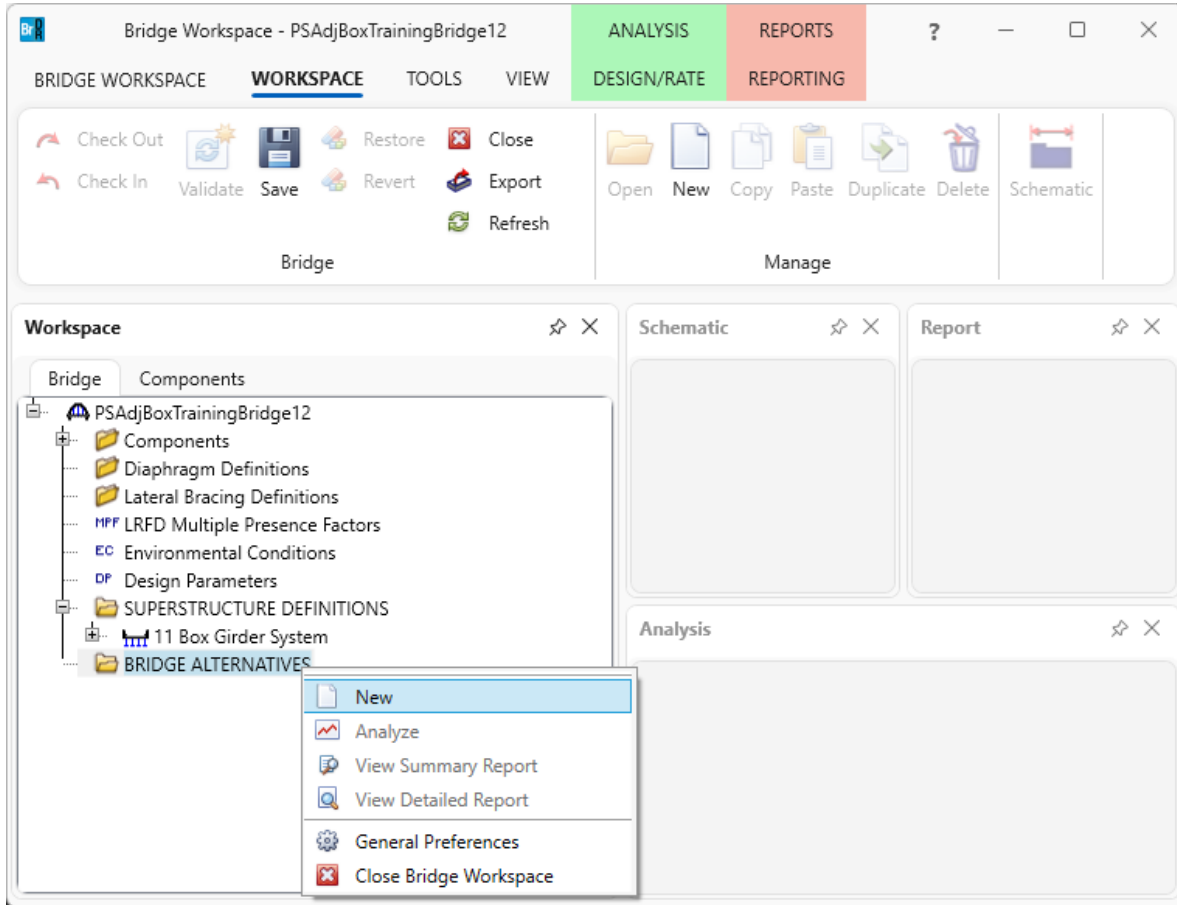
The partially expanded **Bridge Workspace** tree is shown below:



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BRIDGE ALTERNATIVES

Navigate to the **BRIDGE ALTERNATIVES** node in the **Bridge Workspace** tree and create a new bridge alternative by double-clicking on **BRIDGE ALTERNATIVES** (or click on **BRIDGE ALTERNATIVES** and select **New** from the **Manage** group of the **WORKSPACE** ribbon).



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Enter the following data.

Bridge Alternative

Alternative name: Bridge Alternative #1

Description: Substructures

Description:

Horizontal curvature

Reference line length: 90.77 ft

Start bearing End bearing

Starting station: ft

Bearing: N 90^ 0' 0.00" E

Global positioning

Distance: 0 ft

Offset: 0 ft

Elevation: ft

Bridge alignment

Curved

Tangent, curved, tangent

Tangent, curved

Curved, tangent

Start tangent length: ft

Curve length: ft

Radius: ft

Direction: Left

End tangent length: ft

Superstructure wizard...

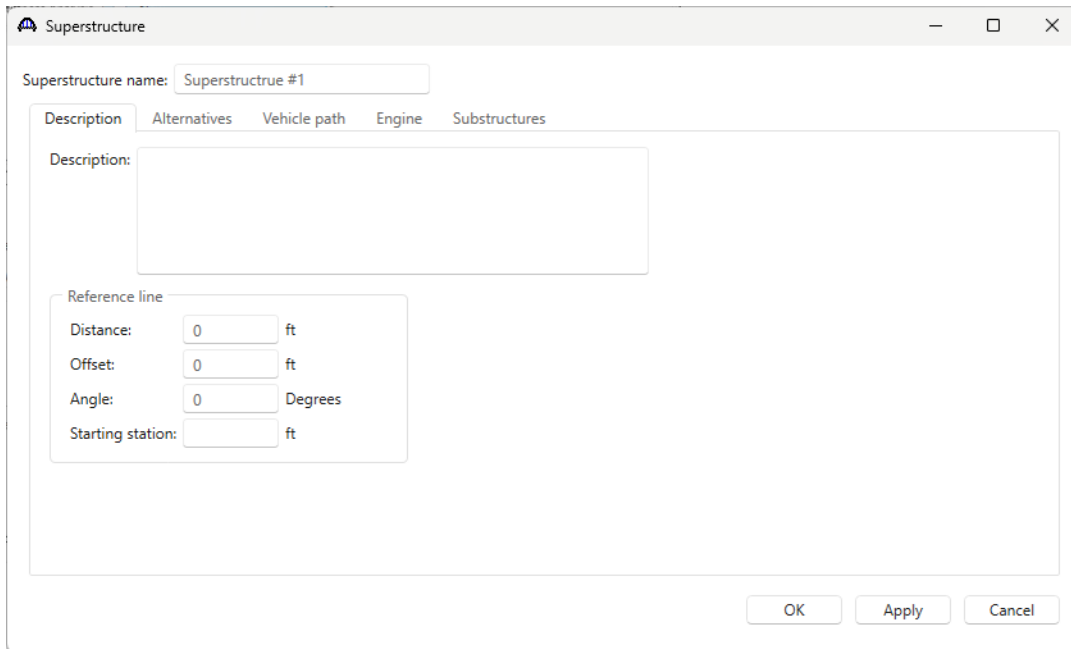
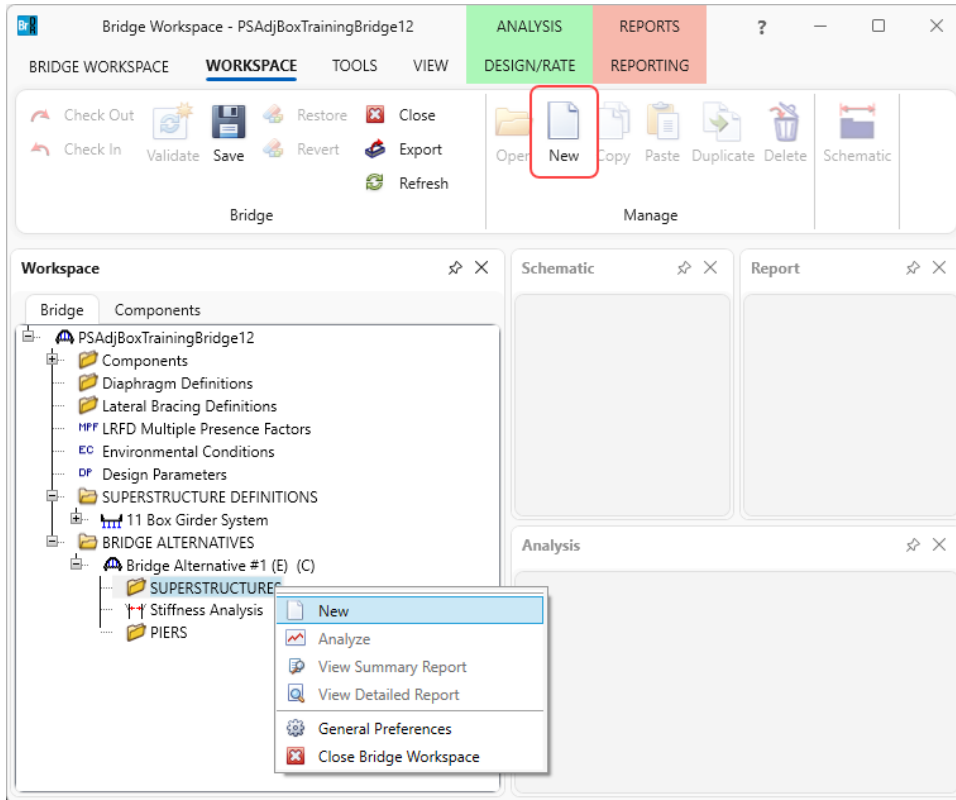
Culvert wizard...

OK Apply Cancel

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

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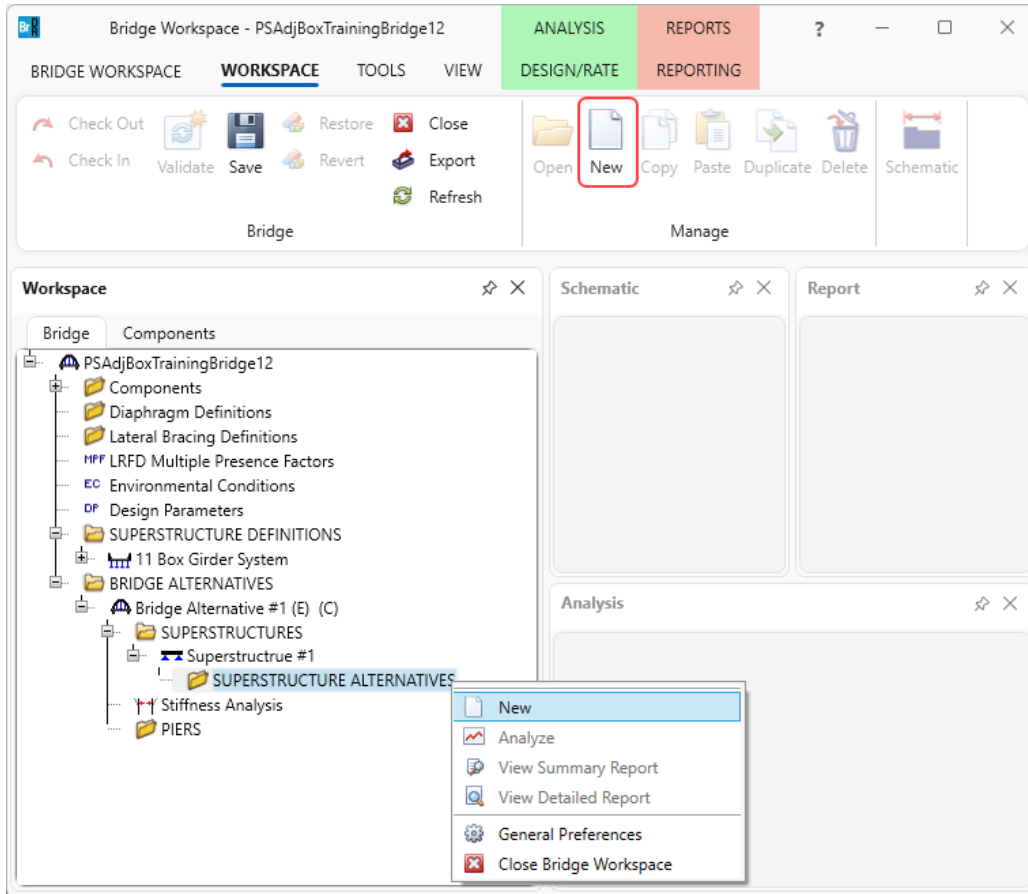
Expand the **Bridge Alternative #1** node in the **Bridge Workspace** tree by clicking the **+** button. Double-click on the **SUPERSTRUCTURES** node (or select **SUPERSTRUCTURES**, click **New** from the **Manage** group of the **WORKSPACE** ribbon) and enter the following new superstructure.



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

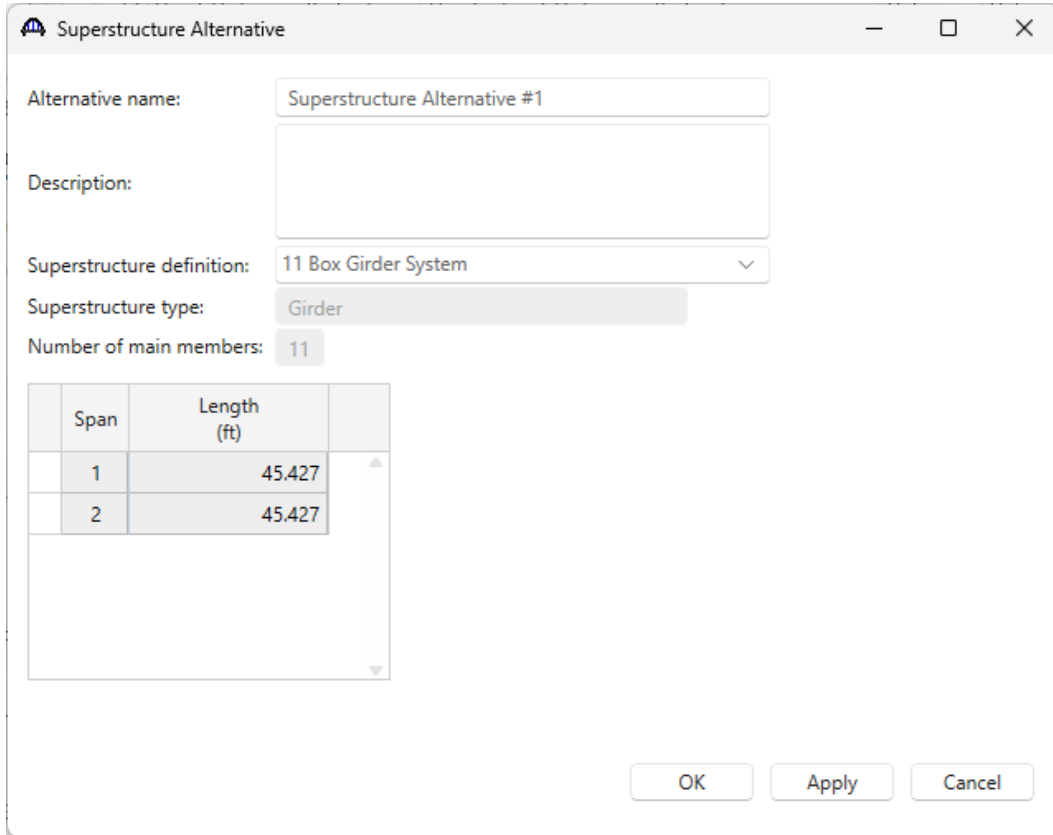
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Expand the **Superstructure #1** node in the **Bridge Workspace** tree by clicking the **+** button. Double-click on the **SUPERSTRUCTURE ALTERNATIVES** node (or select **SUPERSTRUCTURE ALTERNATIVES** and click **New** from the **Manage** group of the **WORKSPACE** ribbon) and enter the following new superstructure alternative.



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Select the **Superstructure definition 11 Box Girder System** as the current superstructure definition for this Superstructure Alternative.



Superstructure Alternative

Alternative name: Superstructure Alternative #1

Description:

Superstructure definition: 11 Box Girder System

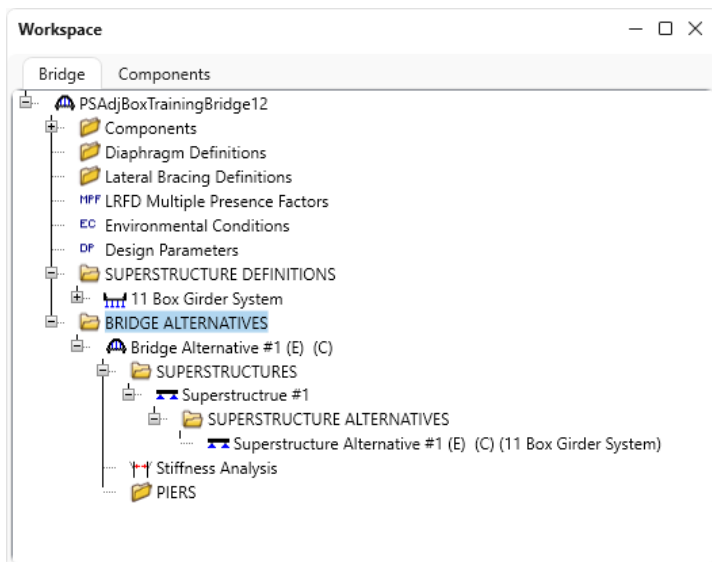
Superstructure type: Girder

Number of main members: 11

Span	Length (ft)
1	45.427
2	45.427

OK Apply Cancel

The partially expanded **Bridge Workspace tree** is shown below.



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The default impact factors, standard LRFD and LFR factors will be used.

Load Case Description

Navigate back to the superstructure definition **11 Box Girder System**. Double-click on the **Load Case Description** node in the **Bridge Workspace** tree to open the **Load Case Description window** and define the dead load cases as shown below. The completed **Load Case Description** window is shown below.

Load case name	Description	Stage	Type	Time* (days)
Wearing Surface		Non-composite (Stage 1)	D,DW	
Parapets		Non-composite (Stage 1)	D,DC	

*Prestressed members only

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Structure Framing Plan Detail – Layout

Double-click on **Framing Plan Detail** node in the **Bridge Workspace** tree to describe the framing plan in the **Structure Framing Plan Details** window. Enter the data as shown below.

Structure Framing Plan Details

Number of spans: 2 Number of girders: 11

Layout Diaphragms

Support	Skew (degrees)
1	20.000
2	20.000
3	20.000

Girder spacing orientation

Perpendicular to girder
 Along support

Girder bay	Girder spacing (ft)	
	Start of girder	End of girder
1	3.00	3.00
2	3.00	3.00
3	3.00	3.00
4	3.00	3.00
5	3.00	3.00
6	3.00	3.00
7	3.00	3.00
8	3.00	3.00
9	3.00	3.00
10	3.00	3.00

OK Apply Cancel

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

Structure Framing Plan Detail – Diaphragms

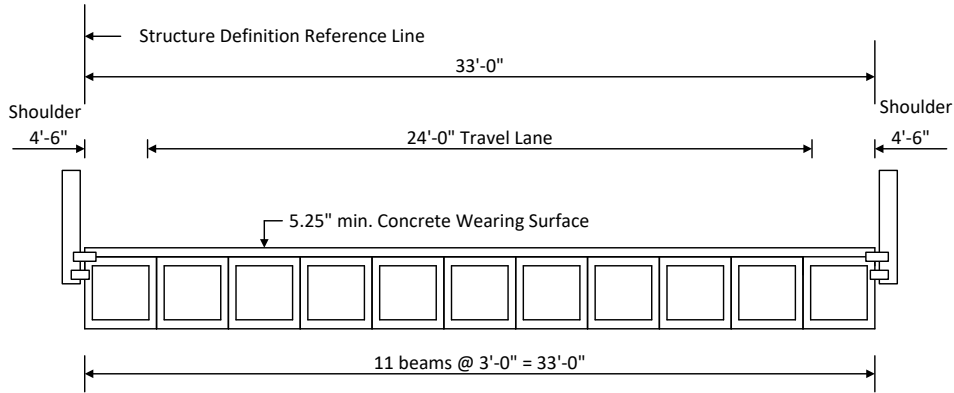
The **Diaphragms** tab of this window is used to enter data for exterior diaphragms, in other words diaphragms located between girders. Since an adjacent box beam structure does not have exterior diaphragms, no data will be entered in the **Diaphragms** tab.

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Structure Typical Section - Deck

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

The basic deck geometry is shown below.



Typical Section

Input the data describing the typical section as shown below.

The screenshot shows the 'Structure Typical Section' dialog box. At the top, there is a diagram of the deck cross-section with labels for '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 are several tabs: 'Deck', 'Deck (cont'd)', 'Parapet', 'Median', 'Railing', 'Generic', 'Sidewalk', 'Lane position', 'Striped lanes', and 'Wearing surface'. The 'Deck' tab is selected. The dialog contains the following input fields:

Parameter	Start	End
Superstructure definition reference line is within the bridge deck:		
Distance from left edge of deck to superstructure definition reference line:	0.00 ft	0.00 ft
Distance from right edge of deck to superstructure definition reference line:	33.00 ft	33.00 ft
Left overhang:	1.50 ft	1.50 ft
Computed right overhang:	1.50 ft	1.50 ft

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

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Structure Typical Section – Railing

Add two steel railings as shown below.

Name	Load case	Measure to	Edge of deck dist. measured from	Distance at start (ft)	Distance at end (ft)	Front face orientation
Steel Railing	Parapets	Back	Left Edge	-0.865	-0.865	Right
Steel Railing	Parapets	Back	Right Ed...	-0.865	-0.865	Left

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

Structure Typical Section – Lane Positions

Select the **Lane position** tab and add the travel lanes as shown below as per the typical section schematic.

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	4.50	28.50	4.50	28.50

LRFD fatigue
 Lanes available to trucks:
 Override Truck fraction:

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

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Structure Typical Section – Wearing surface

Enter the data shown below.

The screenshot shows the 'Structure Typical Section' dialog box with the 'Wearing surface' tab selected. At the top, a diagram illustrates the cross-section of a bridge deck with labels for 'Distance from left edge of deck to superstructure definition ref. line', 'Deck thickness', 'Superstructure Definition Reference Line', and 'Distance from right edge of deck to superstructure definition ref. line'. Below the diagram, the 'Wearing surface' tab contains the following fields:

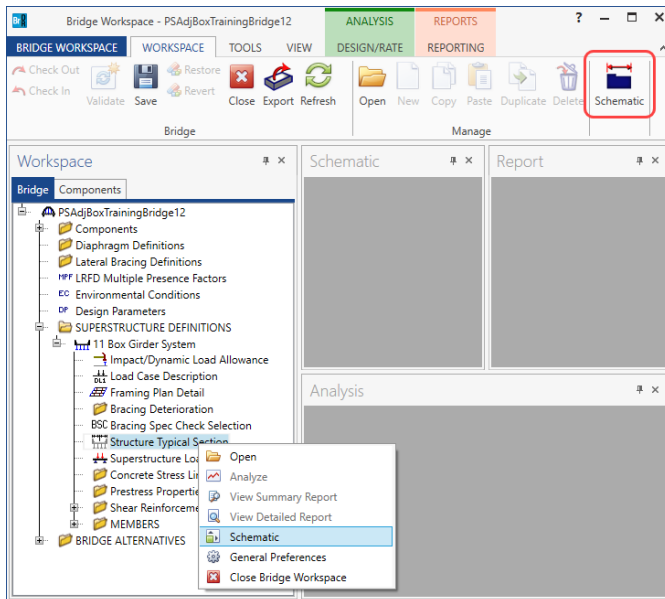
- Wearing surface material: Concrete
- Description: 5.25" min concrete wearing surface
- Wearing surface thickness: 5.2500 in Thickness field measured (DW = 1.25 if checked)
- Wearing surface density: 150.000 pcf
- Load case: Wearing Surface (dropdown menu)
- Copy from library... button

Buttons for 'OK', 'Apply', and 'Cancel' are located at the bottom right of the dialog.

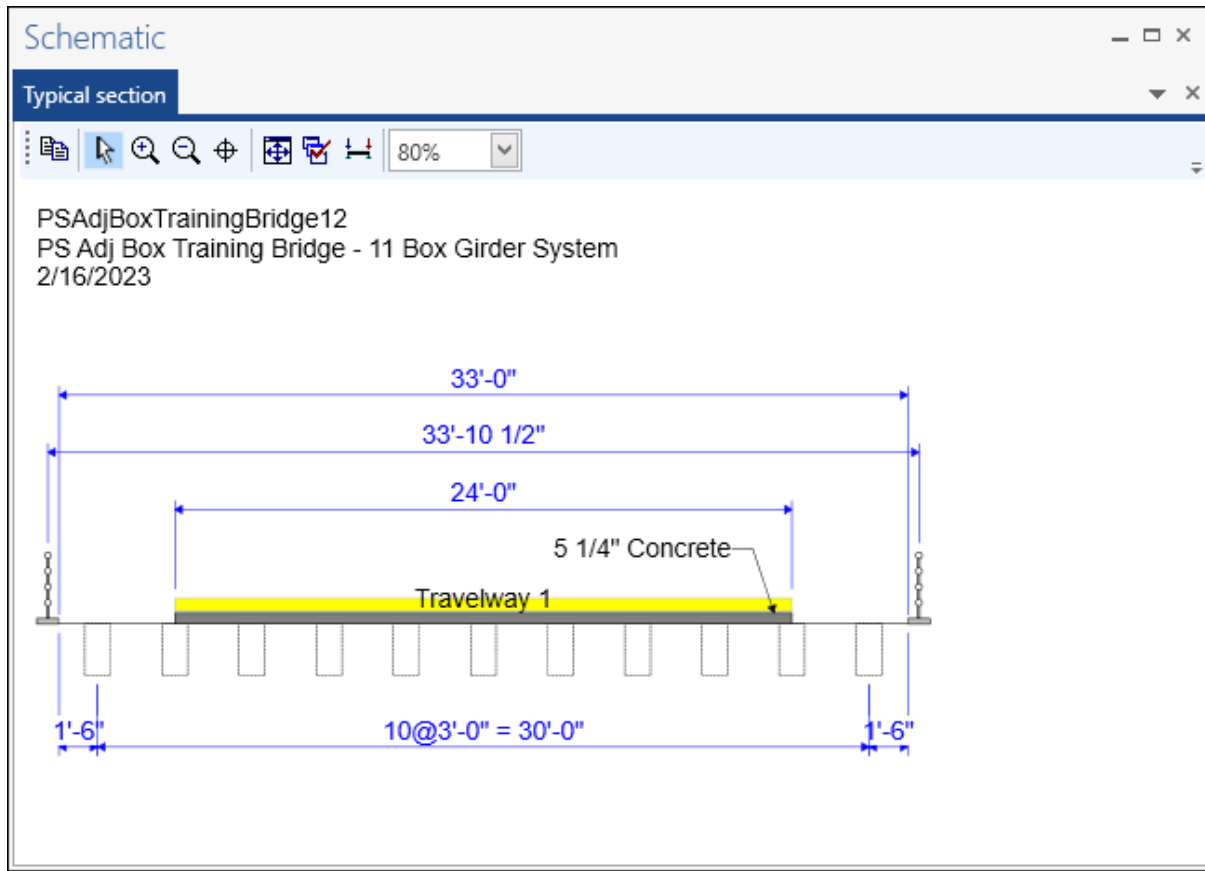
Click **OK** to apply the data and close the window.

Schematic – Structure Typical Section

While the **Structure Typical Section** node is selected in the **Bridge Workspace** tree, open the schematic for the typical section by selecting the **Schematic** button on the **WORKSPACE** ribbon (or right click on **Structure Typical Section** in the **Bridge Workspace** and select **Schematic** from the menu).



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Since the member alternatives are not defined yet, the girders are displayed as dashed boxes. At this point BrDR does not know if the girders will be PS boxes, I-beams, steel rolled beams, etc.

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Concrete Stress Limits

A Stress Limit defines the allowable concrete stresses for a given concrete material. Double click on the **Concrete Stress Limits** node in the **Bridge Workspace** tree to open the **Stress Limit Sets – Concrete** window. Enter data shown above the **Compute** button, select **Moderate** for the **Corrosion condition** and select the **6.0 ksi Beam Concrete** material from the drop-down menu of the **Concrete material**. Click the **Compute** button. Default values for the allowable stresses will be computed based on the **Concrete material** selected and the AASHTO Specifications. The default value for the **Final allowable slab compression** is not computed since the deck concrete is typically different from the concrete used in the beam. This value will be left blank since this example does not have a concrete deck.

	LFD	LRFD
Initial allowable compression:	3 ksi	3.25 ksi
Initial allowable tension:	0.2 ksi	0.2 ksi
Final allowable compression:	3.6 ksi	3.6 ksi
Final allowable tension:	0.4654031 ksi	0.4654031 ksi
Final allowable DL compression:	2.4 ksi	2.7 ksi
Final allowable slab compression:		
Final allowable compression: (LL+1/2(Pe+DL))	2.4 ksi	2.4 ksi

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

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Prestress Properties

Double click on the **Prestress Properties** node in the **Bridge Workspace** tree to open the **Prestress Properties** window. Define the prestress properties as shown below. Since the **AASHTO Approximate** method is used to compute the losses, only the information on the **General P/S data** tab is required.

Prestress Properties

Name: 1/2" LR AASHTO Loss

General P/S data | Loss data - lump sum | Loss data - PCI

P/S strand material: 1/2" (7W-270) LR

Loss method: AASHTO Approximate

Jacking stress ratio: 0.750

P/S transfer stress ratio:

Transfer time: 24.0 Hours

Age at deck placement: 30.00 Days

Final age: 182500.00 Days

Loss data - AASHTO

Percentage DL: 0.0 %

Include elastic gains

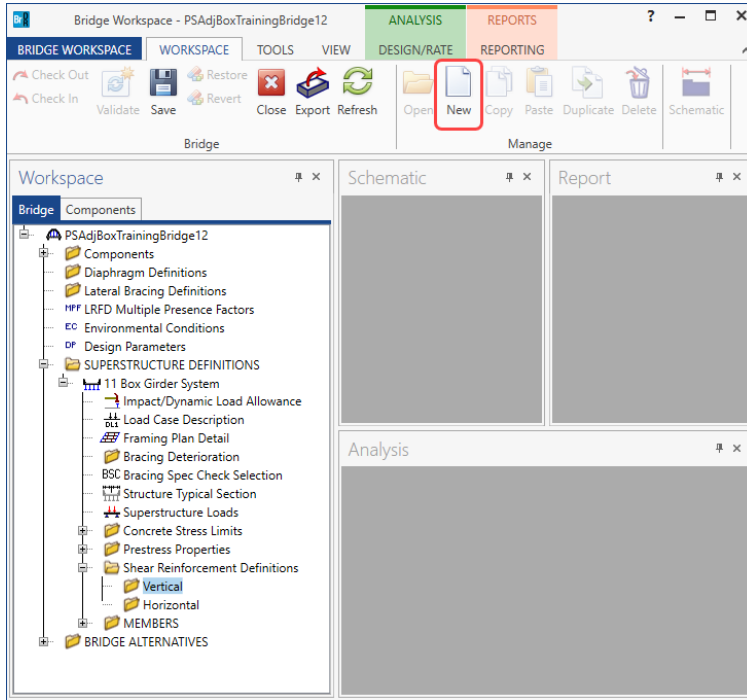
OK Apply Cancel

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

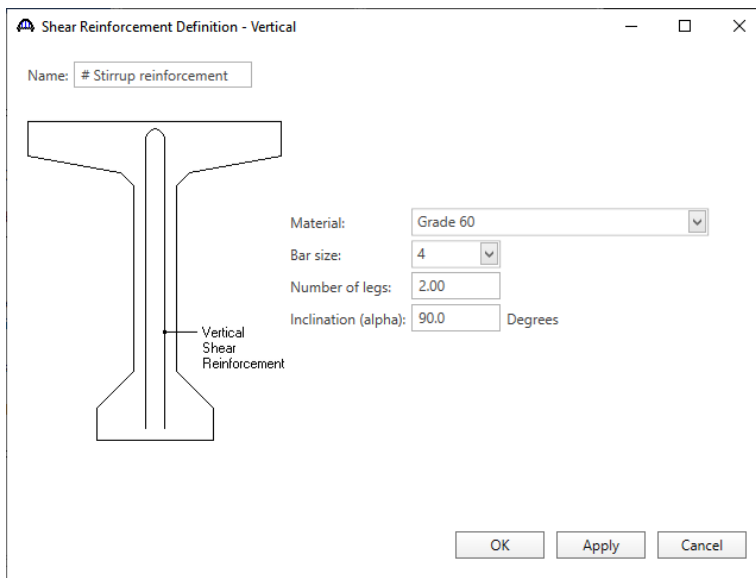
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Shear Reinforcement

Define the vertical shear reinforcement to be used by the girders. Expand the **Shear Reinforcement Definitions** node in the **Bridge Workspace** tree, select the **Vertical** node and click on **New** from the **Manage** group of the **WORKSPACE** ribbon (or double click on **Vertical**).



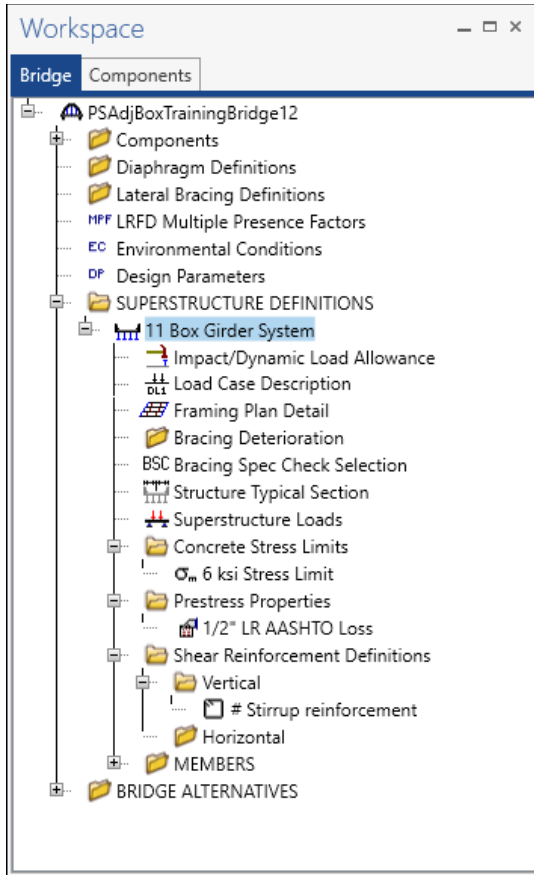
The I shape shown is for illustrative purposes only, it is not meant to display the actual beam shape. Enter the data as shown below.



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

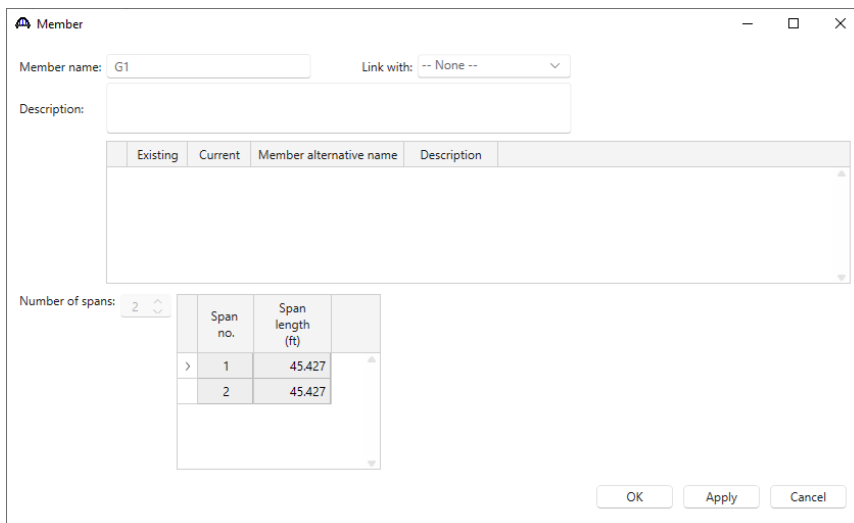
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A partially expanded **Bridge Workspace** is shown below.



Describing a member

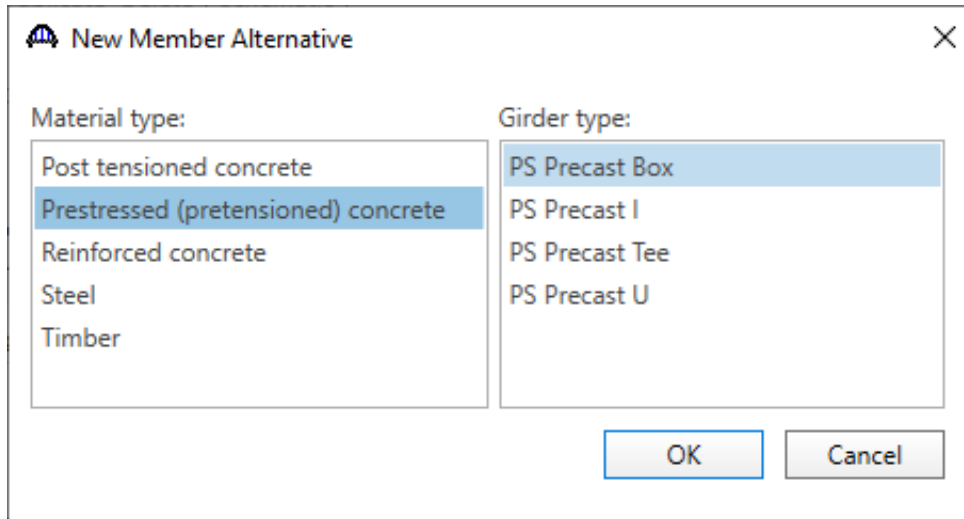
The **Member** window shows the data that was generated when the structure definition was created. No changes are required in this window. The first member alternative created will automatically be assigned as the **Existing** and **Current member alternative** for this Member.



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Defining a Member Alternative

Expand node **G2**. Double-click on **MEMBER ALTERNATIVES** in the **Bridge Workspace** tree for member **G2** to create a new member alternative. The **New Member Alternative** window shown below will open. Select **Prestressed (pretensioned) concrete** for the **Material type** and **PS Precast Box** for the **Girder Type**.



The image shows a dialog box titled "New Member Alternative" with a close button (X) in the top right corner. It contains two list boxes. The first list box, labeled "Material type:", has five items: "Post tensioned concrete", "Prestressed (pretensioned) concrete" (which is highlighted in blue), "Reinforced concrete", "Steel", and "Timber". The second list box, labeled "Girder type:", has four items: "PS Precast Box" (highlighted in blue), "PS Precast I", "PS Precast Tee", and "PS Precast U". At the bottom right of the dialog box are two buttons: "OK" and "Cancel".

Click **OK** to close the window and create a new member alternative.

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The **Member Alternative Description** window will open. Enter the data as shown below. The **Schedule based Girder property input method** is the only input method available for a prestressed concrete beam. Enter data as shown below.

Member alternative:

Description | Specs | Factors | Engine | Import | Control options

Description:

Material type:

Girder type:

Modeling type:

Default units:

Girder property input method

Schedule based

Cross-section based

Self load

Load case:

Additional self load: kip/ft

Additional self load: %

Default rating method:

Crack control parameter (Z)

Bottom of beam: kip/in

Exposure factor

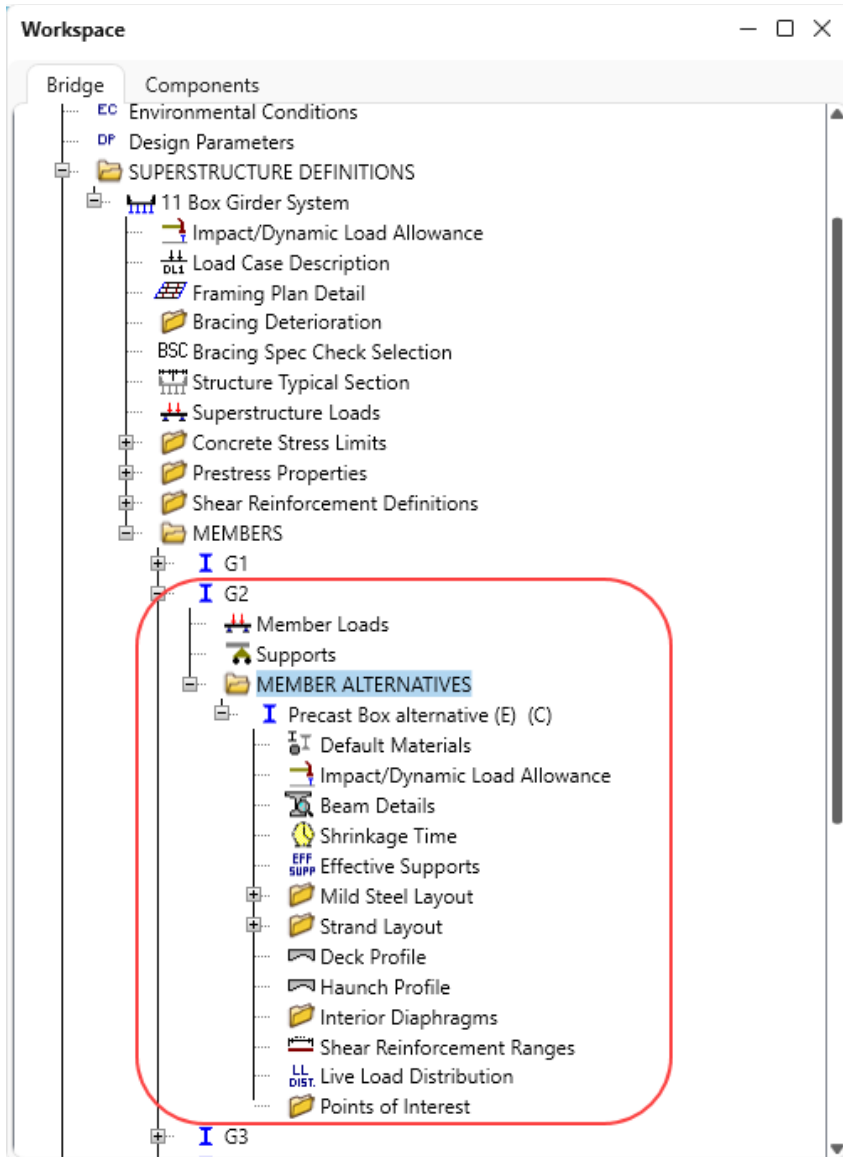
Bottom of beam:

Use creep

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

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

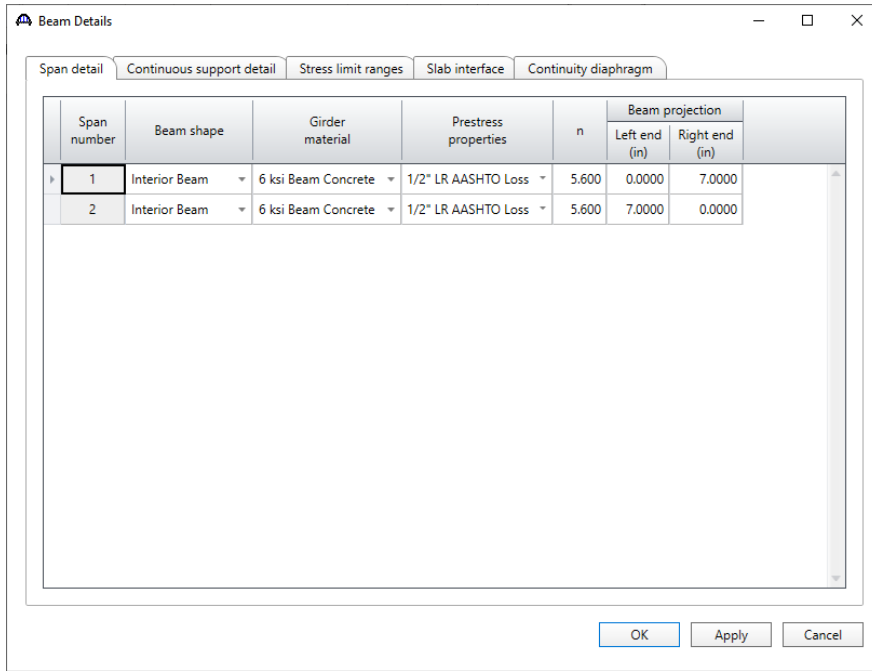
Expand the newly added member alternative. The partially expanded **Bridge Workspace** tree is shown below.



PS15 – 2 Span PS Adjacent Box With Straight Strands Example

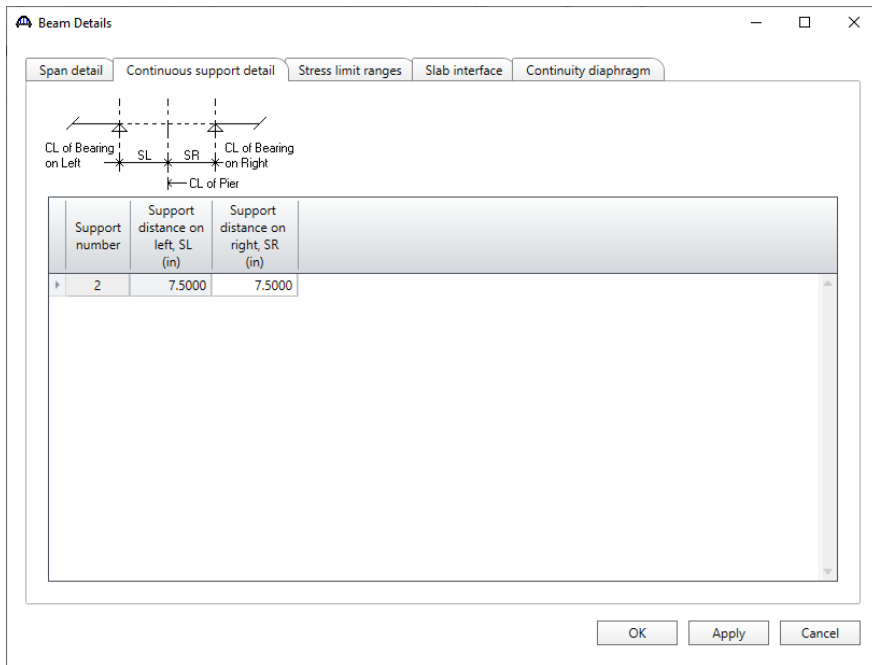
Beam Details – Span detail

Next describe the beam by double clicking on the **Beam Details** node in the **Bridge Workspace** tree. Enter the data in each tab of the **Beam Details** window as shown below.



Beam Details – Continuous support detail

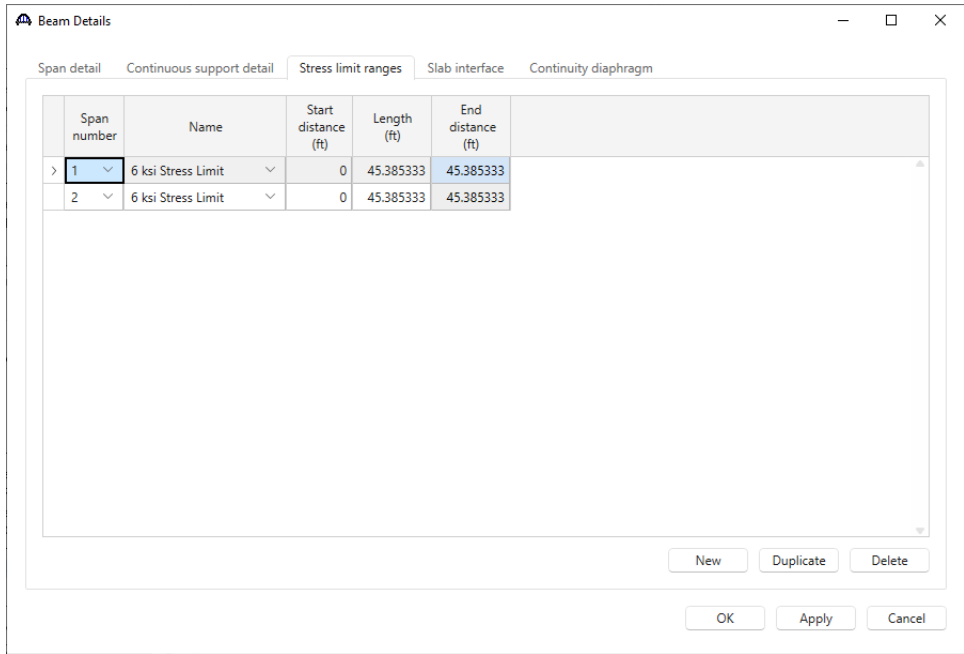
Define the continuous support detail as shown below.



PS15 – 2 Span PS Adjacent Box With Straight Strands Example

Beam Details – Stress limit ranges

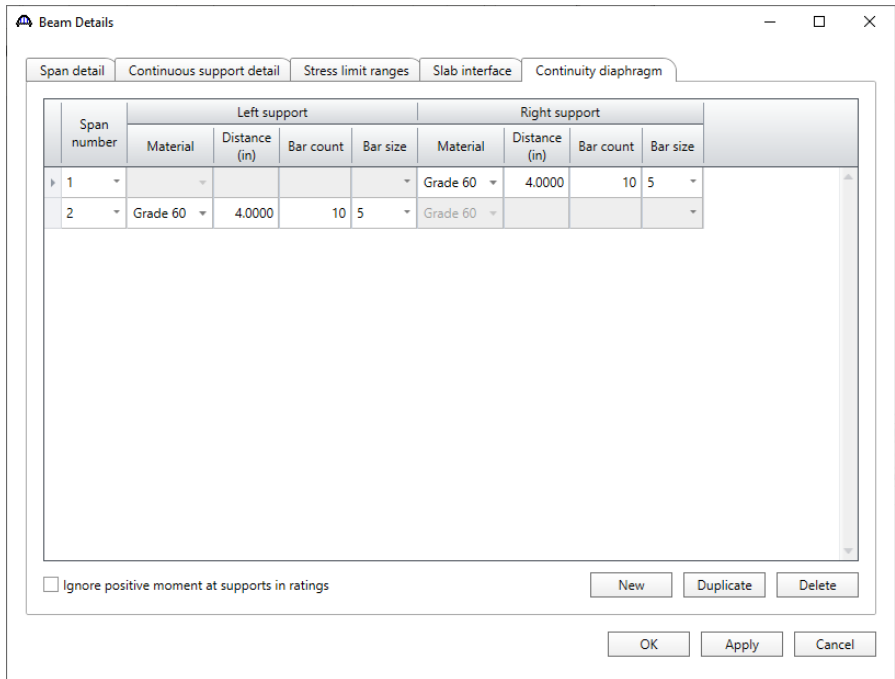
Note that the stress limit ranges are defined over the entire length of the precast beam as shown below for span 1 and span 2.



Since this example does not have a concrete deck, the **Slab interface** tab does not require input.

Beam Details – Continuity diaphragm

Enter the Continuity diaphragm detail as shown below.

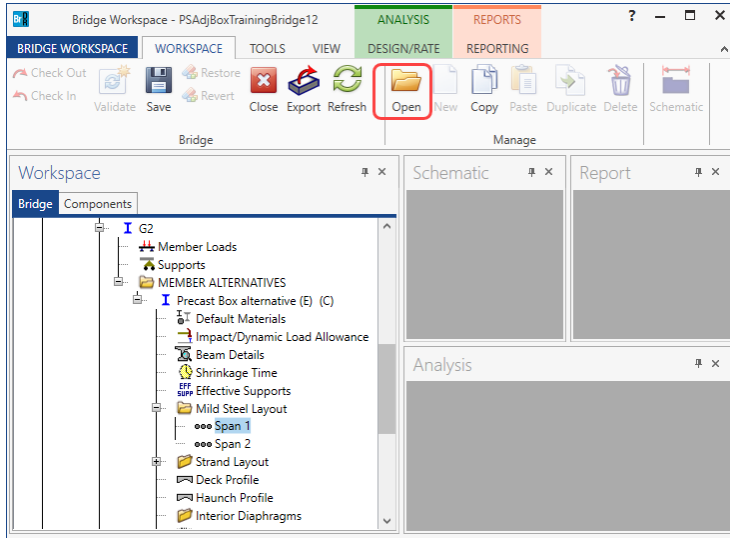


Click **OK** to apply the beam details and close the window.

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

Mild Steel Layout – Span 1

Expand the **Mild Steel Layout** in the **Bridge Workspace** tree and double-click on **Span 1** (or select **Span 1** and click the **Open** button from the **Manage** group of the **WORKSPACE** ribbon) to open the **Mild Steel Layout – Span 1** window.



Enter the Span 1 details as shown below.

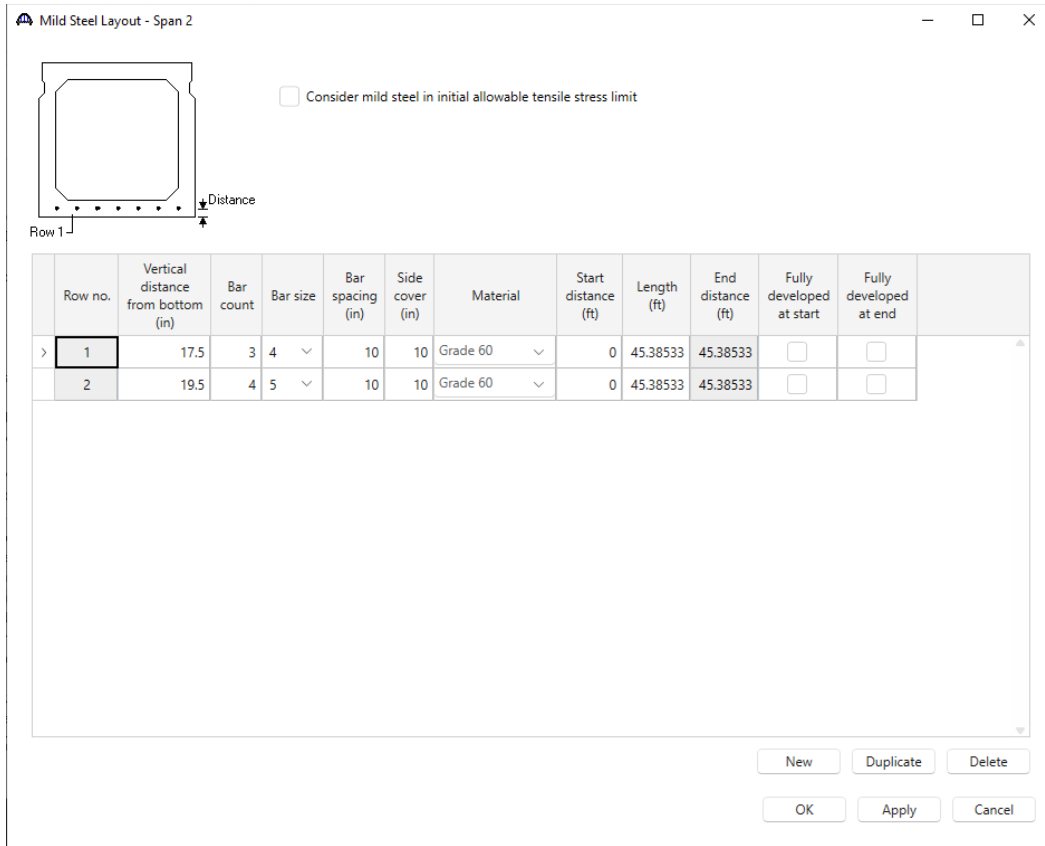
Mild Steel Layout - Span 1

Consider mild steel in initial allowable tensile stress limit

Row no.	Vertical distance from bottom (in)	Bar count	Bar size	Bar spacing (in)	Side cover (in)	Material	Start distance (ft)	Length (ft)	End distance (ft)	Fully developed at start	Fully developed at end
1	17.5	3	4	10	10	Grade 60	0	45.38533	45.38533	<input type="checkbox"/>	<input type="checkbox"/>
2	19.5	4	5	10	10	Grade 60	0	45.38533	45.38533	<input type="checkbox"/>	<input type="checkbox"/>

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

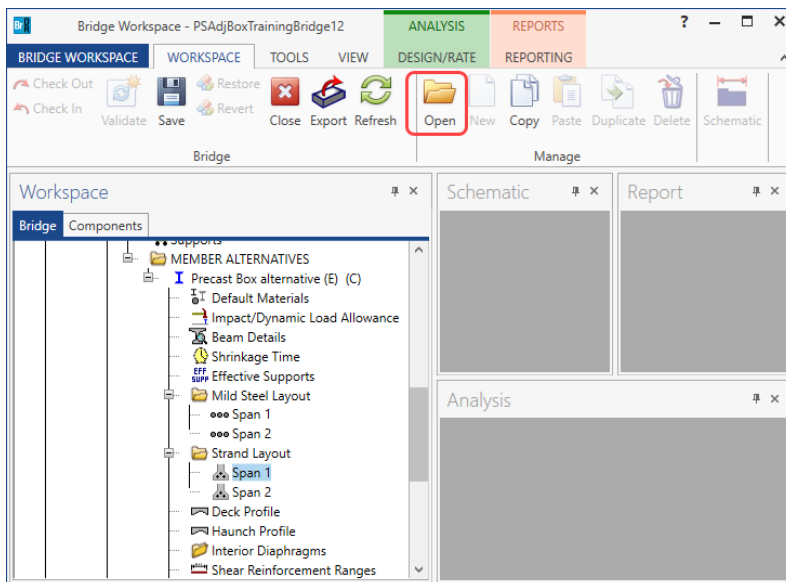
Similarly, enter the **Mild Steel Layout – Span 2** as shown below.



Click **OK** to apply the beam details and close the window.

Strand Layout – Span 1

Expand the **Strand Layout** in the **Bridge Workspace** tree and double-click on **Span 1** (or select **Span 1** and click the **Open** button from the **Manage** group of the **WORKSPACE** ribbon) to open the **Stand Layout – Span 1** window.



PS15 – 2 Span PS Adjacent Box With Straight Strands Example

Use the **Zoom** buttons to shrink/expand the schematic of the beam shape on the right side of the screen so that the entire beam is visible. Select the **Description type** as **Strands in rows** and the **Strand configuration type** as **Straight/Debonded**. The **Mid span** radio button will now become active. Strands can now be defined at the middle of the span by selecting strands on the right hand schematic. Select the following strands in the schematic so that the CG of the strands is 4.5 inches. Click the **Apply** button and then **OK** to apply this data. Repeat these steps for **Span 2**.

Strand Layout - Span 1

Description type
 P and CGS only Strands in rows

Strand configuration type Symmetry
 Straight/Debonded
 Harped
 Harped and straight debonded

Mid span

Debonding

Left

Section location (in)	Measured and debonded from

New Modify Delete

Right

Section location (in)	Measured and debonded from

New Modify Delete

OK Apply Cancel

Notes:
 Strand positions generated by the REVISED method.
 Please refer to Help for a description of this method.

Number of strands = 16
 Number of debonded strands (Total/Here/Other) = 0/0/0
 CG of strands (measured from bottom of section) = 4.50 in

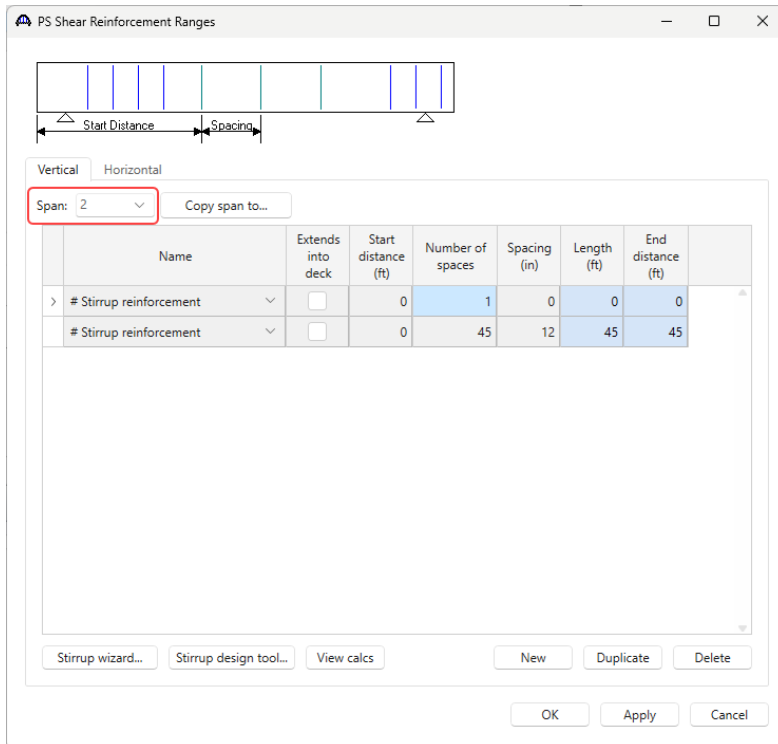
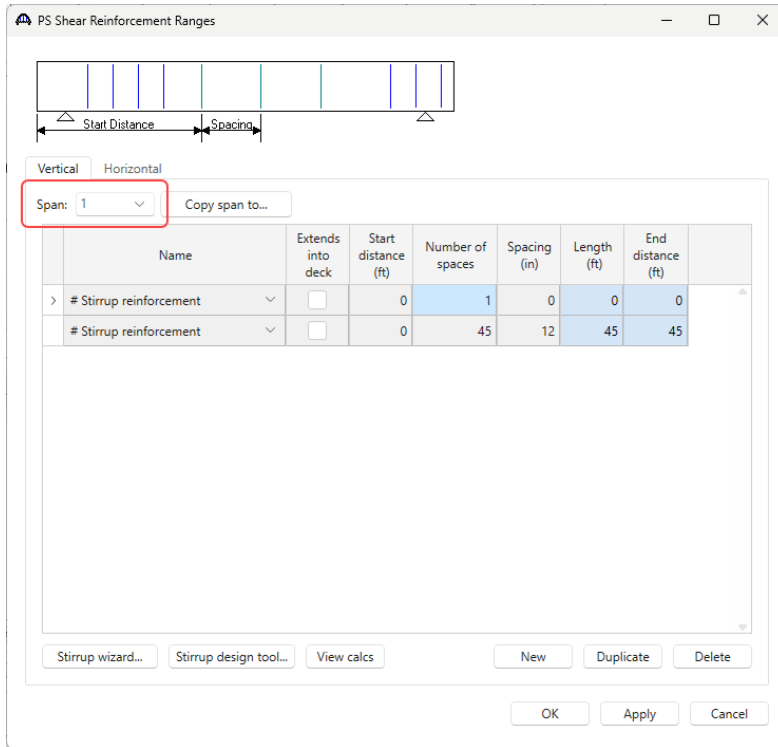
Legend:

- × No strand at this position at the current section location.
- × No strand at this position at the current location but a strand is harped to this position.
- A strand occupies this position at the current section location.
- The strand is debonded from the end of the beam to the current section location.
- The strand is debonded from the mid-span to the current section location.
- The strand is debonded at other section location. Hover over the strand for more information.
- The harped position of a harped strand.
- The mid-span position of a harped strand.
- The mid-span position of one strand and the harped position of another strand.
- Mild steel.

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

Shear Reinforcement Ranges

Double-click on the **Shear Reinforcement Ranges** node in the **Bridge Workspace** tree to open the **PS Shear Reinforcement Ranges** window. The shear reinforcement ranges for each span are entered as described below.



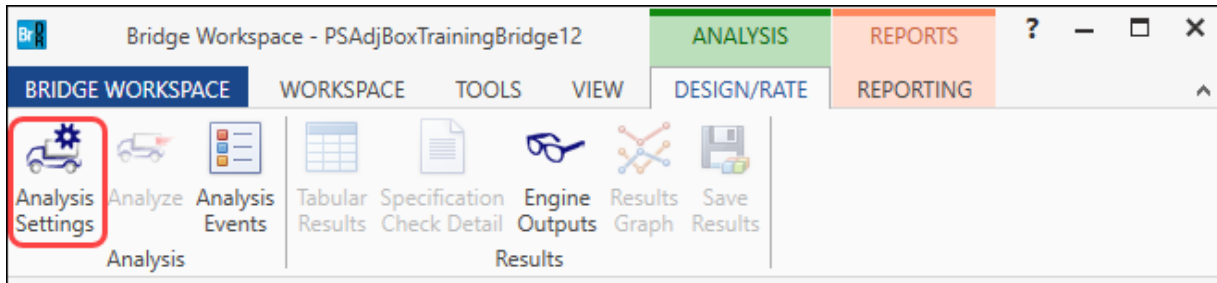
Click **OK** to apply the data and close the window.

PS15 – 2 Span PS Adjacent Box With Straight Strands Example

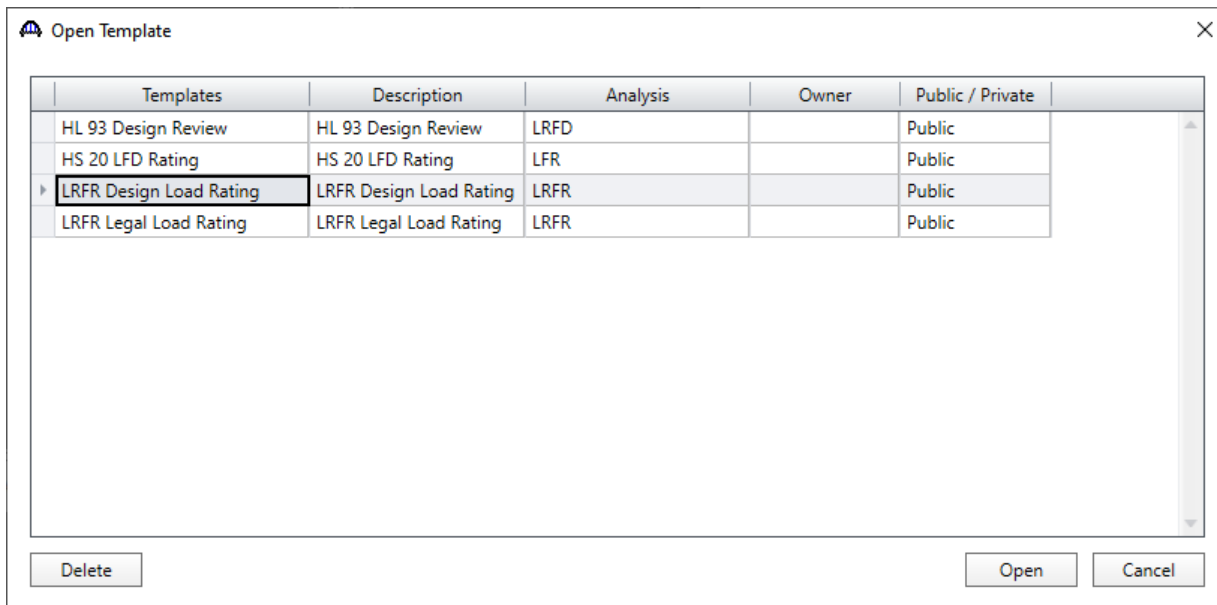
The description of an interior beam for this structure definition is complete. The member alternative can now be analyzed.

LRFR Rating

To perform an **LRFR** rating on **G2**, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon to open the window shown below.

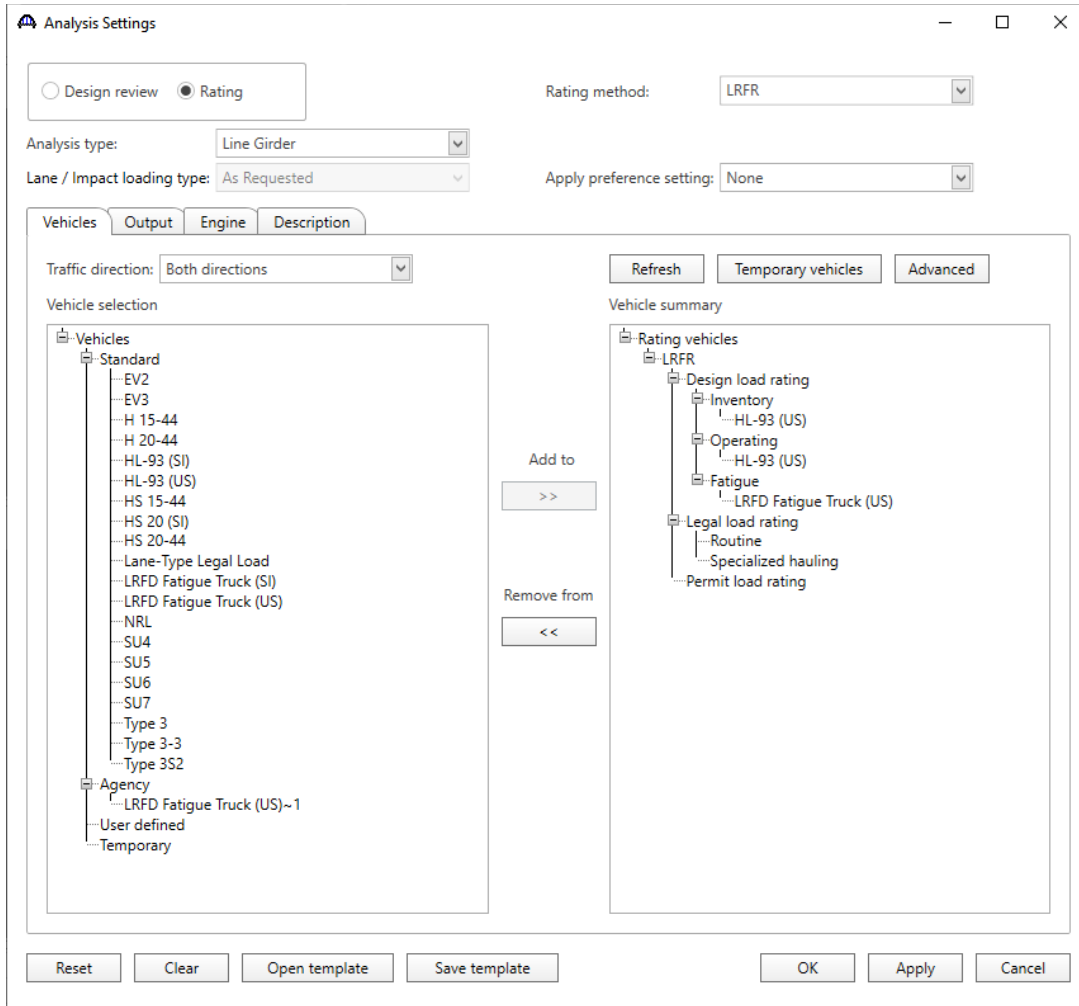


Click the **Open Template** button and select the **LRFR Design Load Rating** to be used in the rating and click **OK**.



PS15 – 2 Span PS Adjacent Box With Straight Strands Example

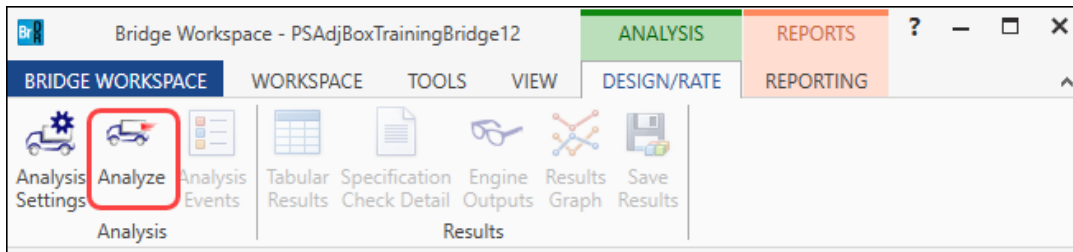
The **Analysis Settings** window will be updated as shown below.



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

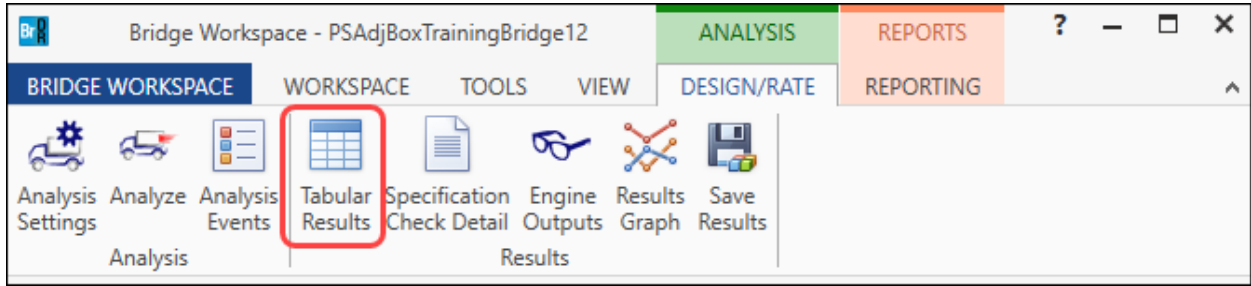
Tabular Results

With **G2** member alternative **Precast Box alternative** selected, click the **Analyze** button on the **Analysis** group of the **DESIGN/RATE** ribbon to perform the rating.



PS15 – 2 Span PS Adjacent Box With Straight Strands Example

When the rating is completed, the 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.

Analysis Results - Precast Box alternative

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
HL-93 (US)	Truck + Lane	LRFR	Inventory	3.66	0.102	45.43	1 - (100.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Truck + Lane	LRFR	Operating	4.74	0.132	45.43	1 - (100.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Inventory	4.40	0.122	45.43	1 - (100.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	Operating	5.70	0.158	45.43	1 - (100.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Inventory	4.51	0.125	45.43	1 - (100.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Operating	5.85	0.163	45.43	1 - (100.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested

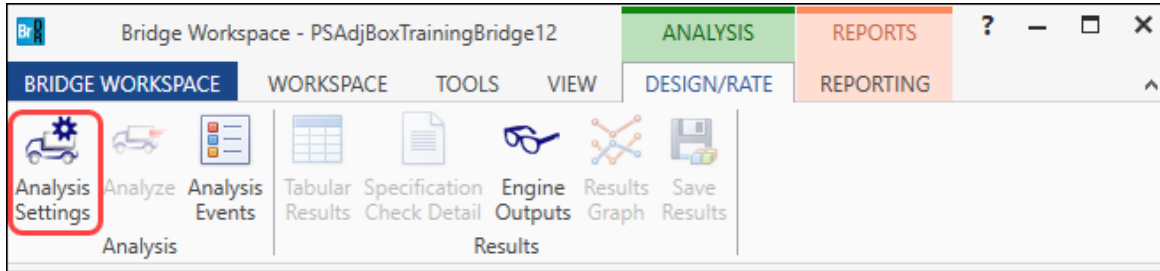
AASHTO LRFR Engine Version 7.5.0.3001
Analysis preference setting: None

Close

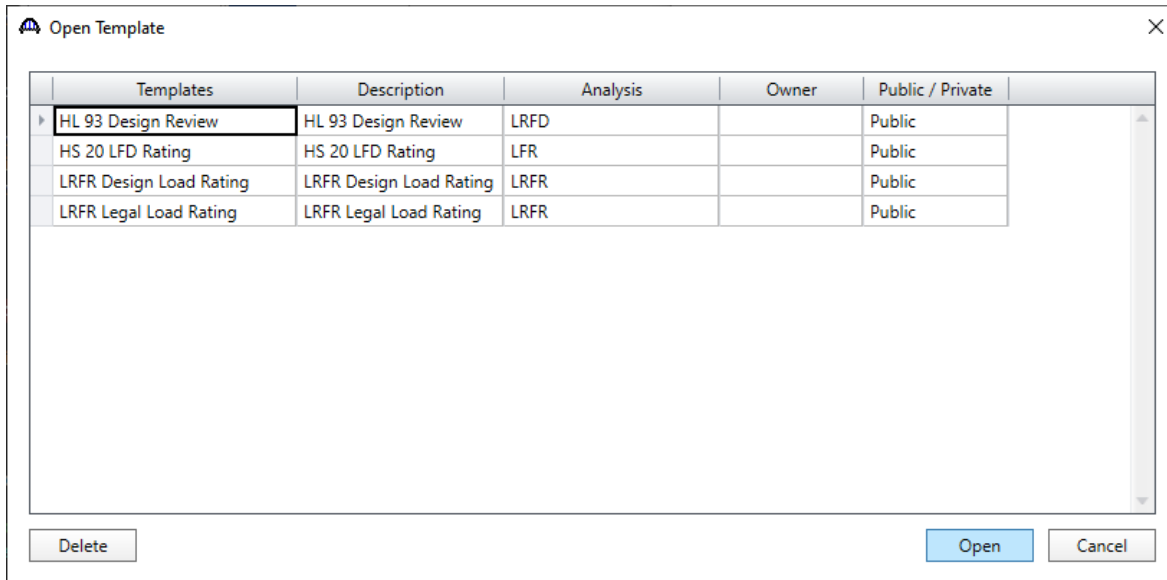
PS15 – 2 Span PS Adjacent Box With Straight Strands Example

LRFD Design review

To perform an **LRFD design review of G2** of this girder for HL93 loading, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon to open the window shown below.

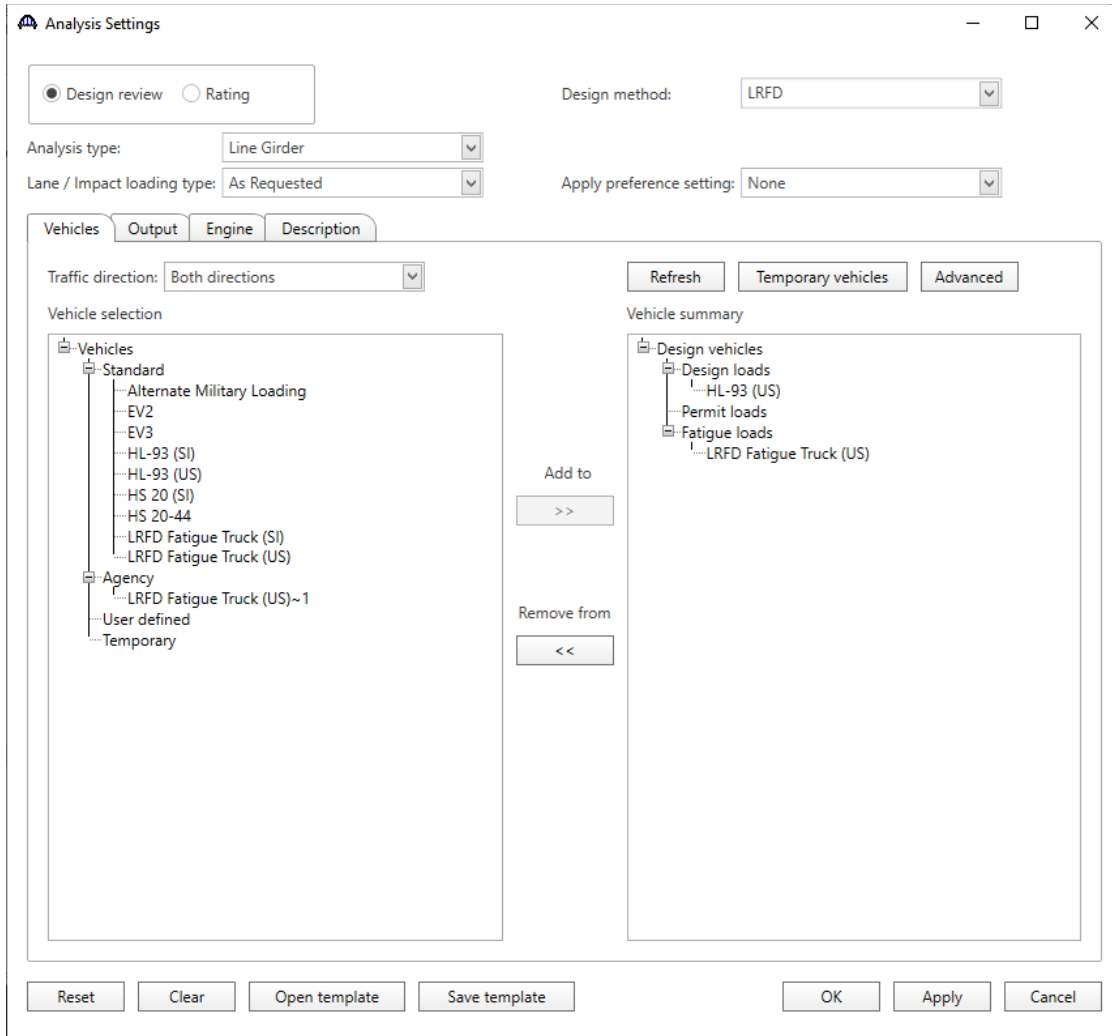


Click the **Open Template** button and select the **HL 93 Design Review** to be used in the rating and click **OK**.



PS15 – 2 Span PS Adjacent Box With Straight Strands Example

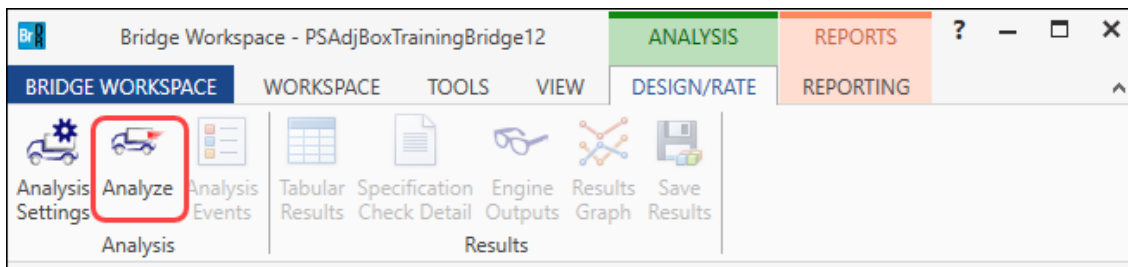
The **Analysis Settings** window will be updated as shown below.



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

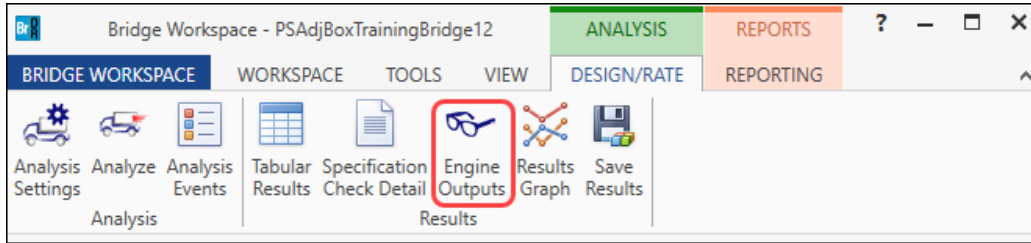
Engine Outputs

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

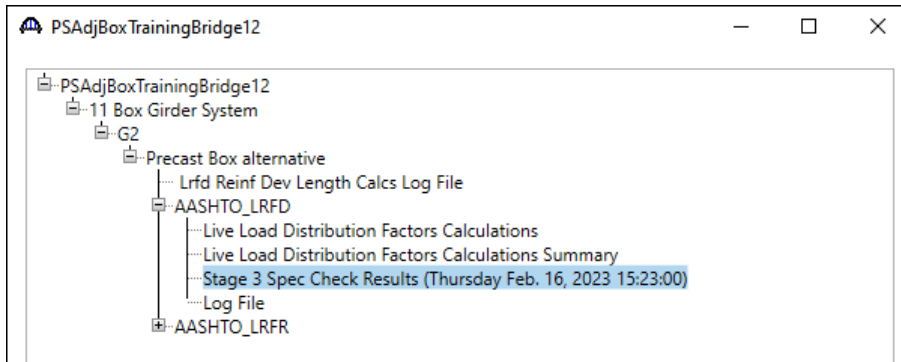


PS15 – 2 Span PS Adjacent Box With Straight Strands Example

AASHTO LRFD analysis will generate a **Spec Check Results** file. When the design review is finished, results can be reviewed by clicking the **Engine outputs** button on the **Results** group of the ribbon.



The following window opens.



To view the spec check results, double click the **Stage 3 Spec Check Results** file in this window.

