AASHTOWare BrDR 7.5.0 Prestressed Concrete Structure Tutorial PS15 – Two Span PS adjacent Box With Straight Strands

BrDR Training

PS15 - Two Span PS Adjacent Box With Straight Strands Example

| ridge ID: PSAdjBox1 | FrainingBridge12 | NBI structure | e ID (8): AdjBoxTrainin10 | | emplate ridge completely | defined | Superstructu | |
|------------------------|---|---------------|---------------------------|----------------|-----------------------------|---------|--------------|--|
| Description Desc | cription (cont'd) | Alternatives | Global reference point | Traffic Custom | agency fields | | | |
| Name: | PS Adj Box Train | ing Bridge | | Yea | ar built: | |] | |
| Description: | FAP Route 840 (Section 120 BR- Vermilion Count | 1 | | ~ | | | | |
| Location: | | | | Ler | ngth: | | ft | |
| Facility carried (7): | | | | Rou | ute number: | |] | |
| Feat. intersected (6): | | | | Mi. | post: | |] | |
| | | | | | | | | |
| Default units: | US Customary | V | | | | | | |
| Default units: | US Customary | × | | | | | | |
| Default units: | US Customary | V | | | | | | |

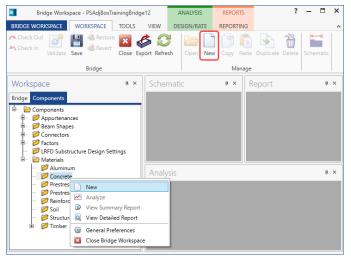
From the **Bridge Explorer** create a **new bridge** and enter the following description data:

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

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.

| Bridge Ma | terials - Concrete | | |
|---------------------------------------|------------------------------|-------------|-----|
| Name: | 6 ksi Beam Concrete | | |
| Description: | | | |
| Compressive | e strength at 28 days (f'c): | 6 | ksi |
| Initial compr | ressive 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 ten | sile strength (fct): | | ksi |
| LRFD Maxim | um aggregate size: | | in |
| | Compute | | |
| Std modulus | of elasticity (Ec): | 4695.982325 | ksi |
| LRFD modul | us of elasticity (Ec): | 4877.010345 | ksi |
| Std initial mo | odulus of elasticity: | 4286.825749 | ksi |
| LRFD initial r | modulus of elasticity: | 4592.232476 | ksi |
| Std modulus | of rupture: | 0.580948 | ksi |
| LRFD modul | us of rupture: | 0.587878 | ksi |
| Shear factor | | 1 | |

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

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 1/2" (7W-270) LR from the library and click OK.

| 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 | 4 |
| 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 | J |
| 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 | |

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 relax | ation 1/2"/Seven Wire/fpu | ı = 270 | | | |
| Strand diameter: | 0.5000 | in | | | |
| Strand area: | 0.153 | in^2 | | | |
| Strand type: | Low Relaxation | ~ | | | |
| Ultimate tensile strengt | h (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 | ОК | Apply | Canco | el |

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

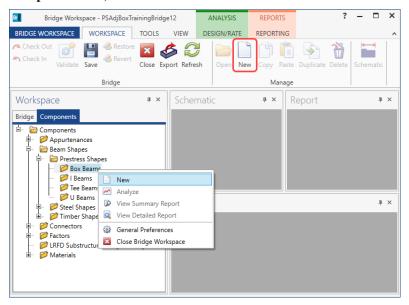
| Description: | | | | | |
|---------------------------------|------------------|--------------|-----|--|--|
| | 60 ksi reinforci | ing steel | | | |
| Material prope | erties | | | | |
| pecified yield | strength (fy): | 60.000087 | ksi | | |
| Modulus of ela | asticity (Es): | 29000.004206 | ksi | | |
| Jltimate streng | gth (Fu): | 90.0000131 | ksi | | |
| Type Plain Epoxy Galva | | | | | |
| Plain O Epoxy | | | | | |

Add the following reinforcement steel in the same manner.

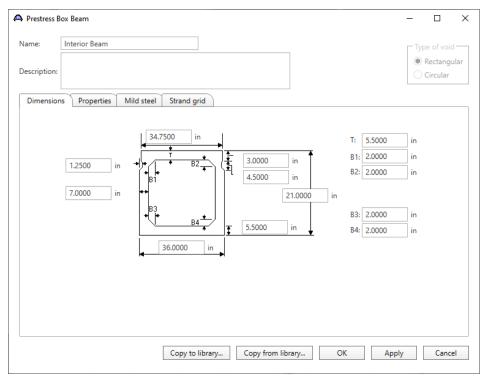
Click **OK** to apply the data and close the window.

Beam Shape

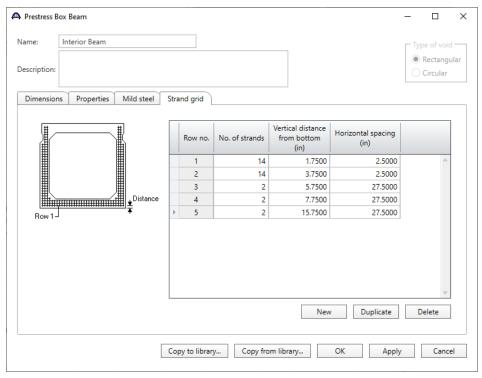
To enter a prestress beam shape to be used in this bridge expand the tree labelled **Beam Shapes** and **Prestress Shapes** as shown below and click on the **Box Beams** node in the **Components** tree, select **New** from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **Box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



The **Prestress Box Beam** window shown below will open. Select the **Type of Void** as **Rectangular** and enter the data for the interior beam as shown below.



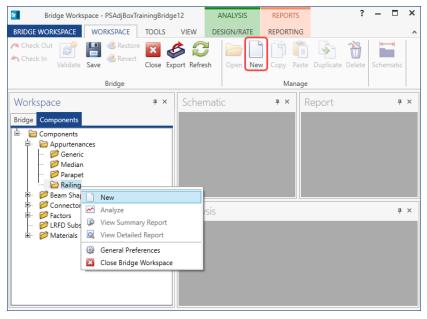
Navigate to the Strand grid tab and enter the data as shown below.



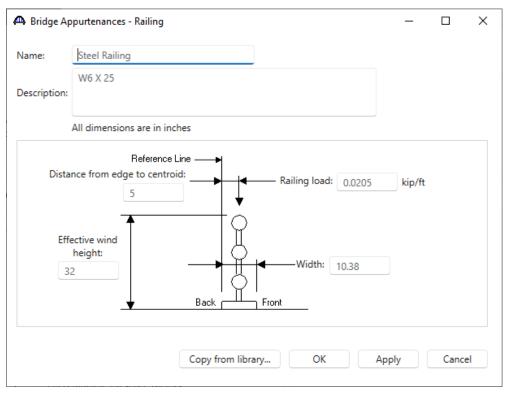
Click **OK** to apply the data and close the window.

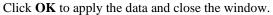
Bridge - Appurtenances

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**).



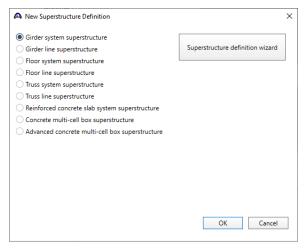
Enter the data as shown below.





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.

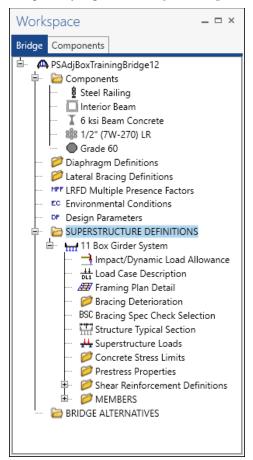


Select **Girder system superstructure**, click **OK** and the **Girder System Superstructure Definition** window will open. Enter the data as shown below.

| | ngine | | | |
|---|---|------------|----------------------|--|
| me: 11 Box Girder Sys | tem | | | Modeling |
| | | | | O Multi-girder system MCB |
| | | | | With frame structure simplified definition |
| scription: | | | | Deck type: |
| | | | | Concrete Deck V |
| fault units: US Customary | Enter span lengths | | | For PS/PT only |
| mber of spans: 2 0 | along the reference | | | Average humidity: |
| mber of girders: 11 0 | | | | % |
| | Span Length (ft) | | | |
| | > 1 45.43 | 27 | | Member alt. types |
| | 2 45.43 | 27 | | Steel |
| | | | | P/S |
| | | | | R/C |
| | | | | Timber |
| | | | | P/T |
| | | | | |
| | | | | |
| | | | | |
| | | * | | |
| | | | | |
| | | | | |
| Horizontal curvature | line Distance from PC to first supp | port line: | ft | |
| Horizontal curvature Superstructure alignment | | port line: | ft ft | |
| Horizontal curvature Superstructure alignment Curved | Distance from PC to first supp | port line: | | |
| Horizontal curvature Superstructure alignment Curved Tangent, curved, tangent | Distance from PC to first supp Start tangent length: | port line: | ft | |
| Horizontal curvature Superstructure alignment Curved Tangent, curved, tangent Tangent, curved | Distance from PC to first supp Start tangent length: Radius: | | ft | |
| Horizontal curvature Superstructure alignment Curved Tangent, curved, tangent | Distance from PC to first supp Start tangent length: Radius: Direction: | Left 🗸 | ft ft | |
| Horizontal curvature Superstructure alignment Curved Tangent, curved, tangent Tangent, curved | Distance from PC to first supp Start tangent length: Radius: Direction: End tangent length: | Left 🗸 | ft ft ft | |
| Superstructure alignment Curved Tangent, curved, tangent Tangent, curved | Distance from PC to first supp Start tangent length: Radius: Direction: End tangent length: Distance from last support lin | Left 🗸 | ft ft ft ft | |

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

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



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).

| Bridge Workspace - P BRIDGE WORKSPACE WOR | | Bridge12 OLS VIEW | ANALYSIS DESIGN/RATE | REPORTS REPORTING | ? | - 0 | × |
|---|---|------------------------------|-------------------------|------------------------|----------------|-------------|------|
| Check Out Check In Validate Save | Restore Revert Redge | Close Export Refresh | Open New | Copy Paste D Manage | uplicate Delet | e Schematic | - |
| Workspace | | Ś | X Schema | tic ☆ | × Report | | \$ × |
| Components Diaphragm Definition Diaphragm Definition Diaphragm Definition Director of the sector of the sec | tions ce Factors ions FINITIONS tem c New Manalyze View Sun | nmary Report ailed Report | Analysis | | | | \$ X |
| | General | Preferences dge Workspace | | | | | |

| Iternative name: Brid | dge Alternative #1 | | | | | |
|--------------------------|--------------------|---------------|------------|--------|------|-----|
| Description Subs | tructures | | | | | |
| Description: | | | | | | |
| Horizontal curv | ature | Global pos | itioning - | | | |
| Reference line lengt | h: 90.77 ft | Distance: | 0 | ft | | |
| O Start bearing | End bearing | Offset: | 0 | ft | | |
| Starting station: | ft | Elevation: | | ft | | |
| Bearing: | N 90^ 0' 0.00" E | | | | | |
| Bridge alignment | | Start tangent | length: | | ft | |
| Curved | | Curve length: | | | ft | |
| | ved, tangent | Radius: | | | ft | |
| Tangent, cur | | Direction: | | Left v | / | |
| Curved, tang | gent | End tangent I | ength: | | ft | |
| | | | | | | |
| | | | | | | |
| Superstructure wizard | Culvert wizard | | | | | |
| | | | | | | |
| | | OK | | Apply | Cano | cel |

Enter the following data.

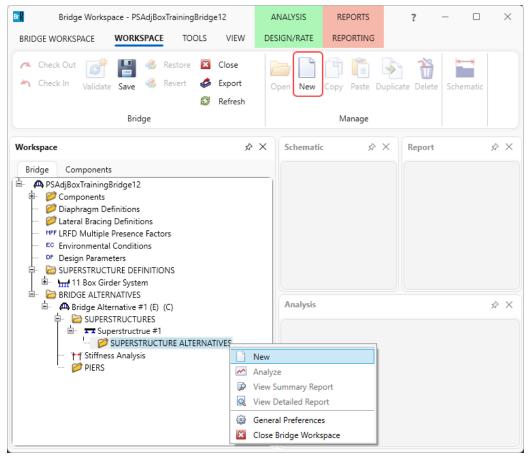
Click \mathbf{OK} to apply the data and close the window.

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.

| Bridge Worl BRIDGE WORKSPACE | kspace - PSAdj | BoxTrainingBridge | | ANALYSIS ESIGN/RATE | REPORTS REPORTING | ? | - 0 | × | |
|--|--|---|----------------------------|------------------------|------------------------|-----------------|-----------|------|--------|
| A Check Out | ate Save Bridge | Revert 🤣 | Close Export Refresh | Oper New | Copy Paste D Manage | uplicate Delete | Schematic | | |
| Workspace | | | \$ X | Schematic | ÷ 🖈 | × Report | | x x | |
| Bridge Compone | | | ~ ~ ~ | | ~ ~ | | | | |
| PSAdjBoxTrainii PSAdjBoxTrainii PostadjBoxTrainii PostadjBoxTraini PostadjBoxTrainii | ngBridge12 s Definitions ing Definitions ole Presence Fa tal Conditions meters CTURE DEFINI | actors | | | | | | | |
| 🖶 🖶 HII Box (🖃 🗁 BRIDGE ALT | | | | Analuria | | | | * × | |
| ៉ – 🗛 Bridge A | Iternative #1 (| | | Analysis | | | | × ~ | |
| ···· ¥⁺ Stiffr | ERSTRUCTURE ness Analysis | New | | | | | | | |
| ' 🧭 PIER | S | Analyze View Summa View Detaile | | | | | | | |
| | | General PrefClose Bridge | | | | | | | |
| Superstructure Superstructure name: | Cuportructo | o #1 | | | | | | - | |
| | | | ine Substr | uctures | | | | | |
| Description: | | | | | | | | | |
| Reference line | | | | | | | | | |
| Distance: | 0 | ft | | | | | | | |
| Offset: | 0 | ft | | | | | | | |
| Angle: | 0 | Degrees | | | | | | | |
| Starting station: | | ft | | | | | | | |
| | | | | | | | | | |
| | | | | | | ОК | A | pply | Cancel |

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

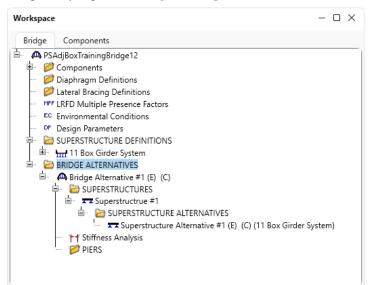
Expand the **Superstructure #1** node in the **Bridge Workspace** tree by clicking the + button. Double-click on the **SUPERSTRUCTURE ALTERNATIVES** node (or select **SUPERSTRUCTURE ALTERNATIVES** and click **New** from the **Manage** group of the **WORKSPACE** ribbon) and enter the following new superstructure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



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

| A | Superstruc | ture Alternativ | /e | | | | | | | | | _ | | × |
|----------|-------------|-----------------|-------|----------|--------|----------|-------|--|----|---|-----|----|------|----|
| Alte | ernative na | me: | Supe | rstructi | ure Al | ternativ | /e #1 | | | | | | | |
| Des | cription: | | | | | | | | | | | | | |
| Sup | perstructur | e definition: | 11 Bo | x Girde | r Syst | em | | | ~ | 1 | | | | |
| Sup | erstructur | e type: | Girde | er | | | | | | | | | | |
| Nu | mber of m | ain members: | 11 | | | | | | | | | | | |
| | Span | Length (ft) | | | | | | | | | | | | |
| | 1 | 4 | 5.427 | - | | | | | | | | | | |
| | 2 | 4 | 5.427 | | | | | | | | | | | |
| | | | | | | | | | ОК | | Арр | ly | Canc | el |

The partially expanded Bridge Workspace tree is shown below.



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.

| A | Load Case Description | | | | - | | × |
|----------|-------------------------|---------------------------------------|---------------------------|--------|-----------------|------|----|
| | Load case name | Description | Stage | Туре | Time* (days) | | |
| | Wearing Surface | | Non-composite (Stage 1) * | D,DW - | | | - |
| | Parapets | | Non-composite (Stage 1) * | D,DC - | | | |
| | | | | | | | ~ |
| *P | restressed members only | Add default load case descriptions | | New | Duplicate | Dele | te |
| | | | | ОК | Apply | Cano | el |

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.

| A Structure Framing P | Plan Details | | | | | | | | | _ | | × |
|-----------------------|-----------------|--------|------------------------|--------------------------|------------------|---------|---|----|-----|-----|------|----|
| Number of spans: 2 | Number of gi | rders: | 11 | | | | | | | | | |
| Layout Diaphrag | | | | | | | | | | | | |
| | gnis | | | | | | | | | | | |
| | | | | cing orientat | | | | | | | | |
| | Skew egrees) | |) Perpend) Along s | licular to gir upport | der | | | | | | | |
| ▶ 1 | 20.000 | _ | | | | | - | | | | | |
| 2 | 20.000 | | Girder | Girder sp (ft) | | | | | | | | |
| 3 | 20.000 | | bay | Start of girder | End of girder | | | | | | | |
| | | ► | 1 | 3.00 | 3.00 | | 1 | | | | | |
| | | | 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 | | | | | | | |
| | ~ | | | | | - | | | | | | |
| | | | | | | | 1 | | | | | |
| | | | | | | | | ОК | Арр | bly | Canc | el |

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

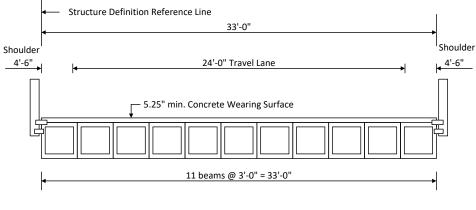
Structure Framing Plan Detail – Diaphragms

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.

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.

| A Structure Typical Section | _ | | × |
|--|-------|-------|---|
| Distance from left edge of deck to Distance from right edge of deck to superstructure definition ref. line | | | |
| Deck Superstructure Definition thickness Reference Line | | | |
| Left overhang | | | |
| Deck Deck (cont'd) Parapet Median Railing Generic Sidewalk Lane position Striped lanes Wearing surface | | | |
| Superstructure definition reference line is within 🕑 the bridge deck. | | | |
| Start End | | | |
| 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 | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| ОК | Apply | Cance | ! |

Structure Typical Section – Railing

Add two steel railings as shown below. A Structure Typical Section _ Back Υ Front Deck (cont'd) Parapet Median Railing Generic Sidewalk Lane position Striped lanes Wearing surface Deck Edge of deck Distance at Distance at Front face dist. measured from start (ft) end (ft) Name Load case Measure to orientation Steel Railing \sim Parapets \sim Back \sim Left Edge 🛛 🗸 -0.865 -0.865 Right 🗸 Steel Railing Back Right Ed... 🗸 -0.865 -0.865 Left \sim Parapets \vee 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.

 \times

| Stru | cture Typical | Section | | | | - | | × |
|------|---------------------|--|---|--|---|-------|--------|----|
| Ţ | Travelw | | ure Definition Reference Line | | | | | |
| Deck | k Deck (co | nt'd) Parapet Median | Railing Generic Sidew | alk Lane position Striped | l lanes Wearing surface | | | |
| | 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) | | | |
| Þ | 1 | 4.50 | 28.50 | 4.50 | 28.50 | | - | |
| | | | | | | | | |
| [| LRFD fatigue | ilable to trucks: | | | | | | |
| | | Fruck fraction: | Compute | | New Duplic | ate | Delete | |
| | | | | | OK | Apply | Cance | el |

Structure Typical Section – Wearing surface

Enter the data shown below.

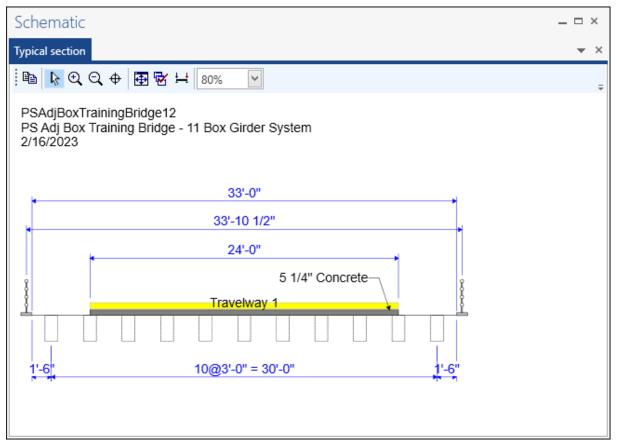
| A Structure Typical Section | - | | \times |
|--|------|-------|----------|
| Distance from left edge of deck to Distance from right edge of deck to superstructure definition ref. line superstructure definition ref. line | | | |
| Deck | | | |
| thickness i Hererence Line | | | |
| Left overhang | | | |
| Deck Deck (cont'd) Parapet Median Railing Generic Sidewalk Lane position Striped lanes Wearing surface | | | |
| Wearing surface material: Concrete | | | |
| 5.25" min concrete wearing surface Description: | | | |
| Wearing surface thickness: 5.2500 in International Interna | | | |
| Wearing surface density: 150.000 pcf | | | |
| Load case: Wearing Surface V Copy from library | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| OK A | pply | Cance | el |
| | | | |

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).

| Bridge Workspace - PSAdjBoxTra | iningBridge12 | ANALYSIS | REPORTS | ? | – 🗆 × |
|--|------------------|-------------|------------|------------------|-----------|
| BRIDGE WORKSPACE WORKSPACE | TOOLS VIEW | DESIGN/RATE | REPORTING | | ^ |
| A Check Out Check In Validate | Close Export Re | Open Nev | Copy Paste | Duplicate Delete | Schematic |
| Bridge | | | Manage | | |
| Workspace | # × | Schematic | ųх | Report | а× |
| Bridge Components | | | | 1 | |
| A FSAdj8o.TrainingBridge12 B | ıs | | | | |
| 🛲 Framing Plan Detail | | Analysis | | | ₽ × |
| Bracing Deterioration BSC Bracing Spec Check Sel Structure Typical Section | | | | | |
| 🚟 🚟 Superstructure Los | Open | | | | |
| 📁 Concrete Stress Lir 📈 | Analyze | | | | |
| 🖶 🧭 Shear Reinforceme | View Summary R | · · · · · | | | |
| 🖻 📂 📂 MEMBERS | View Detailed Re | port | | | |
| BRIDGE ALTERNATIVES | Schematic | | | | |
| | General Preferen | | | | |
| | Close Bridge Wo | rkspace | | | |



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.

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.

| A Stress Limit Sets - | Concrete | | | | | | | _ | | × |
|---|---------------|----------------|--------------|---|-----------|-----|-------|---|-------|---|
| Name: | 6 ksi Stress | Limit | | | | | | | | |
| Description: | | | | | | | | | | |
| Corrosion condition: | Moderate | | ~ | | | | | | | |
| Final allowable te | ension stress | limit coef. (U | 6) override: | | | | | | | |
| Concrete material: | 6 ksi Beam (| Concrete | ~ | | | | | | | |
| [| Compute | | | | | | | | | |
| | | LFD | | | LRFD | | | | | |
| Initial allowable comp | pression: | 3 | ksi | : | 3.25 | ksi | | | | |
| Initial allowable tension | on: | 0.2 | ksi | | 0.2 | ksi | | | | |
| Final allowable comp | ression: | 3.6 | ksi | | 3.6 | ksi | | | | |
| Final allowable tensio | n: | 0.4654031 | ksi | | 0.4654031 | ksi | | | | |
| Final allowable DL co | mpression: | 2.4 | ksi | | 2.7 | ksi | | | | |
| Final allowable slab co | ompression: | | ksi | | | ksi | | | | |
| Final allowable comp (LL+1/2(Pe+DL)) | ression: | 2.4 | ksi | | 2.4 | ksi | | | | |
| | | | | | C | Ж | Apply | | Cance | 2 |

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

Prestress Properties

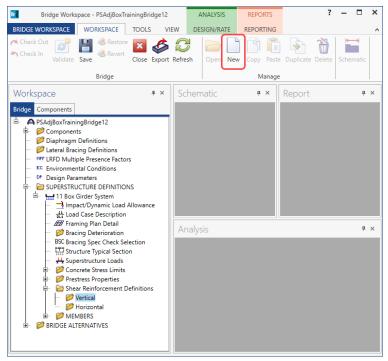
Double click on the **Prestress Properties** node in the **Bridge Workspace** tree to open the **Prestress Properties** window. Define the prestress properties as shown below. Since the **AASHTO Approximate** method is used to compute the losses, only the information on the **General P/S data** tab is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

| A Prestress Properties | _ | | × |
|--|----------------------------|-------|----|
| Name: 1/2" LR AASHTO Loss | | | |
| General P/S data Loss data - lump sum Loss data - PCI | | | |
| General P/S data Loss data - lump sum Loss data - PCI P/S strand material: 1/2" (7W-270) LR Image: Understanding Loss method: AASHTO Approximate P/S transfer stress ratio: 0.750 P/S strand material: 1/2" (7W-270) LR Image: Understanding P/S transfer stress ratio: 0.750 Loss method: AASHTO Approximate Image: Understanding P/S transfer stress ratio: Image: Understanding Loss data - AASHTO Final age: 182500.00 Image: Understanding 182500.00 Loss data - AASHTO Image: Understanding Image: Understanding 182500.00 Image: 0.0 % Image: Understanding 182500.00 |] Hours Days Days | | |
| ОК | Apply | Cance | 21 |

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

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**).

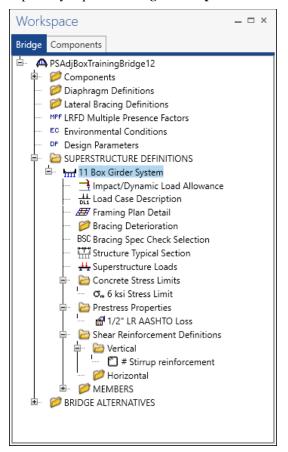


The I shape shown is for illustrative purposes only, it is not meant to display the actual beam shape. Enter the data as shown below.

| A Shear Reinforcement Definition - Vert | ical | | - | | × |
|---|----------------------|--------------|-----|-------|------|
| Name: # Stirrup reinforcement | | | | | |
| |] | | | | |
| | Material: | Grade 60 | | > | |
| | Bar size: | 4 🗸 | | | |
| | Number of legs: | 2.00 | | | |
| | Inclination (alpha): | 90.0 Degrees | | | |
| Vertical Shear Reinforcemer | t | | | | |
| hemoremen | nt | | | | |
| | | | | | |
| | | ОК Ар | ply | Cance | el l |

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

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.

| 🗛 Member | | | | | | | | | - | | × |
|----------------|----------|-----------|----------------|-------------|-------------|--------|----|-------|---|-------|----|
| Member name: | G1 | | | Link with | h: None | \sim | | | | | |
| Description: | | | | | | | | | | | |
| | Existing | Currer | t Member alter | mative name | Description | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | v |
| Number of span | IS: 2 🗘 | Spa no | | | | | | | | | |
| | | > 1 | 45.427 | - | | | | | | | |
| | | 2 | 45.427 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | - | | | | | | | |
| | | | | | | | ОК | Apply | | Cance | el |
| | | | | | | | | | | | |

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.

| A New Member Alternative | × |
|-------------------------------------|----------------|
| Material type: | Girder type: |
| Post tensioned concrete | PS Precast Box |
| Prestressed (pretensioned) concrete | PS Precast I |
| Reinforced concrete | PS Precast Tee |
| Steel | PS Precast U |
| Timber | |
| | |
| | OK Cancel |

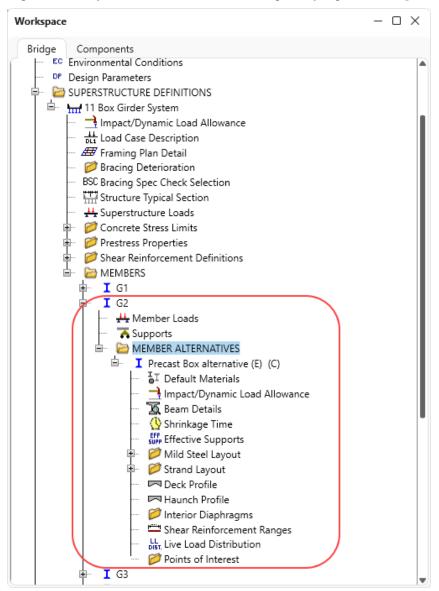
Click **OK** to close the window and create a new member alternative.

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.

| Aember alternative Precast Box alternative Description Spes Factors Engine Import Control options Description: | | | | | | | | | | |
|--|---------------|------------|--------------|---------|--------|----------------------|------------------------|------|--|--|
| Description: Girder type: PS Precast Box Modeling type: PS Precast Box Modeling type: Multi Girder System Default units: US Customary Corss-section based Self load Load case: Engine Assigned Lifk Additional self load: Skip/ft Additional self load: Crack control parameter (Z) Exposure factor Use creep | ember alterna | tive: Pre | ast Box alte | rnative | | | | | | |
| Girder type: PS Precast Box Modeling type: Multi Girder System Default units: US Customary V Girder property input method Schedule based Cross-section based Self load Load case: Engine Assigned Additional self load: % Crack control parameter (Z) Exposure factor V Use creep | Description | Specs | Factors | Engine | Import | Control options | | | | |
| Girder property input method Schedule based Cross-section based Self load Load case: Engine Assigned Additional self load: % Crack control parameter (Z) Exposure factor | Description: | | | | | Material type: | Prestressed (Pretensio | ned) | | |
| Girder property input method Image: Schedule based Cross-section based Self load Load case: Engine Assigned Image: Mail Construction Additional self load: % Crack control parameter (Z) Exposure factor Image: Mail Construction Image: Mail Constrest Constrest Constrest Construction | | | | | | Girder type: | PS Precast Box | | | |
| Girder property input method Schedule based Cross-section based Default rating method: Load case: Engine Assigned LFR Crack control parameter (Z) Exposure factor Use creep | | | | | | Modeling type: | Multi Girder System | | | |
| Girder property input method Scross-section based Load case: Engine Assigned LFR Crack control parameter (Z) Exposure factor Use creep | | | | | | Default units: | US Customary | ~ | | |
| Load case: Engine Assigned Additional self load: kip/ft Additional self load: % | Schedu | le based | | | | | | | | |
| Additional self load: kip/ft Additional self load: % Crack control parameter (Z) Exposure factor | Self load | | | | | Default rating metho | od: | | | |
| Additional self load: % | Load case: | | Engine Ass | igned | ~ | LFR | ~ | | | |
| Crack control parameter (Z) Exposure factor | Additional | self load: | | kip/ft | | | | | | |
| ✓ Use creep | Additional | self load: | | % | | | | | | |
| | | | | kip/in | | | Use creep | | | |

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

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



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.

| бра | an detail | Continuous support d | letail Stress limit ranges | Slab interface Con | tinuity dia | phragm | | |
|-----------------|----------------|----------------------|----------------------------|-----------------------|------------------|-------------------|-----------|---|
| | C | | Girder | Prestress | | Beam p | rojection | |
| | Span number | Beam shape | material | properties | Left end (in) | Right end (in) | | |
| 1 Interior Beam | | Interior Beam 🔹 | 6 ksi Beam Concrete 🔻 | 1/2" LR AASHTO Loss 🔻 | 5.600 | 0.0000 | 7.0000 | - |
| | 2 | Interior Beam 🔹 | 6 ksi Beam Concrete 👻 | 1/2" LR AASHTO Loss * | 5.600 | 7.0000 | 0.0000 | |
| | | | | | | | | |
| | | | | | | | | |

Beam Details - Continuous support detail

Define the continuous support detail as shown below.

| Beam | n Details | | | | | | | _ | | × |
|--------------|-------------------|---------------|---|---------------------|----------------|----------------|--------|-------|-------|----|
| Span | detail | Continuous su | pport detail | Stress limit ranges | Slab interface | Continuity dia | phragm | | | |
| CL c on L | of Bearing ' | | CL of Bearing CL of Bearing on Right | | | | | | | |
| | Support number | | Support distance on right, SR (in) | | | | | | | |
| ÷. | 2 | 7.5000 | 7.5000 | | | | | | - | |
| | | | | | | | | | v | |
| | | | | | | | ОК | Apply | Cance | el |

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.

| pan | deta | il | Continuous support detai | Stress lim | it ranges | Slab interface | Continuity diaphragm | | |
|-----|------|------------|--------------------------|---------------------------|----------------|-------------------------|----------------------|--|--|
| | | an nber | Name | Start distance (ft) | Length (ft) | End distance (ft) | | | |
| > | 1 | \sim | 6 ksi Stress Limit | / 0 | 45.385333 | 45.385333 | | | |
| | 2 | \sim | 6 ksi Stress Limit | / 0 | 45.385333 | 45.385333 | | | |
| | | | | | | | | | |
| | | | | | | | | | |

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

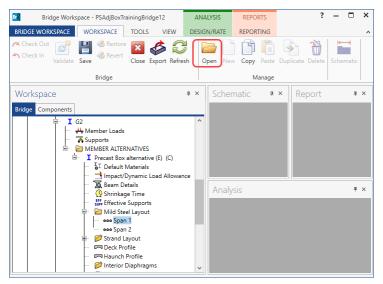
Beam Details – Continuity diaphragm

| бра | an | deta | ail | Continuou | s su | pport detail | Stress In | mit ranges | Slab interf | ice Conti | nuity diaphra | igm _ | | | |
|-----|----|------------|-----|-----------|------|------------------|-----------|------------|-------------|------------------|---------------|--------|--------|------------|---|
| | | | | | _ | Left sup | oport | | | Right su | pport | | | | |
| | | Spa num | | Materia | al I | Distance (in) | Bar count | Bar size | Material | Distance (in) | Bar count | Bar si | ze | | |
| Þ | 1 | 1 | Ŧ | | Ŧ | | | - | Grade 60 | 4.0000 | 10 | 5 | - | | - |
| | 2 | 2 | * | Grade 60 | Ŧ | 4.0000 | 10 | 5 - | Grade 60 | | | | * | | |
| | | | | | | | | | | | | | | | |
| | | | | | | t supports i | | | | | Nev | | Duplic | Delete | ~ |

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

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.

| | | | | | Co | nsider mild | l steel in | initial allowable tens | sile stress li | nit | | | | | |
|---------|---------|---------------------------------|--------------|----|---------|------------------------|-----------------------|------------------------|---------------------------|----------------|-------------------------|--------------------------------|------------------------------|--|--|
| • w` | \] | Vertical | Distance | | | | | | | | | | | | |
| | Row no. | distance from bottom (in) | Bar count | Ba | ar 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 | \sim | 10 | 10 | Grade 60 🛛 🗸 | 0 | 45.38533 | 45.38533 | | | | |
| | 2 | 19.5 | 4 | 5 | \sim | 10 | 10 | Grade 60 🗸 🗸 | 0 | 45.38533 | 45.38533 | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

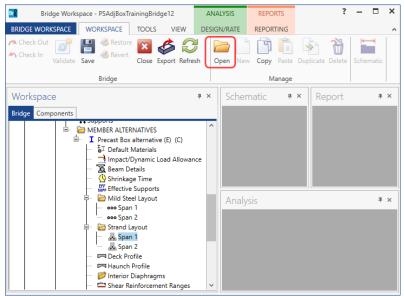
|) | | | Distance | | Co | nsider mild | d steel ir | initial allowable te | nsile stress lii | mit | | | | | |
|------------|---------|---|--------------|-----|--------|------------------------|-----------------------|----------------------|---------------------------|----------------|-------------------------|--------------------------------|------------------------------|------|-------|
| | 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 | \sim | 10 | 10 | Grade 60 🗸 🗸 | 0 | 45.38533 | 45.38533 | | | | |
| | 2 | 19.5 | 4 | 5 | \sim | 10 | 10 | Grade 60 🔍 🗸 | 0 | 45.38533 | 45.38533 | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | New | Duplicate | e De | elete |
| | | | | | | | | | | | | | | | |

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.



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 | – 🗆 X |
| Description type | E E Q Q ⊕ E S ∺ 160% ∨ |
| ○ P and CGS only | Notes: Strand positions generated by the REVISED method. |
| Strand configuration type | Please refer to Help for a description of this method. |
| Straight/Debonded | • • • • |
| | |
| Harped and straight debonded | |
| Mid span | |
| | |
| | $\widehat{\times} \bullet \bullet \times \times \bullet \bullet \bullet \bullet \times \times \bullet \bullet \widehat{\times}$ |
| | $\times \bullet \bullet \times \times \times \bullet \bullet \times \times \bullet \bullet \times$ |
| | Number of strands = 16 |
| Debondina | Number of debonded strands (Total/Here/Other) = 0/0/0 CG of strands (measured from bottom of section) = 4.50 in |
| Left Section location (in) Measured and debonded from | Legend: |
| A | imes No strand at this position at the current section location. imes 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 stand is debonded from the end of the outern to exist a content 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. |
| New Modify Delete | The harped position of a harped strand. |
| Right Section location (in) Measured and debonded from | The mid-span position of a harped strand. The mid-span position of one strand and the harped position of another strand. |
| | Mild steel. |
| | |
| New Modify Delete | |
| OK Apply Cancel | |
| on reprise Cancel | |

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.

| Vertica Span: | Horizor | ce | | Spacing | • | | | | | | | | > |
|------------------|--|----------|--------------------|---------|--------|--------------|---------------------------|------------------|-----------------------|----------------|---------------------------------------|--------|---|
| Vertica | Horizor | ntal | • | Spacing | • | | | | | | | | |
| Vertica | Horizor | ntal | • | Spacing | | | | | | | | | |
| Vertica | Horizor | ntal | • | Spacing | | | | | | | | | |
| Span: | _ | | | | | | | | | | | | |
| Span: | _ | | | | ' | | | | | | | | |
| | 1 ~ | | | | | | | | | | | | |
| > # | | | Сору | span to | o | | | | | | | | |
| > # | | News | _ | | | Extends | Start distance | Number of | Spacing | Length | End | | |
| > # | | Name | e | | | into deck | (ft) | spaces | (in) | (ft) | distance (ft) | | |
| | # Stirrup reinf | forceme | ent | | ~ | | 0 | 1 | 0 | 0 | 0 | | |
| # | # Stirrup reinf | forceme | ent | | ~ | | 0 | 45 | 12 | 45 | 45 | | |
| | | | | | | | | | | | | | |
| Stir | rrup wizard | Sti | tirrup | design | tool | View | calcs | | New | Dupl | icate | Delete | |
| Stir | rrup wizard | Sti | tirrup | design | tool | View | calcs | | New | Dupl | icate | Delete | |
| Stir | rrup wizard | Sti | tirrup | design | tool | View | calcs | | New | | icate Apply | Delete | |
| Stir | rrup wizard | Sti | tirrup | design | tool | View | calcs | (| | | | | |
| | | | | | tool | View | calcs | (| | | | | |
| | rrup wizard ear Reinforcer | | | | tool | View | calcs | (| | | | Cance | |
| | | | | | tool | View | calcs | | | | | Cance | |
| PS She | ear Reinforcer | ment Ra | anges | 5 | | View | calcs | | | | | Cance | |
| | ar Reinforcer | ment Ra | anges | | | View | calcs | | | | | Cance | 4 |
| PS She | ear Reinforcer | ment Rai | anges | 5 | | View | calcs | | | | | Cance | 4 |
| PS She | ear Reinforcer | ment Rai | Binges | s | | View | calcs | | | | | Cance | |
| PS She | ear Reinforcer | ment Rai | Binges | 5 | | | | | | | Apply | Cance | 4 |
| PS She | ear Reinforcer | ment Rai | anges | s | | Extends | Start distance | Number of spares | OK | Length | Apply — End distance | Cance | , |
| PS She | ear Reinforcer Start Distance Horizor 2 ~ | ment Rai | anges Copy e | s |)) | Extends | Start distance (ft) | spaces | OK Spacing (in) | Length (ft) | Apply — End distance (ft) | Cance | 4 |
| PS She | ear Reinforcer | ment Rai | Copy ee | s | | Extends | Start distance | | OK | Length | Apply — End distance | Cance | 4 |

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

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.

| Br | Bridge Worksp | ace - PSAdjBoxTraining | Bridge12 | ANALYSIS | REPORTS | ? | - | × |
|------------------------|---------------------------|------------------------|----------|-------------|-----------|---|---|---|
| BRIDGE W | ORKSPACE | WORKSPACE TOO | LS VIEW | DESIGN/RATE | REPORTING | | | ^ |
| * | - | | ∽ > | < 📙 | | | | |
| Analysis A Settings | nalyze Analysis Events | | | | | | | |
| A | nalysis | | Results | | | | | |

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

| Templates | Description | Analysis | Owner | Public / Private | |
|-------------------------|-------------------------|----------|-------|------------------|--|
| HL 93 Design Review | HL 93 Design Review | LRFD | | Public | |
| HS 20 LFD Rating | HS 20 LFD Rating | LFR | | Public | |
| LRFR Design Load Rating | LRFR Design Load Rating | LRFR | | Public | |
| LRFR Legal Load Rating | LRFR Legal Load Rating | LRFR | | Public | |
| | | | | | |
| | | | | | |

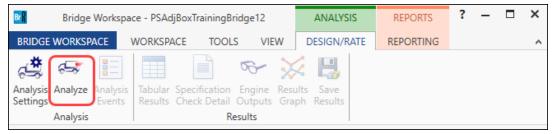
| O Design review 💿 Rating | Rating method: LRFR 💌 |
|--|--|
| halysis type: Line Girder v ne / Impact loading type: As Requested v Vehicles Output Engine Description | Apply preference setting: None |
| Traffic direction: Both directions | Refresh Temporary vehicles Advanced Vehicle summary |
| ➡-Vehicles ➡-Standard ↓-EV2 ↓-EV3 ↓-H 15-44 ↓-H 20-44 ↓-H-93 (US) ↓-HS 15-44 ↓-HS 20-44 ↓-Lane-Type Legal Load ↓-LRFD Fatigue Truck (US) ↓-NRL ↓-SU4 ↓-SU4 ↓-SU5 ↓-SU6 ↓-SU7 ↓-Type 3. ↓-Type 3.S2 ➡-Agency ↓-LRFD Fatigue Truck (US)~1 ↓-User defined ↓-Temporary | Add to Ad |

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.



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.

| Bridge Workspa | ce - PSAdjBoxTrainingBridge12 | ANALYSIS | REPORTS | ? | - | × |
|--|---|-------------|-----------|---|---|---|
| BRIDGE WORKSPACE | WORKSPACE TOOLS VIEW | DESIGN/RATE | REPORTING | | | ^ |
| Analysis Analyze Analysis Settings Analysis Analysis | Tabular Specification Engine Results Check Detail Outputs Gra Results | | | | | |

The window shown below will open.

| Analysis Res | ults - Precast Box alternat | ive | | | | | | | | - 🗆 | × |
|--|--|----------------------|--|-------------------------------|-------------------------|---------------------------------|---|---|--|--|---|
| Print Print | | | | | | | | | | | |
| ort type: | ⊂ La | ne/Impact loading | a type | Displa | y Format | | | | | | |
| ing Results S | | As requested | | ad Singl | e rating level pe | r row | \sim | | | | |
| | | | U beta | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | 1 | Leveller | | | | |
| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Location (ft) | Location Span-(%) | Limit State | Impact | Lane | |
| Live Load HL-93 (US) | | Rating Method | | | Rating Factor 0.102 | | | Limit State STRENGTH-I Concrete Flexure | Impact As Requested | | |
| | Туре | | Level | (Ton) | | (ft) | Span-(%) | | | | |
| HL-93 (US) | Type Truck + Lane | LRFR | Level Inventory | (Ton) 3.66 | 0.102 | (ft) 45.43 | Span-(%) 1 - (100.0) | STRENGTH-I Concrete Flexure | As Requested | As Requested | • |
| HL-93 (US) HL-93 (US) | Type Truck + Lane Truck + Lane | LRFR LRFR | Level Inventory Operating | (Ton) 3.66 4.74 | 0.102 | (ft) 45.43 45.43 | Span-(%) 1 - (100.0) 1 - (100.0) | STRENGTH-I Concrete Flexure STRENGTH-I Concrete Flexure | As Requested As Requested | As Requested As Requested | |
| HL-93 (US) HL-93 (US) HL-93 (US) | Type Truck + Lane Truck + Lane 90%(Truck Pair + Lane) | LRFR LRFR LRFR | Level Inventory Operating Inventory | (Ton) 3.66 4.74 4.40 | 0.102 0.132 0.122 | (ft) 45.43 45.43 45.43 | Span-(%) 1 - (100.0) 1 - (100.0) 1 - (100.0) | STRENGTH-I Concrete Flexure STRENGTH-I Concrete Flexure STRENGTH-I Concrete Flexure | As Requested As Requested As Requested | As Requested As Requested As Requested | |

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.

| Bridge Workspa | ce - PSAdjBoxTrainingBridge12 | ANALYSIS | REPORTS | ? | - | × |
|--|---|-------------|-----------|---|---|---|
| BRIDGE WORKSPACE | WORKSPACE TOOLS VIEW | DESIGN/RATE | REPORTING | | | ^ |
| Analysis Settings Analysis Analysis Analysis | Tabular Specification Engine Results Check Detail Outputs Gra Results | | | | | |

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

| Templates | Description | Analysis | Owner | Public / Private | |
|-------------------------|-------------------------|----------|-------|------------------|--|
| HL 93 Design Review | HL 93 Design Review | LRFD | | Public | |
| HS 20 LFD Rating | HS 20 LFD Rating | LFR | | Public | |
| LRFR Design Load Rating | LRFR Design Load Rating | LRFR | | Public | |
| LRFR Legal Load Rating | LRFR Legal Load Rating | LRFR | | Public | |
| | | | | | |
| | | | | | |

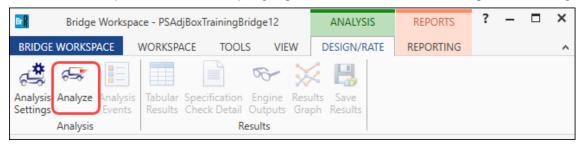
| Design review Rating Rating Alysis type: Line Girder re / Impact loading type: As Requested | Design method: |
|--|-------------------------------------|
| | |
| ne / Impact loading type: As Requested | |
| | Apply preference setting: None |
| Vehicles Output Engine Description | |
| Traffic direction: Both directions | Refresh Temporary vehicles Advanced |
| Vehicle selection | Vehicle summary |
| | Add to |

The Analysis Settings window will be updated as shown below.

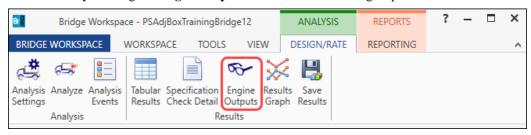
Click **OK** to apply the data and close the window.

Engine Outputs

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



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.

| A PSAdjBoxTrainingBridge12 | _ | × |
|---|---|---|
| PSAdjBoxTrainingBridge12 Image: Precast Box alternative Image: Precast Bo | | |

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

