AASHTOWare BrDR 7.5.0

Prestress Tutorial 13 Two Simple Span Prestressed I Beam with a Multi-Column Pier on Drilled Shafts Example

## **BrDR Training**

This example details the data input of a prestressed concrete I beam bridge and performing an analysis. It is a bridge from the Mississippi DOT inventory. The bridge is comprised of 8 total spans. However, only spans 3 and 4 are entered.

## **Topics Covered**

- Comments and Assumptions
- Data Entry for a New Bridge
- Bridge Components
- Superstructure Definitions
- Describing a Member
- Bridge Alternatives
- Pier Data Entry
- Analysis and Results

### Comments and Assumptions

- Due to rounding on the design plans, the BrDR span lengths are slightly off from the design drawings. Lengths are within 1/16".
- Fence Load = 0.015 k/ft
- Due to the varying overhang, use 2/3 point for constant overhangs in the program.
  - Span 3 Left Overhang = 2.7816'
  - Span 3 Right Overhang = 3.6133'
  - Span 4 Left Overhang = 3.0566'
  - Span 4 Right Overhang = 3.6133'
- Traffic data and design speed for LRFR analysis
  - Assumed ADTT = 469 per NBI
- Barriers are equally distributed to all beams.
- Assume 5000 psi for the 28-day compressive concrete strength of the Type III PS Beam for the 60-foot span.
- The plans show a discrepancy for strand type for the 135 ft beam details. The section indicates <sup>1</sup>/<sub>2</sub>" diameter 270 K-LR strands, but the table and notes show 0.6" diameter 270 K-LR strands. Therefore, 0.6" diameter 270 K-LR strands will be used in the model.
- SIP form weight = 20 psf. The presence of SIP forms was verified using Google Maps.
  - Span 3, Exterior Beams = 0.016 k/ft

- Span 3, Interior Beams = 0.032 k/ft
- Span 4, Exterior Beams = 0.056 k/ft
- Span 3, Interior Beams = 0.113 k/ft
- 0.25" Integral Wearing Surface
- HL-93 and HS 20-44 will be the vehicle used for ratings.
- District, County and Owner information is not populated.
- For the Span 3 exterior beams and Span 4 G6, a LRFD effective width = Overhang + S/2 is used, even though the overhang is greater than S/2 (C4.6.2.6.1).
- Piers 3 and 5 are not entered into the program since the adjacent spans are not entered for this example.
- Due to the limitations of the program, Pier 4 cannot be analyzed with the current version. The issue results due to the fact of splayed framing plans and the overhangs varying from the back span to the ahead span.
- Soil density = 0.120 ksf.
- Finished ground line elevation = 376.5 ft.
- The column unbraced length is the average of all the columns.

## Data Entry for a New Bridge

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

andge ID: PS13     NBI structure ID (8): PS13     Description Description (cont'd)   Alternatives   Global reference point Traffic   Custom agency fields   Name: P513   Vear built:   2016   Description:   Location: 0.1 MI W US 8   Location:   0.1 MI W US 8   Location:   0.1 MI W US 8   And span 4 entered   Description:   Description:   Location:   Default units:   US Customary   Bindge association   Bridge association   OK   Apply	PS13									-		>
Description       Description (cont'd)       Alternatives       Global reference point       Traffic       Custom agency fields         Name:       PS13       Year built:       2016         Description:       ONLY Span 3 and Span 4 entered	idge ID: PS13		NBI struct	ure ID (8): PS	313		Temp	ilate e comple	tely defined	✓ Supe Culve ✓ Subs	rstructures erts tructures	
Name:       P513       Year built:       2016         Description:       ONLY Span 3 and Span 4 entered	Description Des	scription (cont'd)	Alternative	Global re	ference point	Traffic	Custom ag	ency field	ts			
Description:       ONLY Span 3 and Span 4 entered         Location:       0.1 MI W US 8         Facility carried (7):       1-20 Ramp         Route number:       00020         Feat. intersected (6):       Marquette Road, RR         Default units:       US Customary         W       W         Bridge association       W BrR         Bridge association       M BrR         OK       Apply	Name:	PS13					Year b	uilt:	2016			
Location: 0.1 MI W US 8 Length: 677.50 ft Facility carried (7): 1-20 Ramp Route number: 00020 Feat. intersected (6): Marquette Road, RR Default units: US Customary ¥ Bridge association Ø BrR Ø BrD BrM OK Apply Ca	Description:	ONLY Span 3 a	nd Span 4 ent	ered						_		
Facility carried (7):       I-20 Ramp       Route number:       00020         Feat. intersected (6):       Marquette Road, RR       Mi. post:       Image: Content of the second s	Location:	0.1 MI W US 8					Length	n:	677.50	ft		
Feat. intersected (6):       Marquette Road, RR       Mi. post:         Default units:       US Customary       V         Bridge association       V       BrM         OK       Apply       Ca	Facility carried (7):	I-20 Ramp					Route	number:	00020			
Default units: US Customary v Bridge association V BrR V BrD BrM	Feat. intersected (6)	): Marquette Roa	d, RR				Mi. po	st:				
Bridge association BrR V BrD BrM	Default units:	US Customary	~									
Bridge association BrR ØBrD BrM OK Apply Ca												
OK Apply Ca												
	Bridge associ	iation	BrR 🗹 BrD	BrM								



## Bridge Components

To enter the materials to be used by members of the bridge, open the **Components** tab, and click on the button to expand the tree for **Materials**. The tree with the expanded **Materials** branch is shown below.



To add a new concrete material, in the **Components** tab of the Bridge Workspace, click on **Materials**, **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.



Add the concrete material by selecting from the concrete materials library by clicking the **Copy from Library** button. The following window opens:

Class A Class A	A cement concrete	Standard							clusticity	Tutto	of rupture	orrupture	
Class A (US) Class		Stanuaru	SI / Metric	28.00	0.0000108000	2400.00	2320.00	25426.08	27730.36	0.200	3.33	3.33	
Class / (05) Class /	A cement concrete	Standard	US Customary	4.000	0.0000060000	0.150	0.145	3644.15	3986.55	0.200	0.48	0.48	
Class B Class B	B cement concrete	Standard	SI / Metric	17.00	0.0000108000	2400.00	2320.00	19811.84	23520.23	0.200	2.60	2.60	
Class B (US) Class B	B cement concrete	Standard	US Customary	2.400	0.0000060000	0.150	0.145	2822.75	3368.12	0.200	0.37	0.37	
Class C Class C	C cement concrete	Standard	SI / Metric	28.00	0.0000108000	2400.00	2320.00	25426.08	27730.36	0.200	3.33	3.33	
Class C (US) Class (	C cement concrete	Standard	US Customary	4.000	0.000060000	0.150	0.145	3644.15	3986.55	0.200	0.48	0.48	

Select the **Class A** (**US**) material and click **OK**. The selected material properties are copied to the **Bridge Materials** – **Concrete** window as shown below. Change the name of this material to **Class AA** and click on the **Compute** button.

Name: Class AA Description: Class AA cement concre Compressive strength at 28 days (fc):	4.000006	ksi	
Description: Class AA cement concre Compressive strength at 28 days (f'c):	4.0000006	ksi	
Compressive strength at 28 days (f'c):	4.0000006	ksi	
Initial compressive strength (f'ci):		ksi	
Composition of concrete:	Normal 🗸		
Density (for dead loads):	0.15	kcf	
Density (for modulus of elasticity):	0.145	kcf	
Poisson's ratio:	0.2		
Coefficient of thermal expansion (α):	0.000006	1/F	
Splitting tensile strength (fct):		ksi	
LRFD Maximum aggregate size:		in	
Compute			
Std modulus of elasticity (Ec):	3644.147704	ksi	
LRFD modulus of elasticity (Ec):	3986.548657	ksi	
Std initial modulus of elasticity:		ksi	
LRFD initial modulus of elasticity:		ksi	
Std modulus of rupture:	0.474342	ksi	
LRFD modulus of rupture:	0.48	ksi	
Shear factor:	1		
Copy t	o library Copy f	from library OK Apply Cancel	

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

To add the **6 ksi** and **5 ksi** prestressed concrete material, double click on the **Concrete** folder in the **Components** tree again. Repeat the process of copying the **Class A** (**US**) concrete material from the library. Update the **f**'c and **f**'ci for each of the concrete materials as shown below. After changing these values, click the **Compute** button to compute the material properties.

🗛 Bridge Materials - Concrete			-		×
Name: Class F6					
Description:					
Compressive strength at 28 days (f'c):	6	ksi			
Initial compressive strength (f'ci):	4.9	ksi			
Composition of concrete:	Normal ~				
Density (for dead loads):	0.15	kcf			
Density (for modulus of elasticity):	0.145	kcf			
Poisson's ratio:	0.2				
Coefficient of thermal expansion ( $\alpha$ ):	0.000006	1/F			
Splitting tensile strength (fct):		ksi			
LRFD Maximum aggregate size:		in			
Compute					
Std modulus of elasticity (Ec):	4463.150877	ksi			
LRFD modulus of elasticity (Ec):	4557.295222	ksi			
Std initial modulus of elasticity:	4033.332104	ksi			
LRFD initial modulus of elasticity:	4262.672399	ksi			
Std modulus of rupture:	0.580948	ksi			
LRFD modulus of rupture:	0.587878	ksi			
Shear factor:	1	]			
Сору	to library Copy	from library OK Ap	ply	Cance	el

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



PS13 – 2 Simple Span Prestressed I Beam with a Multi-Column Pier on Drilled Shafts Example

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

Add the **reinforcement material** and **prestress strand** using the same techniques. The windows will look like these shown below.

Name:	Grade 60							
Description: 6	0 ksi reinforcing	steel						
Material proper	ties							
Specified yield s	strength (fy): 6	0.0000087	ksi					
Modulus of elas	sticity (Es): 2	9000.004206	ksi					
Ultimate streng	th (Fu): 9	0.0000131	ksi					
Plain Epoxy Galvan	ized							
	Copy to li	ibrary Co	opy from library.	. ОК	Ap	ply	Cano	el
Bridge Mate	erials - PS Stran	d				_		>
Name:	0.6" (/W-2/0)	LR						
Description:	0.6" (7W-270) Low relaxation	LR n 0.600"/Sever	n Wire/fpu = 27	,				
Name: Description: Strand diamet	0.6" (7W-270) Low relaxation ter:	LR 0.600"/Sever 0.6	n Wire/fpu = 27	,				
Name: Description: Strand diamet Strand area:	0.6" (7W-270) Low relaxation	LR 0.600"/Sever 0.6 0.217	n Wire/fpu = 27 in in^2	,				
Name: Description: Strand diamet Strand area: Strand type:	0.6" (7W-270) Low relaxation	LR 0.600"/Sever 0.6 0.217 Low Relaxa	in Wire/fpu = 27	,				
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi	0.6" (7W-270) Low relaxation ter:	LR 0.600"/Sever 0.6 0.217 Low Relaxa ): 270	in Wire/fpu = 27 in in^2 ition ~	,				
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength	0.6" (7W-270) Low relaxation ter: ile strength (Fu (fy):	LR 0.600"/Sever 0.6 0.217 Low Relaxa ): 270 243	in Wire/fpu = 27 in in^2 ition v ksi ksi					
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el	0.6" (7W-270) Low relaxation ter: le strength (Fu (fy): lasticity (E):	LR 0.600"/Sever 0.6 0.217 Low Relaxa ): 270 243 28500	n Wire/fpu = 27 in in^2 ition ~ ksi ksi ksi					
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el	0.6" (7W-270) Low relaxation ter: lle strength (Fu (fy): lasticity (E): Compu	LR 0.600"/Sever 0.6 0.217 Low Relaxa ): 270 243 28500 ute	n Wire/fpu = 27 in in^2 ition ~ ksi ksi ksi	,				
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el	0.6" (7W-270) Low relaxation ter: ile strength (Fu (fy): lasticity (E): Compu h (Std):	LR 0.600"/Sever 0.6 0.217 Low Relaxa 0: 270 243 28500 ute 30	n Wire/fpu = 27 in in^2 ition v ksi ksi ksi					
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el Transfer lengt	0.6" (7W-270) Low relaxation ter: (le strength (Fu (fy): (asticity (E): Compu h (Std): h (I RED):	LR 0.600"/Sever 0.6 0.217 Low Relaxa ): 270 243 28500 ite 30 36	n Wire/fpu = 27 in in^2 ition ~ ksi ksi ksi in	,				
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el Transfer lengt Inansfer lengt	0.6" (7W-270) Low relaxation ter: ile strength (Fu (fy): lasticity (E): Compu- h (Std): h (LRFD): length:	LR 0.600"/Sever 0.6 0.217 Low Relaxa 270 243 28500 ite 30 36 0.74	in Wire/fpu = 27					
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el Transfer lengt Transfer lengt Unit load per	0.6" (7W-270) Low relaxation ter: (le strength (Fu (fy): (asticity (E): Compu h (Std): h (LRFD): length:	LR 0.600"/Sever 0.6 0.217 Low Relaxa 28500 1te 30 36 0.74 Enovy of Enovy of Enovy of 200 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 243 28500 244 28500 245 265 265 265 265 265 265 265 26	n Wire/fpu = 27	r				
Name: Description: Strand diamet Strand area: Strand type: Ultimate tensi Yield strength Modulus of el Transfer lengt Unit load per	0.6" (7W-270) Low relaxation ter: (le strength (Fu (fy): (asticity (E): Compu h (Std): h (LRFD): length:	LR 0.600"/Sever 0.6 0.217 Low Relaxa 243 28500 1te 30 36 0.74 Epoxy of	n Wire/fpu = 27	,				

🐴 Bridge Mat	terials - PS Strand				-		×
Name:	1/2" (7W-270) L	R					
Description:	Low relaxation 1	I/2"/Seven	Wire/fpu = 270				
Strand diame	eter:	0.5	in				
Strand area:		0.153	in^2				
Strand type:		Low Relax	ation $\checkmark$				
Ultimate tens	sile strength (Fu):	270	ksi				
Yield strengt	h (fy):	243	ksi				
Modulus of e	elasticity (E):	28500	ksi				
	Compute	2					
Transfer leng	th (Std):	25	in				
Transfer leng	th (LRFD):	30	in				
Unit load per	length:	0.52	lb/ft				
		Ероху	coated				
Co	opy to library	Copy fro	om library OK	Ар	ply	Cance	9

#### Beam Shapes

To enter a prestress beam shape to be used in this bridge expand the tree labeled **Beam Shapes** and **Prestress Shapes** as shown below.



Click on the **I Beams** node in the **Components** tree and select **New** from the **Manage** group of the **WORKSPACE** ribbon (or right mouse click on **I Beams** and select **New** or double click on **I Beams** in the **Components** tree). The window shown below will open.



Select the Top flange type as Wide and click the Copy from library... button. Select BT-72 (AASHTO-PCI Bulb-

Tee BT-72) and click OK. The beam properties are copied to the Prestress I Beam window as shown below.

AASHTO TYPE V         ASAHTO TYPE V         Standard         US Customary         63.000         4.2000         8.0000         2.8000         3.000         10.0000         4.0000         False         False         Image: Comparison of the comparison	Name	Description	Library	Units	Depth	Top flange thickness	Top flange width	Bottom flange thickness	Bottom flange width	Top hauch height	Bottom haunch height	Top haunch 2 height	Top haunch 2 width	Deck included	Top flange ext. width	Radius fillet	Top flange radius fillet	Bottom flange radius fillet	Top web radius fillet	Bottom we radius fille	b t
AASHTO TYPE VI       ASHTO TYPE VI       Stander       US cutomay       72000       50000       420000       820000       220000       910000       910000       940000       94000       940e       False	AASHTO TYPE V	AASHTO TYPE V	Standard	US Customary	63.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					Τ
BT-54         AASHTO-PCI Bulb-Tee BT-54         Stander         U Scutomary         54.000         24.000         66.000         26.000         44.500         26.000         Faile	AASHTO TYPE VI	AASHTO TYPE VI	Standard	US Customary	72.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					
BT-53         AASHTO-PCI Buils-Tee ST-6         Stander         US Customary         63000         53000         64000         64000         20000         44500         20000         False	BT-54	AASHTO-PCI Bulb-Tee BT-54	Standard	US Customary	54.0000	3.5000	42.0000	6.0000	26.0000	2.0000	4.5000	2.0000	2.0000	False		False					
BT-72         AASHTO-PCI Buils-Tee BT-72         Standerd         US Customary         72000         3.5000         4.2000         6.0000         2.26000         3.0000         4.5000         2.0000         False         False         False           1-28.66         1-28.66         Standerd         US Customary         6.0000         4.2000         8.0000         3.0000         1.0000         4.0000         False	BT-63	AASHTO-PCI Bulb-Tee BT-63	Standard	US Customary	63.0000	3.5000	42.0000	6.0000	26.0000	2.0000	4.5000	2.0000	2.0000	False		False					
1-28-66         I-28-66         Standard         US customary         66.000         6.0000         4.2000         8.2000         3.000         1.0000         4.0000         False         Fa	BT-72	AASHTO-PCI Bulb-Tee BT-72	Standard	US Customary	72.0000	3.5000	42.0000	6.0000	26.0000	2.0000	4.5000	2.0000	2.0000	False		False					
1-28/78       I-28/78       Standard       US Customary       78.000       5.0000       4.0000       28.000       3.0000       10.0000       4.0000       False       False <t< td=""><td>I-28x66</td><td>I-28x66</td><td>Standard</td><td>US Customary</td><td>66.0000</td><td>5.0000</td><td>42.0000</td><td>8.0000</td><td>28.0000</td><td>3.0000</td><td>10.0000</td><td>4.0000</td><td>4.0000</td><td>False</td><td></td><td>False</td><td></td><td></td><td></td><td></td><td></td></t<>	I-28x66	I-28x66	Standard	US Customary	66.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					
I-28x84         I-28x84         I-28x84         IVS Customary         94.0000         5.0000         42.0000         8.0000         28.0000         3.0000         10.0000         4.0000         False         False         False           1-28x94         I-28x94         Standard         US Customary         90.000         5.0000         4.0000         3.0000         10.0000         4.0000         False         Fa	I-28x78	I-28x78	Standard	US Customary	78.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					
1-28.90 128.09 Standard US Customary 20000 5.0000 42.0000 28.0000 30.000 10.0000 4.0000 4.0000 Faise Faise Faise	I-28x84	I-28x84	Standard	US Customary	84.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					
	I-28x90	I-28x90	Standard	US Customary	90.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					
1-28x96 I-28x96 Standard US Customary 96.0000 5.0000 42.0000 8.0000 28.0000 3.0000 10.0000 4.0000 4.0000 False False	I-28x96	I-28x96	Standard	US Customary	96.0000	5.0000	42.0000	8.0000	28.0000	3.0000	10.0000	4.0000	4.0000	False		False					



Navigate to the Strand grid tab and enter the following prestress strand locations.

lame:	BT-72					Top flange type
escription:	AASHTO-PCI Bulb-Tee BT	-72				Narrow Wide
Dimensio	ns Properties Mild st	eel Strand	t grid			
Į		Row no.	No. of strands	Vertical distance from bottom (in)	Horizontal spacing (in)	
		F 1	12	2.5000	2.0000	-A.
		2	12	4.5000	2.0000	
THE	Distance	3	4	6.5000	2.0000	
Ro	w 1 ] *	4	2	8.5000	2.0000	
		5	2	63.0000	2.0000	
		6	2	65.0000	2.0000	
		7	2	67.0000	2.0000	
		8	2	69.0000	2.0000	
					New	uplicate Delete

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

Enter the **AASHTO Type IV** beam (**Narrow** top flange type) using the same technique. The windows are 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 parapet, select **Parapet** and click on **New** from the **Manage** button on the **WORKSPACE** ribbon (or double click on **Parapet** in the **Components** tree).



Enter the parapet details as shown below.

A Bridge A	opurtenances - Parapet			- 0	×
Name:	2'-8" Railing w/ Fence				
Description:					
	All dimensions are in inches				
F	6.0000 Additional load 2.0000 Reference Line Back Front	<ul> <li>d: 0.015 ki</li> <li>d) 0</li> <lid) 0<="" li=""> <li>d) 0</li> <lid) 0<="" li=""> <lid>0 <lid) 0<="" li=""> <lid>0 <li>d) 0</li> <li>d) 0</li> <lid>0 <li>d) 0</li> <li>d) 0</li> <lid>0 <li>d) 0</li> <lid>0 <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <lid>0 <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <lid>0 <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <lid>0 <li>d) 0</li> <li>d) 0</li> <li>d) 0</li> <lid>0 <lid>0 <li>d) 0</li> <lid>0 <li>d) 0</li> <lid>0 <li>d) 0</li> <lid>0 <lid>0 <li>d) 0</li> <lid>0 <li>d) 0</li> <lid>0 <lid>0 <lid>0 <lid>0 <lid>0 <lid>0 <lid>0 <li>d) 0</li> <lid>0 <lid>0 <li>d) 0</li> <lid>0 <lid>0 <lid>0 <lid>0 <li>d) 0</li> <lid>0 <li>d) 0</li> <lid>0 <lid>0&lt;</lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid></lid)></lid></lid)></lid)></ul>	Roadway Surface	Parapet unit load: 0.1500 kcf Calculated properties Net centroid (from reference line): 4.840 in Total load: 0.320 kip/ft	
		Co	py from library	OK Apply Cance	1

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

🐴 Bridge A	ppurtenances - Parapet			- 0	
Name:	2'-8" Railing				
Description	e -				
	All dimensions are in inches				
I	Additional lo 2.0000 6.0000 Reference	000 kip	/ft Boadway Surface	Parapet unit load: 0.1500 kcf Calculated properties Net centroid (from reference line):	
	Back Front	19.0000 10.0000 3.0000		5.078 in Total load: 0.305 kip/ft	

Create a second barrier without the additional load which accounts for the fence as shown below.



#### LRFD Substructure Design Settings

To define the substructure design settings, select LRFD Substructure Design Settings and click on New from the Manage button on the WORKSPACE ribbon (or right click on LRFD Substructure Design Settings in the Components tree and select New from the drop down menu).

Bridge Workspace - P	S13		ANALYSIS	REPOR	TS	?	- 0	×
BRIDGE WORKSPACE WORKSPACE	TOOLS	VIEW	DESIGN/RATE	REPORTI	NG			^
Check Dut Check In Validate Save Bridge	Close	🞸 💭 Export Refre	esh Open Ne	w Copy Ma	Paste Duplicate Di	elete	Schemati	c
Workspace	₹×	Schem	atic	₹×	Report		+	×
Components	tings	Expand Bra	usch					
in Waterias	Ŷ	Collapse Br	ranch				4	×
		New Analyze						
		View Sumn View Detail	nary Report led Report					
	(i) [2]	General Pre Close Bridg	eferences ge Workspace					

Click the **Copy from library button...** Select **Final Design Setting (US)** and click **OK.** The selected design settings are copied to the **LRFD Substructure Design Settings** window as shown below.

	Name	Description	Library	Units	Preliminary	Final
Final [	Design Setting (SI)	Final Design Setting (SI)	Standard	SI / Metric	False	True
Final [	Design Setting (US)	Final Design Setting (US)	Standard	US Customary	False	True
Prelim	inary Design Setting (SI)	Preliminary Design Setting (SI)	Standard	SI / Metric	True	False
Prelim	inary Design Setting (US)	Preliminary Design Setting (US)	Standard	US Customary	True	False
	,, ,,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,	J		,	2	
				OK	Apply	Car
				UK	Арру	Cal
LRFD S	ubstructure Design Settings			_	□ ×	
ime:	Final Design Setting (U	S)		Design se	tting type	
	Final Design Setting (U	S) ^		Prelimi	nary	
scriptio	on:			✓ Final		
Limit st	tates Vehicles Substr	ucture loading				
	anturio month and Arabusia					
Ar	type module	Spec version Factors				
► LR						
	AASHIO	* LRFD 5t * 2010 AAS *			<b></b>	
	AASHIO	* LRFD 5t * 2010 AAS *			*	
Choos	e the limit states to be ed in the analysis:	LRFD 5t      Z010 AAS			4	
Choos include	e the limit states to be ed in the analysis: RENGTH-I	LRFD 5t      Z010 AAS     Dynamic load allowance     Fatigue and fracture limit st	ates: 15.0	%	4	
Choos include	e the limit states to be ed in the analysis: RENGTH-I RENGTH-II	LRFD 5t      Z010 AAS     Dynamic load allowance     Fatigue and fracture limit st     All other limit states:	ates: 15.0 33.0	%	A V	
Choos include ST	e the limit states to be ed in the analysis: RENGTH-I RENGTH-II RENGTH-III	LRFD 5t      2010 AAS      Dynamic load allowance      Fatigue and fracture limit st      All other limit states:	ates: 15.0 33.0	%	м. У	
Choos include	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-III TRENGTH-IV	LRFD 5t      Z010 AAS     Dynamic load allowance     Fatigue and fracture limit st     All other limit states:	ates: 15.0 33.0	%	4 V	
Choos include ST ST ST ST ST	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-III TRENGTH-IV TRENGTH-V	LRFD 5t      Z010 AAS     Dynamic load allowance     Fatigue and fracture limit st     All other limit states:	ates: 15.0 33.0	%	4 V	
Chooss include ST ST ST ST ST ST ST ST ST ST ST	e the limit states to be ed in the analysis: "RENGTH-I "RENGTH-II "RENGTH-III "RENGTH-IV "RENGTH-V "RENGTH-V "RENGTH-V	LRFD 5t      2010 AAS	ates: 15.0 33.0	%	4 V	
Choos include ST ST ST ST ST ST ST ST ST	e the limit states to be ed in the analysis: RENGTH-I RENGTH-II RENGTH-III RENGTH-IV RENGTH-V REVICE-I REVICE-I	LRFD 5t      2010 AAS	ates: 15.0 33.0	%	4 V	
Chooss include ST ST ST ST ST ST ST ST ST ST	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-II TRENGTH-IV TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-V	LRFD 5t      2010 AAS	ates: 15.0 33.0	%	4 V	
Chooss include	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-III TRENGTH-IV TRENGTH-IV TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-I TRENGTH-II T	LRFD 5t      2010 AAS	ates: 15.0 33.0	%	4 V	
Chooss include ST ST ST ST ST ST ST ST ST ST ST ST ST	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-II TRENGTH-IV TRENGTH-IV TRENGTH-IV TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-V TRENGTH-II TRENGTH-II	LRFD 5t      2010 AAS	ates: 15.0 33.0	%	A V	
Chooss include ST ST ST ST ST ST ST ST ST ST ST ST ST	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-III TRENGTH-IV TRENGTH-I TRENGTH-I TRENG	LRFD St      2010 AAS	ates: 15.0 33.0	%	A V	
Chooss include ST ST ST ST ST ST ST ST ST ST ST ST ST	e the limit states to be ed in the analysis: RENGTH-I RENGTH-II RENGTH-III RENGTH-IV RENGTH-II RENGTH-II RENGTH	LRFD 5t      2010 AAS	ates: 15.0 33.0	%	4 V	
Chooss includd ST ST ST ST SE SE SE SE SE SE SE SE SE SE SE SE SE	e the limit states to be ed in the analysis: TRENGTH-I TRENGTH-II TRENGTH-III TRENGTH-IV TRENGTH-I TRENGTH-V TRENGTH-I TRENG	LRFD St      2010 AAS	ates: 15.0 33.0	%	A V	

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

The default impact factors, standard LRFD and LFR factors will be used. Bridge Alternatives will be added after entering the Structure Definition.

## Superstructure Definitions

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.

Analysis	s Specs	Engine		
me: S	ipan 3			Modeling  Multi-airder system () MCB
				With frame structure simplified definitio
scription:				Deck type:
				Concrete Deck 🗸
fault units: U	JS Customary	Enter span lengths     along the reference		For PS/PT only
imber of spans:	1 🗘	line:		Average humidity:
imber of girders:	8 🗘	Span Length		/0.000 %
		. (π) 1 132.0625	A.	Member alt. types
				Steel
				✓ P/S
				✓
				✓ P/S R/C Timber P/T
			Ŧ	✓ P/S R/C Timber P/T
Horizontal curvature	e along refere	unce line	Ŧ	✓ P/S R/C Timber P/T
Horizontal curvature ] Horizontal curvat	e along refere	nce line Distance from PC to first support line:		✓ P/S R/C Timber P/T
Horizontal curvature   Horizontal curvat   Superstructure al	e along refer ture lignment	ince line Distance from PC to first support line: Start tangent length:	ft	✓ P/S R/C Timber P/T
Horizontal curvature Horizontal curvat Superstructure al © Curved	e along refere ture lignment	nce line Distance from PC to first support line: Start tangent length: Radius:	: ft	✓ P/S R/C Timber P/T
Horizontal curvature Horizontal curvat Superstructure al O Tangent, curve Tangent, curve	e along refer ture lignment ed, tangent	ince line Distance from PC to first support line: Start tangent length: Radius: Direction:	* ft ft ft Left v	✓ P/S R/C Timber P/T
Horizontal curvature Horizontal curvat Superstructure al Orurved Tangent, curve Orured, tange	e along refer ture lignment ed, tangent ed	nce line Distance from PC to first support line: Start tangent length: Radius: Direction: End tangent length:	* ft ft Left v ft	✓ P/S R/C Timber P/T
Horizontal curvature Horizontal curvat Superstructure al O curved Tangent, curve Curved, tange	e along refer ture lignment ed, tangent ed	nce line Distance from PC to first support line: Start tangent length: Radius: Direction: End tangent length: Distance from last support line to PT:	* ft ft ft Left ~ ft ft	P/S □ R/C □ Timber □ P/T
Horizontal curvature Horizontal curvat Superstructure al O Tangent, curve Tangent, curve Curved, tange	e along refer ture ignment ed, tangent ed int	nce line Distance from PC to first support line: Start tangent length: Radius: Direction: End tangent length: Distance from last support line to PT: Design speed:	* ft ft Left v ft ft ft ft	P/S □ R/C □ Timber □ P/T

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

The partially expanded Bridge Workspace tree is shown below.



#### Load Case Description

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		Туре		Time* (days)	
ŀ	DC1	DC acting on non-composite section	Non-composite (Stage 1)	•	D,DC	*		
	DC2	DC acting on long-term composite section	Composite (long term) (Stage 2)	*	D,DC	Ŧ		
	DW	DW acting on long-term composite section	Composite (long term) (Stage 2)	*	D,DW	*		
	SIP Forms	Weight due to stay-in-place forms	Non-composite (Stage 1)	•	D,DC	-		

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

## Structure Framing Plan Detail – Layout

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

🕰 St	truct	ture Framin	g Plan Details									-	-		×
Nur	nbei	r of spans:	1 N	umber of girde	ers:	8									
La	ayou	ıt Diaph	iragms												
					Gi	rder spac	ing orientatio	1							
		Support	Skew (degrees)			Perper	ndicular to gire support	der							
	>	1	39.0218889	A											
		2	39.0218889			Girder	Girder s (fi	pacing :)							
						bay	Start of girder	End of girder							
					>	1	6.5573	7.0052	-						
						2	6.5052	6.5052							
						3	6.5052	6.5052							
						4	6.5573	6.5573							
						5	6.5052	6.5052							
						6	6.5052	6.5052							
						7	6	7.2187							
										1					
										C	к	Apply		Cance	2

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

### Structure Framing Plan Detail – Diaphragms

This window needs to be revisited after the Structure Reference Line is set in the Structure Typical Section window.

## 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.

Distance from left edge of deck to superstructure definition ref. line       Superstructure definition ref. line         Deck       Deck       Superstructure Definition         Deck       Deck       Reference Line         Deck       Deck       Right 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:       20.5265       ft       20.8754       ft         Distance from right edge of deck to superstructure definition reference line:       20.9258       ft       21.87169       ft         Left overhang:       2.781       ft       2.781       ft         Computed right overhang:       3.60536       ft       3.60536       ft	-		)
Deck       Deck       Superstructure Definition         eft overhang       Image: Control of the second sec			
Att overhang     Deck   Deck (cont'd)   Parapet   Median   Railing   Generic   Sidewalk   Lane position   Striped lanes   Wearing surface   Superstructure definition reference line is   Within   Ustance from left edge of deck to   superstructure definition reference line:   20.5265   ft   20.8754   ft   Distance from right edge of deck to   superstructure definition reference line:   20.9258   ft   2.781   ft   2.781   ft   2.781   ft   3.60536   ft     Superstructure definition reference line:     2.781   ft   2.781   ft   3.60536   ft     Superstructure definition reference line:     2.781   ft     Superstructure definition reference line:     2.781   ft     Superstructure			
toverhang A Right 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: 20.5265 ft 20.8754 ft Distance from right edge of deck to superstructure definition reference line: 20.9258 ft 21.87169 ft Left overhang: 2.781 ft 2.781 ft Computed right overhang: 3.60536 ft 3.60536 ft			
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:          20.5265       ft          20.8754       ft         Distance from right edge of deck to superstructure definition reference line:          20.9258       ft          21.87169       ft         Left overhang:          2.781       ft          2.781       ft         Computed right overhang:          3.60536       ft          3.60536       ft			
Superstructure definition reference line iswithinthe bridge deck.Distance from left edge of deck to superstructure definition reference line:20.5265ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:20.9258ftDistance from right edge of deck to superstructure definition reference line:2.781ftComputed right overhang:3.60536ft3.60536ft			
StartEndDistance from left edge of deck to superstructure definition reference line:20.5265ftDistance from right edge of deck to superstructure definition reference line:20.9258ft21.87169ftLeft overhang:2.781ftComputed right overhang:3.60536ft3.60536ft			
Distance from left edge of deck to superstructure definition reference line:20.5265ft20.8754ftDistance from right edge of deck to superstructure definition reference line:20.9258ft21.87169ftLeft overhang:2.781ft2.781ftComputed right overhang:3.60536ft3.60536ft			
Distance from right edge of deck to superstructure definition reference line: Left overhang: Computed right overhang: 2.781 3.60536 ft 3.60536 ft 3.60536 ft			
Left overhang:2.781ft2.781ftComputed right overhang:3.60536ft3.60536ft			
Computed right overhang: 3.60536 ft 3.60536 ft			
OK	Apply	Can	cel

## Structure Typical Section – Deck (cont'd)

The **Deck (cont'd)** tab is used to enter information about the **Deck concrete** and the **Total deck thickness**. The material to be used for the deck concrete is selected from the list of bridge materials. Enter the data as shown below.

A Structure Typical Section	-		×
Distance from left edge of deck to Distance from right edge of deck to			
Superstructure deminion ret. Inter			
thickness   Reference Line			
Left overhang			
Deck (cont'd) Parapet Median Railing Generic Sidewalk Lane position Striped lanes Wearing surface			
Deck concrete: Class AA			
Total deck thickness: 8.0000 in			
Load case: Engine Assigned			
Deck crack control parameter: 130.000 kip/in			
Sustained modular ratio factor: 2.000			
Deck exposure factor:			
ОК Ар	ply	Cance	el

#### Structure Typical Section – Parapets

#### Add two parapets as shown below.

🗛 Si	truc	ture Typical Section								-		×
Bac	k	Front	Median Railing	Gen	eric Sidew	alk Lane positi	on Striped	lanes Wea	vring surface			
		Name	Load case		Measure to	Edge of deck dist. measured from	Distance at start (ft)	Distance at end (ft)	Front face orientation			
	>	2'-8" Railing w/ Fence 🛛 🗸	DC2	$\sim$	Back $\checkmark$	Left Edge 🛛 🗸	0.166666	0.166666	Right $\checkmark$		A	
		2'-8" Railing w/ Fence $\sim$	DC2	$\sim$	Back $\vee$	Right Edge 🗸 🗸	0.166666	0.166666	Left $\sim$			
								Nev	v Dupl	icate	Delete	
									ОК	Apply	Cance	el

## Structure Typical Section – Lane Position

Select the **Lane position** tab and use the **Compute...** button to compute the lane positions. A window showing the results of the computation opens. Click **Apply** to apply the computed values.

<b>A</b>	Compute La	ne Positions				×
	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	-19.109834	19.509134	-19.458734	20.455024	-
					Apply Cance	el

#### The Lane Position tab is populated as shown below.

Struct	ture Typical S	ection				—	
	Travelw	A) (B) Superstructure ay 1 (C) Superstructure (C) Superstructure	re Definition Reference Line avelway 2				
Deck	Deck (cor	nt'd) Parapet Median	Railing Generic Sidew	valk Lane position Strip	ed 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)		
>	1	-19.1098	19.5091	-19.4587	20.455		^
	RFD fatigue Lanes ava Override	ailable to trucks:	Compute		New Dup	licate Delete	•
					ОК	Apply Car	ncel

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

## Structure Framing Plan Detail – Diaphragms

Re-open the **Structure Framing Plan Detail** window and navigate to the **Diaphragms** tab to enter the diaphragm spacing. Enter the information for each girder bay as shown below.

Support number         Start distance (ft)         Diaphragm spacing (ft)         Number of spaces         End (ft)         Indistance distance (ft)         Load (kip)         Diaphragm         Diaphragm           1         1         0         0         0         1         0         0         0         5.32        Not Assigned         V           1         V         12.5521         16.4048         0         1         0         12.5521         16.4048         3.16        Not Assigned         V           1         V         52.5521         56.402         0         1         0         52.5521         56.402         3.16        Not Assigned         V           1         V         92.2917         96.2918         0         1         0         92.2917         96.2918         3.16        Not Assigned         V           1         V         132.345714         132.063249         0         1         0         132.345714         132.063249         5.52        Not Assigned         V           Number of girders	Support number         Start distance number         Diaphragm regim (tr)         Number of spaces         Length of spaces         End (tr)         Length (tr)         End (tr)         Diaphragm (tr)         Diaph	Support number         Statt distance (ft)         Diaphragm spacing (ft)         Number of spaces         Length (ft)         End (ft)         Lod (kip)         Doaphragm (kip)         Diaphragm (ft)           1          0         0         0         0         0         5.32        Not Assigned            1          12.5521         16.4048         0         1         0         10         52.5521         56.402         0         1         0         52.5521         56.402         0         1         0         92.2917         96.2918         3.16        Not Assigned            1          92.2917         96.2918         0         1         0         132.345714         132.063249         5.52        Not Assigned            1          132.345714         132.063249         0         1         0         132.345714         132.063249         5.52        Not Assigned
I         Left girder         Right girder         Right girder         Right girder         Right girder         Right girder           1          0         0         0         1         0         0         5.32        Not Assigned            1          12.5521         16.4048         0         1         0         52.5521         56.402         0         1         0         52.5521         56.402         3.16        Not Assigned            1          92.2917         96.2918         0         1         0         92.2917         96.2918         3.16        Not Assigned            1          92.2917         96.2918         0         1         0         132.345714         132.063249         5.52        Not Assigned            1          132.345714         132.063249         0         1         0         132.345714         132.063249         5.52         -Not Assigned            V         V         V         V         V         Not Assigned             V         V         V         V         V         V	Image: Normal problem         Right girder         Righ	Image: Problem         Right girder         Right girder         (11)
1       ~       0       0       0       1       0       0       0       5.32      Not Assigned ~         1       ~       12.5521       16.4048       0       1       0       12.5521       16.4048       3.16      Not Assigned ~         1       ~       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned ~         1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned ~         1       ~       92.2917       96.2918       0       1       0       132.345714       132.063249       5.52      Not Assigned ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ~         .	1       ✓       0       0       0       1       0       0       5.32      Not Assigned ✓         1       ✓       12.5521       16.4048       0       1       0       12.5521       16.4048       3.16      Not Assigned ✓         1       ✓       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned ✓         1       ✓       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned ✓         1       ✓       92.2917       96.2918       0       1       0       132.345714       132.063249       5.52      Not Assigned ✓         1       ✓       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ✓         New       Duplicate       Delete         OK       Apply       Car         OK       Apply       Car         Upport       Diaphragm         Volspan="5">Diaphragm       Number       Sart       Sart       Sart       Sart       Sart       Sart	1       ~       0       0       0       1       0       0       0       5.32      Not Assigned       ~         1       ~       12.5521       16.4048       0       1       0       12.5521       16.4048       3.16      Not Assigned       ~         1       ~       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned       ~         1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned       ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ~         V       1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ~
1       ~       12.5521       16.4048       0       1       0       12.5521       16.4048       3.16      Not Assigned       ~         1       ~       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned       ~         1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned       ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ~         New       Duplicate         OK       Apply	1       ✓       12.5521       16.4048       0       1       0       12.5521       16.4048       3.16      Not Assigned ✓         1       ✓       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned ✓         1       ✓       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned ✓         1       ✓       92.2917       96.2918       0       1       0       132.345714       132.063249       5.52      Not Assigned ✓         1       ✓       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ✓         1       ✓       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ✓         New       Duplicate       Delete         OK       Apply       Can         OK       Apply       Can         Diaphragm       wizard         V       Diaphragm       Number       Implragm       Mistance       Implra	1       ~       12.5521       16.4048       0       1       0       12.5521       16.4048       3.16      Not Assigned         1       ~       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned       ~         1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned       ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ~
1       ~       52.5521       56.402       3.16      Not Assigned ~         1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ~         .       New       Duplicate	1       V       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned         1       V       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned         1       V       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned         1       V       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned         V       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       V         New       Duplicate       Delete       OK       Apply       Car         0K       Apply       Car       OK       Apply       Car         0       Ophragms       -       <	1       ~       52.5521       56.402       0       1       0       52.5521       56.402       3.16      Not Assigned         1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned
1       ~       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ~         1       ~       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned ~         New       Duplicate	1       ×       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned       ×         1       ×       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ×         1       ×       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ×         New Duplicate       Delete         OK       Apply       Car         OK       Apply       Car         Under of girders: 8         yout       Diaphragms       - </td <th>1       ✓       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned         1       ✓       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ✓</th>	1       ✓       92.2917       96.2918       0       1       0       92.2917       96.2918       3.16      Not Assigned         1       ✓       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ✓
1       1       1       0       1       0       132.345714       132.063249       5.52      Not Assigned       >         New       Duplicate       OK       Apply         0       0       1       0       132.345714       132.063249       5.52      Not Assigned       >         New       Duplicate       OK       Apply       OK       Apply       OK       Apply         Inber of spans:       1       Number of girders:       8       0	1       ×       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ×         Image: New Duplicate Delete       New Duplicate Delete       OK Apply Car         OK Apply Car       OK Apply Car         Image: New Duplicate Delete       Image: New Duplicate Delete         Image: New Duplicate Delete       OK Apply Car         Image: New Duplicate Delete       Image: New Duplicate Delete         Image: New Duplicate Delete       Image: New Duplicate Delete       Image: New Duplicate Delete <th>1       ∨       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ∨         New       Duplicate       OK       Apply</th>	1       ∨       132.345714       132.063249       0       1       0       132.345714       132.063249       5.52      Not Assigned       ∨         New       Duplicate       OK       Apply
New Duplicate OK Apply  ructure Framing Plan Details  nber of spans: 1 Number of girders: 8 ayout Diaphragms	New     Duplicate     Delete       OK     Apply     Car       ructure Framing Plan Details     —     —       ruber of spans:     1     Number of girders:     8       yout     Diaphragms     —     —       rder bay:     2     Copy bay to     Diaphragm wizard     —       Support     Start (ft)     Diaphragm spacing (ft)     Number of spaces     Length (ft)     Length (ft)     Length (ft)     Load (ft)     Diaphragm       1     V     0     0     1     0     0     5.32    Not Assigned	New Duplicate
OK Apply  ructure Framing Plan Details  nber of spans:  Number of girders:  prove Diaphragms	OK     Apply     Car       ructure Framing Plan Details     —     —     —       nber of spans:     1     Number of girders:     8       yout     Diaphragms     —     —       rder bay:     2     ✓     Copy bay to     Diaphragm wizard       Support     Start distance (ft)     Diaphragm spacing (ft)     Number of spaces     Length (ft)     Length (ft)     Load (kip)     Diaphragm       1     ✓     0     0     0     5.32    Not Assigned ✓	QK Apply
ructure Framing Plan Details – nber of spans: 1 Number of girders: 8 yout Diaphragms	spansi 1     Number of girders: 8       yout     Diaphragms       rder bay: 2     Copy bay to       Diaphragm       wizard         Support     Start distance (ft)     Diaphragm spacing (ft)     Number of spaces     Length (ft)     End distance (ft)     Load (kip)     Diaphragm       1     V     0     0     1     0     0     0     5.32    Not Assigned	
irder bay: 2 Copy bay to Diaphragm wizard	Support number     Start distance (ft)     Diaphragm spacing (ft)     Number of spaces     Length (ft)     End distance (ft)     Load (kip)     Diaphragm       1     0     0     0     0     0     5.32    Not Assigned	nber of spans: 1 Number of girders: 8
Start End	$ \frac{\begin{tabular}{cccccccccccccccccccccccccccccccccccc$	rder bay: 2 · Copy bay to Diaphragm wizard
Summer distance Diaphragm Number Leasth distance Least	number         (ii)         of spaces         (ft)         (iii)         (kip)         Opposite           Left girder         Right girder         0         0         0         0         5.32        Not Assigned	inder bay: 2 Copy bay to Diaphragm wizard Start End
Support (A) spacing Number Length (A) Load Diaphragm	1 ∨ 0 0 0 1 0 0 0 5.32Not Assigned ∨	rder bay: 2 Copy bay to Diaphragm wizard Support distance Diaphragm spacing Number Length distance Load Diaphragm
Support         Cload         Diaphragm           number         (ft)         spacing (ft)         of spaces (ft)         (ft)         (ft)         Diaphragm		rder bay: 2 Copy bay to Diaphragm vizard Support distance (ft) Diaphragm grider bay: 2 Copy bay to Diaphragm vizard Diaphragm
Support number         (ft)         spacing (ft)         Number of spaces (ft)         Length of spaces (ft)         Construction (ft)         Load (kip)         Diaphragm           1         V         0         0         1         0         0         0         5.32        Not Assigned	1 × 16.4048 20.2287 0 1 0 16.4048 20.2287 3.16Not Assigned ×	rder bay: 2 · Copy bay to Diaphragm rder bay: 2 · Copy bay to Diaphragm support number Left girder 1 · V 0 0 0 0 1 0 0 0 0 0 5.32Not Assigned ×
$\frac{\text{Support}}{\text{number}} \xrightarrow[(ft]]{} \hline [(ft]] \hline \ [(ft]] \hline \hline [(ft]] \hline \ [(ft]] \hline \hline \ [(ft]] \hline \hline \ [(ft] \hline \hline \ \ \hline \ \hline \hline \hline \ \hline \hline \hline \hline \hline \hline \hline \hline \hline $	1 × 56.402 60.2287 0 1 0 56.402 60.2287 3.16Not Assigned ×	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
$\frac{ V_{\text{support}} }{ V_{\text{support}} } = \frac{ V_{\text{support}} }{ V_{\text{support}} } =  V$		$\begin{array}{c c c c c c c c c c c c c c c c c c c $
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	1 V 96.2918 100.2662 0 1 0 96.2918 100.2662 3.16Not Assigned V	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $
$\frac{ V_{\text{reg}} _{1}}{ V_{\text{reg}} _{1}} \xrightarrow{V_{\text{reg}}} \frac{ V_{\text{reg}} _{1}}{ V_{\text{reg}} _{1}} \xrightarrow{V_{\text{reg}}} \xrightarrow{V_{\text{reg}}} \xrightarrow{V_{\text{reg}}} \frac{ V_{\text{reg}} _{1}}{ V_{\text{reg}} _{1}} \xrightarrow{V_{\text{reg}}} \xrightarrow{V_{\text{reg}}} \frac{ V_{\text{reg}} _{1}}{ V_{\text{reg}} _{1}} \xrightarrow{V_{\text{reg}}} V_{\text$	1 × 56.402 60.2287 0 1 0 56.402 60.2287 3.16Not Assigned ×	$\begin{array}{c c c c c c c c c c c c c c c c c c c $
V   V   V   V   V   V   V   V   V   V		Support number         Start distance (H)         Diaphragm Spacing (H)         Number of spaces         Length of spaces         distance (H)         Longth (H)         Length (H)         Diaphragm (H)         Diaphragm Diaphragm         Diaphragm (H)           1         V         0         0         0         1         0         0         5.32        Not Assigned V           1         V         16.4048         20.2287         0         1         0         56.402         60.2287         3.16        Not Assigned V
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	1 V 96.2918 100.2662 0 1 0 96.2918 100.2662 3.16Not Assigned Y	Support number         Start distance (ft)         Diaphragm pacing (ft)         Number of spaces (ft)         Length of spaces (ft)         Length (ft)         Gistance distance (ft)         Load (kip)         Diaphragm Diaphragm           1         V         0         0         0         1         0         0         5.32        Not Assigned V           1         V         16.4048         20.2287         0         1         0         56.402         60.2287         0         1         0         56.402         60.2287         0         1         0         96.2918         100.2662         0         1         0         96.2918         100.2662         3.16        Not Assigned V

der b	ay: 3		<u> </u>	Copy bay to.		wizaro	igm d					
Su	upport umber	St dist (	tart tance ft)	Diaphragm spacing	Number of spaces	Length (ft)	Er dista (f	nd ance 't)	Load (kip)	Diaphragm		
		Left girder	Right girder	(π)			Left girder	Right girder				
1	$\sim$	0	0	0	1	0	0	0	5.32	Not Assigned	$\sim$	
1	$\sim$	20.2287	24.0526	0	1	0	20.2287	24.0526	3.16	Not Assigned	$\sim$	
1	$\sim$	60.2287	64.0555	0	1	0	60.2287	64.0555	3.16	Not Assigned	$\sim$	
1	$\sim$	100.2662	104.2406	0	1	0	100.2662	104.2406	3.16	Not Assigned	$\sim$	
1	~	132.063249	132.063249	0	1	0	132.063249	132.063249	5.52	Not Assigned	$\sim$	
									New	Destinute		Delet

Sup	oport nber	St dist (	art ance ft)	Diaphragm spacing	Number of spaces	Length (ft)	Er dista (f	id ince t)	Load (kip)	Diaphragm		
		Left girder	Right girder	(ft)			Left girder	Right girder				
1	$\sim$	0	0	0	1	0	0	0	5.32	Not Assigned	$\sim$	
1	$\sim$	24.0526	27.9071	0	1	0	24.0526	27.9071	3.16	Not Assigned	$\sim$	
1	$\sim$	64.0555	67.9129	0	1	0	64.0555	67.9129	3.16	Not Assigned	$\sim$	
1	$\sim$	104.2406	108.2468	0	1	0	104.2406	108.2468	3.16	Not Assigned	$\sim$	
1	$\sim$	132.063249	132.063249	0	1	0	132.063249	132.063249	5.52	Not Assigned	$\sim$	
									New	Duplicate		Delete

$ \begin{array}{ c c c c } \hline Support & Start & Diaphragm \\ \hline (t) & Right girder & Right Right & Right Righ$	Support number         Call         Call
Left girder         Right girder         (ff)         Press         (v)         Left girder         Right girder         (v)         Left girder         Right girder           1          0         0         0         1         0         0         0         532        Not Assigned            1         279071         31.731         0         1         0         279071         31.731         3.16        Not Assigned            1          679129         71.7397         0         1         0         679129         71.7397         3.16        Not Assigned            1          108.2468         112.2212         0         1         0         132.063249         552        Not Assigned            1          132.063249         132.063249         132.063249         552        Not Assigned            number of spans:         1         Number of girders:         8                yout         Diaphragm         Vizard	Left girder         I           1         ×         0           1         ×         27.9071           1         ×         67.9129           1         ×         108.2468           1         ×         132.063249
1       v       0       0       1       0       0       5.32      Not Assigned v         1       27.9071       31.731       0       1       0       27.9071       31.731       3.16      Not Assigned v         1       67.9129       71.7397       0       1       0       67.9129       71.7397       3.16      Not Assigned v         1       V       108.2468       112.2212       0       1       0       108.2468       112.2212       3.16      Not Assigned v         1       V       108.2468       112.2212       0       1       0       192.063249       5.52      Not Assigned v         1       V       132.063249       132.063249       0       1       0       132.063249       5.52      Not Assigned v         New       Duplicate       Delete         OK       Apply       Can         Number of girders: 8         wout       Diaphragm         Vigned distance         number       Start       Diaphragm       Start       Diaphragm       Lend       distance       Lond       Diaphragm       Lend       distance <td< th=""><th>1         ~         0           1         ~         27.9071           1         ~         67.9129           1         ~         108.2468           1         ~         132.063249</th></td<>	1         ~         0           1         ~         27.9071           1         ~         67.9129           1         ~         108.2468           1         ~         132.063249
1       27.9071       31.731       0       1       0       27.9071       31.731       3.16      Not Assigned          1       26.79129       71.7397       0       1       0       67.9129       71.7397       3.16      Not Assigned          1       108.2468       112.2212       0       1       0       108.2468       112.2212       3.16      Not Assigned          1       108.2468       112.2212       3.16      Not Assigned            1       132.063249       132.063249       0       1       0       132.063249       5.52      Not Assigned          1       132.063249       132.063249       0       1       0       132.063249       5.52      Not Assigned          1       132.063249       132.063249       0       0       132.063249       5.52      Not Assigned          0K       Apply       Can         order       OK       Apply       Can         order       Image: State       Image: State <td< th=""><th>1         ~         27.9071           1         ~         67.9129           1         ~         108.2468           1         ~         132.063249</th></td<>	1         ~         27.9071           1         ~         67.9129           1         ~         108.2468           1         ~         132.063249
1        67.9129       71.7397       0       1       0       67.9129       71.7397       3.16      Not Assigned          1        108.2468       112.2212       0       1       0       108.2468       112.2212       3.16      Not Assigned          1        132.063249       132.063249       132.063249       132.063249       5.52      Not Assigned          1        132.063249       132.063249       132.063249       5.52      Not Assigned          1        132.063249       132.063249       132.063249       5.52      Not Assigned           New       Duplicate       Delete       OK       Apply       Can                   nuber of spans:       1       Number of girders:       8             syout       Diaphragms	1         ~         67.9129           1         ~         108.2468           1         ~         132.063249
1       108.2468       112.2212       0       1       0       108.2468       112.2212       3.16      Not Assigned ×         1       132.063249       132.063249       132.063249       132.063249       5.52      Not Assigned ×         1       132.063249       132.063249       132.063249       5.52      Not Assigned ×         New       Duplicate       Delete       OK       Apply       Can         order family       O       OK       Apply       Can         nber of spans:       1       Number of girders:       8         ayout       Diaphragms       —       —       —         irder bay:       6       Copy bay to       Diaphragm       Mumber         Support       distance       Diaphragm       Length       distance       Load       Diaphragm         left girder       Right girder       %       Mumber       Length       distance       Load       Diaphragm	1         ∨         108.2468           1         ∨         132.063249
1       132.063249       132.063249       132.063249       132.063249       5.52      Not Assigned          New       Duplicate       Delete         OK       Apply       Can         ructure Framing Plan Details       -       -         nber of spans:       1       Number of girders:       8         ayout       Diaphragms       -       -         irder bay:       6       Copy bay to       Diaphragm         Support       Start       Diaphragm       Length       distance         (th)       Left girder       Right girder       Diaphragm	1 ~ 132.063249
New       Duplicate       Delete         OK       Apply       Can         OK       Apply       Can         Inder of spans:       1       Number of girders:       8         ayout       Diaphragm       Diaphragm       Import         Start       Diaphragm       Number       End         Support       Start       Diaphragm       Length       distance         Import       Inghragm       Number       Import       Diaphragm         Import       Inghragm       Number       Length       Import         Import       Inghragm       Number       Import       Import         Import       Inghragm       Number       Length       Import         Import       Inghragm       Number       Import       Import         Import       Import       Import       Import       Import       Import	
rder bay: 6 Copy bay to Diaphragm vizard Support number Left girder Right girder Support Left girder Right girder Left girder Right girder	
Support number     Start distance (ft)     Diaphragm spacing (ft)     Number of spaces     Length (ft)     End distance (ft)     Load (kip)     Diaphragm	ructure Framing Plan Details ober of spans: 1
Left girder Right girder (ft) Left girder Right girder	ructure Framing Plan Details nber of spans: 1 nyout Diaphragms rder bay: 6
	ructure Framing Plan Details nber of spans: 1 iyout Diaphragms rder bay: 6 Star Support distar number (ft)
1 V 0 0 0 1 0 0 5.32Not Assigned V	ructure Framing Plan Details nber of spans: 1 uyout Diaphragms rder bay: 6 Support distar number (ft) Left girder 1
1 × 31731 355549 0 1 0 31731 355549 316Not Assigned ×	ructure Framing Plan Details nber of spans: 1 ayout Diaphragms rder bay: 6 Support number Left girder 1 ✓ 0
	ructure Framing Plan Details nber of spans: 1 nyout Diaphragms rder bay: 6 Support distar number (ft) Left girder 1 1 ~ 0 1 ~ 31.731
1         71.7397         75.5664         0         1         0         71.7397         75.5664         3.16        Not Assigned	iructure Framing Plan Details nber of spans: 1 ayout Diaphragms irder bay: 6 Support distar number (ft) Left girder 1 1 × 0 1 × 31.731 1 × 71.7397
1         71.7397         75.5664         0         1         0         71.7397         75.5664         3.16        Not Assigned         ×           1         ×         112.2212         116.1956         0         1         0         112.2212         116.1956         3.16        Not Assigned         ×	ructure Framing Plan Details nber of spans: 1 nyout Diaphragms rder bay: 6 Support number 1 × 0 1 × 31.731 1 × 112.2212
1 × 0 0 0 1 0 0 5.32Not Assigned ×	tructure Framing Plan Details nber of spans: 1 ayout Diaphragms irder bay: 6 Support distar number (ft) Left girder 1
1 V 31731 35 5549 0 1 0 31731 35 5549 3.16 Not Assigned V	iructure Framing Plan Details nber of spans: 1 ayout Diaphragms irder bay: 6 Support distar number (ft) Left girder 1 1    0
1 × 31731 355549 0 1 0 31731 355549 316 Not Assigned ×	ructure Framing Plan Details nber of spans: 1 ayout Diaphragms irder bay: 6 Support distar number (ft) Left girder 1 1   0
1 × 31731 355549 0 1 0 31731 355549 316Not Assigned ×	iructure Framing Plan Details nber of spans: 1 ayout Diaphragms irder bay: 6 Support distar number (ft) Left girder 1 1 ~ 0
1 V 31731 35 5549 0 1 0 31731 35 5549 3 16 Not Assigned V	ructure Framing Plan Details nber of spans: 1 nyout Diaphragms rder bay: 6 Support distar number (ft) Left girder 1 1    0
	ructure Framing Plan Details nber of spans: 1 ayout Diaphragms rder bay: 6 Support distar number (ft) Left girder 1 1 × 0 1 × 0
1 × 71,7397 75.5664 0 1 0 71,7397 75.5664 3.16Not Assigned ×	ructure Framing Plan Details nber of spans: 1 yout Diaphragms rder bay: 6 Support distar number (ft) Left girder 1 1 ~ 0 1 ~ 31.731 1 ~ 71.7397
1         25,000         1         0         0,000	ructure Framing Plan Details nber of spans: 1 nyout Diaphragms rder bay: 6 Support number 1 × 0 1 × 31.731 1 × 771.7397 1 × 11122122
1         71.7397         75.5664         0         1         0         71.7397         75.5664         3.16        Not Assigned $\checkmark$ 1         ×         11.22212         116.1956         0         1         0         71.7397         75.5664         3.16        Not Assigned $\checkmark$ 1         ×         112.2212         116.1956         0         1         0         112.2212         116.1956        Not Assigned $\checkmark$	ructure Framing Plan Details her of spans: 1 yout Diaphragms rder bay: 6 Support number 1 × 6 1 × 00 1 × 31.731 1 × 771.7397 1 × 12.2212 1 × 12.2212

er ba	ay: 7		$\sim$	Copy bay to		Diaphra wizar	igm d				
Su	upport umber	St dist (	tart ance ft)	Diaphragm spacing	Number of spaces	Length (ft)	Er dista (f	id ince t)	Load (kip)	Diaphragm	
		Left girder	Right girder	(tt)			Left girder	Right girder			
1	$\sim$	0	0	0	1	0	0	0	5.32	Not Assigned 🗸 🗸	
1	~	35.5549	39.0677	0	1	0	35.5549	39.0677	3.16	Not Assigned 🗸 🗸	
1	~	75.5664	79.0677	0	1	0	75.5664	79.0677	3.16	Not Assigned 🗸 🗸	
1	~	116.1956	119.8438	0	1	0	116.1956	119.8438	3.16	Not Assigned 🗸 🗸	
1	~	132.063249	131.299342	0	1	0	132.063249	131.299342	5.52	Not Assigned 🗸 🗸	
									New	Duolicate	Dalat

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

#### 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 the **Class F6** 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. A 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.

A Stress Limit Sets -	Concrete					_	-		×
Name:	Class F6								
Description:									
Corrosion condition:	Moderate		$\sim$						
Final allowable to	ension stress	limit coef. (US	5) override:						
Concrete material:	Class F6		~						
	Compute								
		LFD		LRFD					
Initial allowable comp	pression:	2.94	ksi	3.185	ksi				
Initial allowable tensi	on:	0.2	ksi	0.2	ksi				
Final allowable comp	ression:	3.6	ksi	3.6	ksi				
Final allowable tensio	on:	0.4654031	ksi	0.4654031	ksi				
Final allowable DL co	mpression:	2.4	ksi	2.7	ksi				
Final allowable slab c	ompression:		ksi		ksi				
Final allowable comp (LL+1/2(Pe+DL))	ression:	2.4	ksi	2.4	ksi				
				C	К	Apply		Cance	ł

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.

me. 0.0 (/w-2/0	) LR					
General P/S data	Loss data - lump sum	Loss data - PCI	)			
P/S strand materia	l: 0.6" (7W-270) LR	>	Jacking stress ratio:	0.750		
Loss method:	AASHTO Approxim	ate 🗸	P/S transfer stress ratio:			
			Transfer time:	24.0	Hours	
			Age at deck placement:	30.00	Days	
			Final age:	36500.00	Days	

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

#### Shear Reinforcement

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



#### Define the stirrup as shown below.

A Shear Reinforcement Definition - Vertical	-		Х
Name: Bars K&S			
Material: Grade 60 Bar size: 5 Number of legs: 2.00 Inclination (alpha): 90.0 Degrees Shear Reinforcement		V	
OK A	pply	Cance	el

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 is automatically assigned as the **Existing** and **Current member alternative** for this Member.

A Member										-		×
Member name: G1	1			Lin	k with: N	one	~					
Description:												
	Existing	Current	Member alterna	ative name	Description							
<b>&gt;</b>	1	$\checkmark$	G1									^
												-
Number of spans:	1 0	Spa no	n Span length . (ft)									
		) 1	132.3	5	]							
				-								
								OK	Арр	ly	Cance	el

## Member Loads

Double-click on the **Member Loads** node in the **Bridge Workspace** tree to open the **Girder Member Loads** window. Enter the **Uniform load** to account for the SIP forms.

A Girde	er Member Loads					_		×
Pedest	trian load:	] lb/ft Concentrated	Settlement	-2				
	Load case name	Span	Uniform load (kip/ft)	Description				
Þ	SIP Forms *	All Spans *	0.016				<u>~</u>	
							*	
					New D	uplicate	Delete	
					ОК	Apply	Cance	el

#### Defining a Member Alternative

Double-click on **MEMBER ALTERNATIVES** in the **Bridge Workspace** tree for member **G1** 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 I** 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 as shown below. Enter the data as shown below. The **Schedule based Girder property input method** is the only input method available for a prestressed concrete beam.

nber alternative: G1 escription Spes Factors Engine Import Control options escription: Girder type: PFrestressed (Pretensioned) Girder type: PS Precat 1 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: kip/ft Additional self load: % Crack control parameter (Z) Top of beam: kip/fn Bottom of beam: Default of beam: Default cases	~		_								scription	mative De	wemper Alte
escription Spes Factor Engine Import Control options escription: Girder type: Girder type: Girder type: Multi Girder System Default units: Schedule based Cross-section based Self load Load case: Engine Assigned Multi Girder System Default rating method: LFR Crack control parameter (Z) Top of beam: Kip/in Bottom of beam: Kip/in Bottom of beam: Material type: Prestressed (Pretensioned) Prestressed (Pretensioned) Default rating method: US Customary US Customary US Customary Use creep Default rating method: LFR Use creep												tive: G1	ember alterna
escription: Girder type: Girder type: Girder type: Multi Girder System Default units: Schedule based Cross-section based Self load Load case: Engine Assigned Crack control parameter (Z) Top of beam: kip/in Bottom of beam: Kip/in Bottom of beam: Kip/in							ontrol options	1	Import	Engine	Factors	Specs	Description
Girder property input method Schedule based Cross-section based Self load Load case: Engine Assigned Additional self load: kip/ft Additional self load: % Crack control parameter (Z) Top of beam: kip/fn Bottom of beam: control parameter (Z) Top of beam: control parameter (					sioned)	Prestressed (Preter	Material type:						Description:
Girder property input method Schedule based Cross-section based Self load Load case: Engine Assigned Additional self load: % Crack control parameter (2) pof beam: kip/m Bottom of beam: Default rating method: Load case: Engine Assigned Crack control parameter (2) Top of beam: Default rating method: Bottom of beam:						PS Precast I	Girder type:						
Circler property input method         ● Schedule based         Cross-section based         Self load         Load case:         Engine Assigned         V         Additional self load:         %         Crack control parameter (Z)         Exposure factor         Top of beam:         Bottom of beam:         kip/in					1	Multi Girder Syster	Modeling type:						
Girder property input method ● Schedule based Cross-section based Self load Load case: Engine Assigned ♥ Additional self load: kip/ft Additional self load: % Crack control parameter (2) Crack control parameter (2) Top of beam: Control parameter (2) Bottom of beam: Control parameter (2) Self Dodd ♥ Bottom of beam: Control parameter (2) Self Dodd ♥ Self					$\sim$	US Customary	Default units:						
Schedule based          Cross-section based         Self load <ul> <li>Engine Assigned</li> <li>LFR</li> <li>LFR</li> <li>Additional self load:</li> <li>%</li> </ul> Additional self load:       %         Crack control parameter (Z)       Exposure factor         Top of beam:       kip/in         Bottom of beam:       kip/in											t method	perty inpu	Girder pro
Cross-section based Self load Lad case: Engine Assigned Kip/ft Additional self load: Kip/ft Additional self load: Kip/in Crack control parameter (Z) Top of beam: Kip/in Bottom of beam: Bottom of beam: Control parameter (Z)												le based	Schedu
Self load Lad case: Engine Assigned  LBR  Lad case: Engine Assigned  LFR  LR  CR  Crack control parameter (Z) Top of beam: Top of beam: Bottom of beam: Bottom of beam:											ed	ection bas	O Cross-s
Load case:       Engine Assigned       IFR         Additional self load:       kip/ft         Additional self load:       %         Crack control parameter (Z)       Exposure factor         Top of beam:       kip/in         Bottom of beam:       kip/in    Bottom of beam:						od:	ault rating metho	D					Self load
Additional self load: kip/ft Additional self load: % Crack control parameter (Z) Top of beam: Lip/in Bottom of beam: Bottom of beam: Use creep Top of beam: Bottom of beam: Source of the self self self self self self self sel						~	R		$\sim$	igned	Engine Ass		Load case:
Additional self load: % Crack control parameter (Z) Top of beam: hip/in Bottom of beam: bip/in Bottom of beam: bip										kip/ft		self load:	Additional
Crack control parameter (Z)       Exposure factor       Use creep         Top of beam:       Top of beam:       Bottom of beam:         Bottom of beam:       Bottom of beam:       Bottom of beam:										%		self load:	Additional
					p	Use cree	am:	re fa bear i of l	Exposu Top of b Bottom	kip/in kip/in	eter (Z)	m:	Crack con Top of bea Bottom of
		Car											

Navigate to the **Control options** tab and change the **Loss & stress calculations** to **Use transformed section properties** under **LRFR**.



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

## Beam Details

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.

pan	n detail	Stress limit ranges	Slab inte	erface	Web end block								
	6		Circl	1	December			Beam p	rojection				
	number	Beam shape	mate	erial	propertie	is and the second secon	n	Left end (in)	Right end (in)	i			
•	1	BT-72 -	Class F6	*	0.6" (7W-270) LF	2 -		16.0000	16.000	0			
									ОК		Apply	Ca	anc
ear	m Details										_		
ear par	m Details n detail	Stress limit range	s Slab i	interface	Web end bloc	:k							
ear	m Details n detail Span number	Stress limit range	s Slab i	interface Start distance (ft)	Web end bloc e Length (ft)	End distance (ft)					_		
ipar	m Details n detail ( Span number 1 ~	Stress limit range Name Class F6	s Slab i	Start distance (ft)	Web end bloc e Length (ft) 0 135.012381	End distance (ft) 135.01238	1						
3ear	m Details n detail Span number 1	Stress limit range Name Class F6	s Slab i	Start distanci (ft)	Web end bloc e Length (ft) 0 135.012381	End distance (ft) 135.01238	11			Duroli	-		

4	Beam Details			-		×
	Span detail Stress limit ranges SI	ab interface	Web end block			
	Interface type:	Intentionally	Roughened V			
	Default interface width to beam widths:	$\checkmark$				
	Interface width:		in			
	Cohesion factor:	0.280	ksi			
	Friction factor:	1.000				
	K1:	0.300				
	K2:	1.800	ksi			
			ОК	Apply	Cance	el 👘

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

## Strand Layout

Expand the tree under **Strand Layout** and open the **Span 1** window. Use the **Zoom** buttons on the right side of this window to shrink/expand the schematic of the beam shape so that the entire beam is visible.

Select the **Description type** as **Strands in rows** and the **Strand configuration type** as **Harped**. The **Mid span** radio button will now become active. Strands can now be defined at the middle of the span by selecting strands in the right hand schematic. Select the strands in the bottom flange of the schematic so that the CG of the strands is 4.23 inches.

A Strand Layo	out - Span 1			- 🗆 X
Description	type			
O P and CG	S only	ws		Nate: Brance particles generated by the MEV/48D method. Please the Help for 6 description of this method.
Strand config	guration type	Symmetry		
O Straight/	Debonded			**
Harped				
O Harped a	and straight debonded			
Mid span				
left and		Harp point locations		
Right end	Harp point	Distance (ft)	Radius (in)	
	Left	54.00	0.0000	
	Right	54.00	0.0000	
		OK Ap	ply Cancel	Ander of altradys = 20         Ander of altradys = 20         Ander of altradys = 20         Cold altradys altradys         Cold altradys altradys         Cold altradys altradys         Ander of altradys = 20         Netword of altradys = 20         Cold altradys altradys         Cold altradys altradys         A diatradys         A diatradys

Now select the **Left end** radio button to enter the harped strand locations at the left end of the precast beam. Place the cursor in the schematic view on the right side of the screen. The strands can be defined at the left end of the span by selecting strand locations in the right hand schematic. Select the top 8 strand locations in the schematic so that the CG of the strands is 20.37 inches.

A Strand Layo	ut - Span 1				—	$\Box$ $\times$
Description t	уре			الله 🖌 😋 🗘 🕂 🖶 🔂 🔛		
O P and CG	S only	/5		Notes: Bland positions generated by the REVISED method. Places after is kings for a description of this method.		
Strand config	guration type	Symmetry				
◯ Straight/l	Debonded					
Harped						
O Harped a	nd straight debonded					
O Mid span	,					
left end		Harp point locations				
Right end	Harp point	Distance (ft)	Radius (in)			
	▶ Left	54.00	0.0000 🗠			
	Right	54.00	0.0000			
		OK Af	oply Cancel			

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

## Deck Profile

This window needs to be revisited after the information for Beam 2-8 is entered. No reinforcement is described.

#### Haunch Profile

The haunch profile is defined by double-clicking on the **Haunch Profile** node in the **Bridge Workspace** tree. Enter data as shown below.

A PS Haunch Profi	ile									- 0	×
$\begin{array}{c c} & & & & \\ & & & & \\ & & & & \\ & & & & $											
Support number	Start distance (ft)	Length (ft)	End distance (ft)	Z1 (in)	Z2 (in)	Z3 (in)	Z4 (in)	Y1 (in)	Y2 (in)	Y3 (in)	
> 1 ×	0	132.345714	132.345714	0	0	0	0	1.25		0	-
								lew	Duplicate	Delet	e
								ОК	Apply	Car	cel

Click **OK** to apply the data and close the window.
#### 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 are entered as described below. The vertical shear reinforcement is defined as extending into the deck on the **Vertical** tab of this window. This indicates composite action between the beam and the deck. Data does not have to be entered on the **Horizontal** tab to indicate composite action since that has been defined by extending the vertical bars into the deck.

ipa ipa	n: 1 v								
	Name		Extends into deck	Start distance (ft)	Number of spaces	Spacing (in)	Length (ft)	End distance (ft)	
>	Bars K&S	~		0.166667	1	0	0	0.166667	-
	Bars K&S	$\sim$	$\checkmark$	0.166667	18	4	6	6.166667	
	Bars K&S	~		6.166667	6	6	3	9.166667	
	Bars K&S	~		9.166667	1	16	1.333333	10.5	
	Bars K&S	~		10.5	76	18	114	124.5	
	Bars K&S	~		124.5	1	16	1.333333	125.833333	
	Bars K&S	~		125.833333	6	6	3	128.833333	
	Bars K&S	$\sim$	$\sim$	128.833333	18	4	6	134.833333	

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

The description of an exterior beam (except for the deck profile) for this structure definition is complete. Using the techniques used for Beam 1, enter the data for the remaining beams for Span 3.

						Beam Pr	ojection	Stress	Harp	
Beam	Span	Uniform	Beam	Girder	Prestress	Left	Right	Limit	Point	Haunch
No.	Length	Load	Shape	Material	Properties	End	End	Range	Location	Y1
	ft	k/ft				in	in	ft	ft	in
G2	132.0632	0.032	BT-72	Class F6	0.6" (7W-270) LR	16	16	134.7299	53.8645	1.25
G3	132.0632	0.032	BT-72	Class F6	0.6" (7W-270) LR	16	16	134.7299	53.8645	1.25
G4	132.0632	0.032	BT-72	Class F6	0.6" (7W-270) LR	16	16	134.7299	53.8645	1.25
G5	132.0632	0.032	BT-72	Class F6	0.6" (7W-270) LR	16	16	134.7299	53.8645	1.25
G6	132.0632	0.032	BT-72	Class F6	0.6" (7W-270) LR	16	16	134.7299	53.8645	1.25
G7	132.0632	0.032	BT-72	Class F6	0.6" (7W-270) LR	16	16	134.7299	53.8645	1.25
G8	131.2993	0.016	BT-72	Class F6	0.6" (7W-270) LR	16	16	133.9660	53.4830	1.25

#### Deck Profile

Next revisit the **Deck Profile** window by double-clicking the **Deck Profile** node in the **Bridge Workspace** tree for member **G1**. The window is shown below. Click the **Compute from typical section...** button to open the window as shown below. Enter the Structural thickness as shown below and click **OK**.

A Compute Deck Profile From Structure Typical Section	×
Total deck thickness entered on the Structure Typical Section window = 8.0000	in
Enter a structural thickness to use when computing the effective flange width: 7.75	in
OK	Cancel

The following warning message will appear. This warning appears because the assumed constant overhang for the analysis is slightly larger than the limits per AASHTO C4.6.2.6.1 ( $0.5 \times Beam$  Spacing).

Bridge D	esign & Rating	×
<u>^</u>	Overhang width greater than 0.5*S! LRFD effective flange widths cannot be computed!	
	ОК	

For this example, the user will enter the Std effective flange widths into the LRFD effective flange widths as shown below.

				Start		End	Structural	Start effective	End effective	Start effective	End effective				
	Mater	ial	Support number	distance (ft)	Length (ft)	distance (ft)	thickness (in)	flange width (Std) (in)	flange width (Std) (in)	flange width (LRFD) (in)	flange width (LRFD) (in)	n			
>	Class AA	$\sim$	1 ~	0	132.345714	132.345714	7.75	72.7158	72.7158	72.7158	72.7158		8		

The **Deck Profile** windows for the remaining beams are shown below.

#### **G2**

	PS Precast I											
eck concrete Reinforcement												
	Material	Si	upport umber	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
	Class AA $\sim$	1	$\sim$	0	132.063249	132.063249	7.75	78.375	78.375	60.82449	62.907885	8

**G3** 

🕰 Dec	k Profile											
Type:	PS Precast I											
Dec	k concrete Reinfo	orcement										
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n	
>	Class AA 🛛 🗸	1 ~	0	132.063249	132.063249	7.75	78.0624	78.0624	60.646763	60.646763	8	
>	Class AA V	1 ~	0	132.063249	132.063249	7.75	(in) 78.0624	(in) 78.0624	(in) 60.646763	(in) 60.646763	8	

G4

:	PS Precast I										
eck	k concrete Rein	forcement									
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA $\sim$	1 ~	0	132.063249	132.063249	7.75	78.375	78.375	60.889622	60.889622	8

# **G5**

A De	eck	Profile											
lype		PS Precast I											
De	ck	concrete Reinfo	orcement										
		Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n	
	>	Class AA $\sim$	1 ~	0	132.063249	132.063249	7.75	78.375	78.375	60.889622	60.889622	8	
			,,										

# G6

e:	PS Precast I											
ecł	c concrete Re	info	orcement									
	Material		Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA	~	1 ~	0	132.063249	132.063249	7.75	78.0624	78.0624	60.646763	60.646763	8

# **G7**

e:	PS Precast I										
ec	k concrete Reinfo	orcement									
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
$\rightarrow$	Class AA 🛛 🗸	1 ~	0	132.063249	132.063249	7.75	75.0312	75.0312	58.455274	64.16933	8

G8 (Note that the same warning message will appear as it did for G1. Enter the Std values for LRFD values)

e:	PS Precast I										
ec	k concrete Reinf	orcement									
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA 🛛 🗸	1 ~	0	131.299342	131.299342	7.75	79.264323	79.264315	79.264323	79.264315	8

## Shear Reinforcement Ranges for other members

## G2-G7

a	r Reinforce	ment Rang	es					- 0	
	Start Distan	ce ,	Spacing						
[	1 ~								
	Nar	ne	Extends into deck	Start distance (ft)	Number of spaces	Spacing (in)	Length (ft)	End distance (ft)	
Ba	rs K&S	`		0.166667	1	0	0	0.166667	-
Ba	rs K&S	`	· 🔽	0.166667	18	4	6	6.166667	
Ba	rs K&S	```		6.166667	6	6	3	9.166667	
Ba	rs K&S	`	Y	9.166667	1	14.375	1.197917	10.364584	
Ba	rs K&S	`	Z	10.364584	76	18	114	124.364584	
Ba	rs K&S	`	<ul> <li>✓</li> </ul>	124.364584	1	14.375	1.197917	125.562501	
Ba	rs K&S	`	Y	125.562501	6	6	3	128.562501	
Ba	rs K&S	`	Contraction (1998)	128.562501	18	4	6	134.562501	
rrı	up wizard	Stirr	up design to	View calc	S	N	ew Dup	Apply Co	e
rrı	up wizard	Stirr	up design to	View calcs	S			New Dup	New Duplicate Delet

/ert	Start Distance	- <b>H</b>	Spacing					
par	n: 1 v							
	Name		Extends into deck	Start distance (ft)	Number of spaces	Spacing (in)	Length (ft)	End distance (ft)
>	Bars K&S	~		0.166666	1	0	0	0.166666
	Bars K&S	~	$\sim$	0.166666	18	4	6	6.166666
	Bars K&S	~	<ul> <li>Image: A second s</li></ul>	6.166666	6	6	3	9.166666
	Bars K&S	~	<ul> <li>Image: A set of the set of the</li></ul>	9.166666	1	9.9375	0.828125	9.994791
	Bars K&S	~	<ul> <li>Image: A set of the set of the</li></ul>	9.994791	76	18	114	123.994791
	Bars K&S	~	$\sim$	123.994791	1	9.9375	0.828125	124.822916
	Bars K&S	~	<ul> <li>Image: A second s</li></ul>	124.822916	6	6	3	127.822916
	Bars K&S	~	<ul> <li>Image: A set of the set of the</li></ul>	127.822916	18	4	6	133.822916

Once the input for Span 3 is complete, create Span 4 in a similar manner. The required superstructure input screens and member input data are shown below.

Definition Analysis Space E	"		
Name: Span 4	ingine.		Modeling Multi-girder system MCB With frame structure simplified definition
Default units: US Customary Number of spans: 1 Number of girders: 6	<ul> <li>Enter span lengths along the reference line:</li> <li>Span Length (ft)</li> <li>1 66.3642</li> </ul>		Concrete Deck ✓ For PS/PT only Average humidity: 70 % Member alt. types Steel ✓ P/S ℝ/C ☐ Timber ─ P/T
Horizontal curvature along reference	e line		
Horizontal curvature	Distance from PC to first support line:	ft	
Superstructure alignment	Start tangent length:	ft	
Superstructure alignment	Start tangent length: Radius:	ft	
Superstructure alignment Curved Tangent, curved, tangent	Start tangent length: Radius: Direction: Left	ft ft v	
Superstructure alignment Curved Tangent, curved, tangent Tangent, curved	Start tangent length: Radius: Direction: Left End tangent length:	ft ft v	
Superstructure alignment Curved Tangent, curved, tangent Tangent, curved Curved Curved, tangent	Start tangent length: Radius: Direction: End tangent length: Distance from last support line to PT:	ft f	
Superstructure alignment Curved Tangent, curved, tangent Curved, tangent Curved, tangent	Start tangent length: Radius: Direction: End tangent length: Distance from last support line to PT: Design speed:	ft ft v ft	
Superstructure alignment Curved Tangent, curved, tangent Tangent, curved Curved, tangent	Start tangent length: Radius: Direction: End tangent length: Distance from last support line to PT: Design speed: Superelevation:	ft ft v ft	
Superstructure alignment Curved Tangent, curved, tangent Curved, tangent Curved, tangent	Start tangent length:       Image: Comparison of the second	ft f	

	Descrip	otion			Stage		Туре		Time* (davs)	
DC1	DC acting on non-com	posite se	ection	Non-comp	osite (Stage 1)	Ŧ	D,DC	*	(,-,	
DC2	DC acting on long-tern	n compo	site section	Composite	(long term) (Stage 2	2) -	D,DC	*		
DW	DW acting on long-terr	m comp	osite section	Composite	(long term) (Stage 2	2) -	D,DW	*		_
SIP Forms	Weight due to stay-in-	place for	ms	Non-comp	osite (Stage 1)	*	D,DC	*		
tressed member	s only case descriptions						New	Dupli	icate	Dele
							ОК	Ар	ply	Can
yout Diaphrag	gms	<i>c</i> : 1								
Support	Skew (degrees)		Perpendicula Along suppo	entation ar to girder ort						
Support	Skew (degrees)		er spacing ori Perpendicula Along suppo	entation ar to girder ort						
Support > 1 2	Skew (degrees) 39.0218889 -2.6880054		er spacing ori Perpendicula Along suppo	entation ar to girder ort Girder spacin (ft)	g					
Support       >       1       2	Skew (degrees)		Perpendicula Along suppo Girder bay Star gir	entation ar to girder ort Girder spacin (ft) rt of En der gi	g d of rder					
Support       >       1       2	Skew (degrees)		Girder bay 1 99	entation ar to girder ort Girder spacin (ft) rt of En der gi 0.4063	9 d of r2917					
Support	Skew (degrees)         Image: Comparison of the state of the sta		Finder Star Sirder Star bay Star 1 9 2 9.54	entation ar to girder ort Girder spacin (ft) rt of En der gi 0.4063 83333	9 d of r22917 7.4583					
Support > 11 2	Skew (degrees)         Image: Comparison of the state of the sta		Final States Sta	Girder spacin (ft) Alton der gi Alton Bassas Alton Bassas Alton Bassas	9 d of rder 7.2917 7.4583 7.3333					
Support > 1 2	Skew (degrees) 39.0218889 -2.6880054		First States Sta	Girder spacin (ft) Addes	9 d of rder 7.2917 7.4583 7.3333 7.2917					
Support 1 2	Skew (degrees) 39.0218889 -2.6880054		Sirder bay 1 99.54 3 99.54 3 99.54 3 99.54 3 99.54 3 99.54 3 99.54 3 99.54 3 99.54 5 88	entation         int o girder           ar to girder         ort           ort         fill           der         gi           0.4063         0           0.6354         0           0.5781         0           0.6458         0	g d of rder 7.2917 7.4583 7.2917 7.2917 7.2917					



umber o Layout	of spans: Diap	1 hragms	Number of	girders: 6									
Girder b	bay: 5		~ (	Copy bay to.		Diaphra wizare	igm d						
Su	upport umber	St dist (	art ance ft)	Diaphragm spacing (ft)	Number of spaces	Length (ft)	Er dista (f	nd ance t)	Load (kip)	Diaphragm			
		Left girder	Right girder	(14)			Left girder	Right girder					
1	~	0	0	0	1	0	0	0	5.35	Not Assigned	$\sim$	1	
1	~	20.9175	26.401	0	1	0	20.9175	26.401	3.15	Not Assigned	$\sim$		
1	~	46.3171	51.9323	0	1	0	46.3171	51.9323	3.15	Not Assigned	~		
1	~	75.941458	81.727304	0	1	0	75.941458	81.727304	4.21	Not Assigned	$\sim$		
			ckness		÷								
t overhan Deck	Deck (cr	+ ont'd) Para	pet Median	Railing	Generic	→ Right ove Sidewalk	rhang Lane position	Striped lane	s Wea	aring surface			
toverhan Deck	Deck (co	+ + + + + + + + + + + + + + + + + + +	pet Median	Railing	Generic × the brid	Right over	rhang Lane position	Striped lane	s Wea	aring surface			
Deck Deck	Deck (co	ont'd) Para	pet Median ence line is wit	Railing hin Start	Generic v the briv Er	Right over	rhang Lane position	Striped lane:	s Wea	aring surface			
t overhan Deck Supersti Distance superstr	Deck (co ructure d e from le ructure d	efinition refere	pet Median ence line is wit cto nce line: 2	Railing thin Start 1.5541 ft	Generic v the brid Er 21.4473	→ Right ove Sidewalk dge deck. ndft	nhang Lane position	Striped lane:	s Wea	aring surface			
Deck Deck Superstr Distance superstr Distance superstr	Deck (co ructure d e from le ructure d e from rig ructure d	efinition refere tedge of decl efinition refere	pet Median ence line is with c to nce line: 2 ck to 2 nce line: 2	Railing hin Start 1.5541 ft 1.517 ft	Generic > the bria Er 21.4473 21.8545	Right over Sidewalk dge deck. nd ft ft	arhang Lane position	Striped lane	s Wea	aring surface			
Deck Deck Distance superstr Distance superstr Left ove	Deck (co ructure d e from le ructure d e from rig ructure d e from rig ructure d	efinition refere tedge of decl lefinition refere ght edge of de ght edge of de efinition refere	pet Median ence line is wit c to ck to ck to c ence line: 2 ance line: 3	Railing           thin         Start           1.5541         ft           1.517         ft           0.056666         ft	Generic v the briv 21.4473 21.8545 3.056666	Right over Sidewalk dge deck. id ft ft ft ft	rhang Lane position	Striped lane	s Wea	aring surface			
Deck Superstr Distance superstr Distance superstr Left ove Comput	Deck (cr ructure d e from le ructure d e from rig ructure d erhang: ted right	ont'd) Para lefinition refere ft edge of decl efinition refere ght edge of de elefinition refere overhang:	pet Median ence line is wit to co nce line: 2 ck to nce line: 3 3 3	Railing           thin           Start           1.5541           ft           1.517           ft           .056666           ft           .617241	Generic v the bria Er 21.4473 21.8545 3.056666 3.618778	Aight over Sidewalk dge deck. nd ft ft ft ft ft ft	rhang Lane position	Striped lane	s Wea	aring surface			

Median Railing	Generic	Right c Sidewalk	verhang Lane p	position Str	triped lanes	Wearing surface	Apply	Cance
Median Railing	Generic	Right c Sidewalk	Lane p	bosition Str	triped lanes	Wearing surface	Apply	Cance
Median Railing	Generic	Right c Sidewalk	Lane p	position Str	triped lanes N	Wearing surface	Apply	Cance
Median Railing	Generic	Sidewalk	Lane p	position Str	triped lanes	OK	Apply	Cance
AA in Assigned V		~				OK	Apply	Cance
in  Assigned  Kip/in						OK	Apply	Cance
<pre>eAssigned</pre>						OK	Apply	Cance
Median Railing					(	OK	Apply	Cance
Median Railing					(	ОК	Apply	Cance
Median Railing					(	ОК	Apply	Cance
Median Railing					(	ОК	Apply	Cance
Median Railing					(	ОК	Apply	
Median Railing							дрру —	
Median Railing								
Median Railing								
	Generic	Sidewalk	Lane p	oosition Str	triped lanes	Wearing surface		
Load case	Meas	sure to c	Edge of de dist. measur from	eck Distanc ured star (ft)	ce at Distance int end	at Front face orientation		
DC2	✓ Back	~ Le	eft Edge	<ul> <li>✓ 0.166</li> </ul>	6666 0.1666	i66 Right ~		
DC2	✓ Back	~ R	ight Edge	~ 0.166	6666 0.1666	i66 Left 🗸		
DC2 DC2	Load case	Load case Meas >> Back >> Back	Load case     Measure to     o       V     Back     V     L       V     Back     V     R	Load case     Measure to     Edge of didist.measure from        Back      Left Edge        Back      Right Edge	Load case     Measure to     Edge of deck dist. measured from     Distan sta (ft       V     Back     Left Edge     0.16       V     Back     Right Edge     0.16	Load case     Measure to Measure to Back     Edge of deck dist. measured from     Distance at start (ft)     Distance end (ft)       V     Back     V     Left Edge     0.166666     0.1666       V     Back     V     Right Edge     0.166666     0.1666	Load case     Measure to     Edge of deck dist. measured from     Distance at start (ft)     Distance at end (ft)     Front face orientation       V     Back     Left Edge     0.166666     0.166666     Right        V     Back     Right Edge     0.166666     0.166666     Left	Load case     Measure to     Edge of deck dist. measured from     Distance at start (ft)     Distance at end (ft)     Front face orientation       V     Back     Left Edge     0.166666     0.166666     Right     V       V     Back     Right Edge     0.166666     0.166666     Left     V

	1+						_		
(A)	(B) Supersi	ructure Definition R	eference Line						
Travelway 1	┥/╢┝─	Travelway 2	→Л						
Deck Deck (cont'd)	Parapet Medi	an Railing	Generic Sidew	valk Lane position S	triped lanes	Wearing surface			
Dista	nce from left edge	of Distance fr	om right edge of	Distance from left edge	of Distance f	rom right edge of			
Travelway number	lway to superstruct inition reference lin at start (A)	ture travelway t ne definitior at	to superstructure n reference line start (B)	travelway to superstructu definition reference line at end (A)	e definitio	to superstructure on reference line it end (B)			
> 1	(ft) -20.1	374	(ft) 20.1003	(ft) -20.03	106	(ft) 20.4378			
LRFD fatique									
Lanes available to	o trucks:								
Override Truck	(fraction:		·			New Dup	licate	Delete	
			ompute						
Stress Limit Sets -	Concrete						— C	]	
• Stress Limit Sets - ame:	Concrete Class F5						- C	]	
Stress Limit Sets - ame: escription:	Concrete Class F5						C	]	
Stress Limit Sets - ame: escription: prrosion condition:	Concrete Class F5 Moderate		~				- c	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to	Concrete Class F5 Moderate ension stress	limit coef. (US	S) override:				_ [	]	
Stress Limit Sets - ame: escription: prrosion condition:     Final allowable to procrete material:	Concrete Class F5 Moderate ension stress Class F5	limit coef. (US	>) 5) override: >	)			— [	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to porcrete material:	Concrete Class F5 Moderate ension stress Class F5 Compute	limit coef. (US	S) override:				— c	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to poncrete material:	Concrete Class F5 Moderate ension stress Class F5 Compute	limit coef. (US	> 5) override: >				_ [	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to porcrete material:	Concrete Class F5 Moderate ension stress Class F5 Compute	limit coef. (US LFD 2.4	> 5) override: >	LRFC 2.6	) ksi		_ [	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to procrete material: itial allowable comp itial allowable tensi	Concrete Class F5 Moderate ension stress Class F5 Compute pression:	limit coef. (US LFD 2.4 0.1897367	>) override: >) ksi	LRFC 2.6 0.1896	) ksi ksi		_ C	]	
Stress Limit Sets - ame: escription: prosion condition:     Final allowable to procrete material: itial allowable comp itial allowable tensi nal allowable comp	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on:	limit coef. (US LFD 2.4 0.1897367	>) override: >) ksi ksi ksi	LRFC 2.6 0.1896 3	) ksi ksi		_ [	]	
Stress Limit Sets - ame: escription: prrosion condition:     Final allowable to procrete material: itial allowable comp itial allowable tensi nal allowable comp nal allowable tensi	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on: ression:	limit coef. (US LFD 2.4 0.1897367 3	> 5) override: > ksi ksi ksi	LRFC 2.6 0.1896 3	) ksi ksi si		— C	]	
Stress Limit Sets - ame: escription: prosion condition: Final allowable to procrete material: itial allowable comp itial allowable tensional allow	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on: ression: on:	limit coef. (US LFD 2.4 0.1897367 3 0.4248529	>) override: >) verride: v ksi ksi ksi lsi	LRFE 2.6 0.1896 3 0.4248	) ksi ksi 529 ksi		_ [	]	
Stress Limit Sets - ame: escription: orrosion condition:     Final allowable to oncrete material: itial allowable comp nal allowable comp nal allowable tensio nal allowable tensio nal allowable DL co	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on: rression: on: mpression:	limit coef. (US LFD 2.4 0.1897367 3 0.4248529 2	> S) override: ksi ksi ksi ksi	LRFE 2.6 0.1896 3 0.4248 2.25	) ksi ksi ksi 529 ksi ksi		_ [	]	
Stress Limit Sets - ame: escription: prrosion condition:     Final allowable to procrete material: itial allowable comp itial allowable tensio nal allowable tensio nal allowable tensio nal allowable slab co	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on: mpression: on: compression:	limit coef. (US LFD 2.4 0.1897367 3 0.4248529 2	>) override: >) verride: ksi ksi ksi ksi ksi ksi	LRFC 2.6 0.1896 3 0.4248 2.25	) ksi ksi 529 ksi ksi ksi		_ [	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to procrete material: itial allowable comp nal allowable tension nal allowable tension nal allowable tension nal allowable tension nal allowable comp nal allowable slab con nal allowable slab con nal allowable comp L+1/2(Pe+DL))	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on: ression: on: mpression: compression: ression:	limit coef. (US LFD 2.4 0.1897367 3 0.4248529 2 2 2	> ) override: >) ksi ksi ksi ksi ksi ksi ksi	LRFC 2.6 0.1896 3 0.4248 2.25 2	) ksi ksi 529 ksi ksi ksi ksi ksi		[	]	
Stress Limit Sets - ame: escription: prrosion condition: Final allowable to procrete material: itial allowable comp ial allowable tensional allowable tensional allowable tensional allowable tensional allowable tensional allowable comp hal allowable slab con hal allowable slab con hal allowable slab con hal allowable comp L+1/2(Pe+DL))	Concrete Class F5 Moderate ension stress Class F5 Compute pression: on: ression: om mpression: compression: ression:	limit coef. (US LFD 2.4 0.1897367 3 0.4248529 2 2 2	> ) override: >) verride: ksi ksi ksi ksi ksi ksi ksi	LRFC 2.6 0.1896 3 0.4248 2.25 2	) ksi ksi 529 ksi ksi ksi ksi			]	

PS13 – 2 Simple Span Prestressed I Beam with a Multi-Column Pier on Drilled Shafts Example

Prestress Properties					-		>
me: 1/2" (7W-270) LR	l						
General P/S data Lo	ss data - lump sum Loss dat	a - PCI	)				
P/S strand material:	1/2" (7W-270) LR	~	Jacking stress ratio:	0.750	]		
Loss method:	AASHTO Approximate	$\sim$	P/S transfer stress ratio:				
			Transfer time:	24.0	Hours		
			Age at deck placement:	30.00	Days		
			Final age:	36500.00	Days		
Percentage DL: 0.0	%						
				OK	Apply	Canc	el

A Shear Reinforcement Definition - Vertical	- 0	×
Name: Bars K&S		
Materia	~	
Bar size		
Numbe		
Inclinati	Degrees	
Reinforcement		
	Apply Cancel	I

## Member Input Data

Remember to wait to compute effective flange width until all member alternatives have been created.

		SIP					Beam Pr	ojection	Stress	
Beam	Span	Uniform	Beam	Girder	Prestress		Left	Right	Limit	Haunch
No.	Length	Load	Shape	Material	Properties	n	End	End	Range	Y1
	ft	k/ft					in	in	ft	in
G1	50.51026	0.056	AASHTO TYPE IV	Class F5	1/2" (7W-270) LR	7	16.875	9	52.6665	1.00
G2	56.77454	0.113	AASHTO TYPE IV	Class F5	1/2" (7W-270) LR	7	16.875	9	58.9308	1.00
G3	63.15814	0.113	AASHTO TYPE IV	Class F5	1/2" (7W-270) LR	7	16.875	9	65.3144	1.00
G4	69.56865	0.113	AASHTO TYPE IV	Class F5	1/2" (7W-270) LR	7	16.875	9	71.7249	1.00
G5	75.94146	0.113	AASHTO TYPE IV	Class F5	1/2" (7W-270) LR	7	16.875	9	78.0977	1.00
G6	81.7273	0.056	AASHTO TYPE IV	Class F5	1/2" (7W-270) LR	7	16.875	9	83.8836	1.00

The Deck Profile windows for the beams are shown below.

### G1

pe:	PS Precast I											
Dec	k concrete	Reinf	orcement									
	Materi	al	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA	$\sim$	1 ~	0	50.51026	50.51026	7.75	80.578804	80.379299	80.578804	80.379299	

### **G2**

)e:	PS Precast I										
Decl	k concrete Reinfo	orcement									
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA 🛛 🗸	1 ~	0	56.774537	56.774537	7.75	88.644465	88.3957	88.644465	88.3957	

**G3** 

pe:	eck Profile e: PS Precast I beck concrete Reinforcement Material Support distance (ft) End distance (ft) > Class AA $\checkmark$ 1 $\checkmark$ 0 63.158144 63.158144											
Dec	k concrete	Reinf	orcement									
	Materia	I	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA	$\sim$	1 ~	0	63.158144	63.158144	7.75	89.601391	88.651175	89.601391	88.651175	

**G4** 

	DS Drocost I											
Dec	k concrete Rei	nfo	rcement									
	k Protile PS Precast I k concrete Material Class AA ~		Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA	~	1 ~	0	69.568648	69.568648	7.75	89.502855	87.656801	89.502855	87.656801	

#### **G5**

pe:	PS Precast I										
Dec	k concrete Rein	forcement									
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
>	Class AA 🛛 🗸	1 ~	0	75.941458	75.941458	7.75	85.046464	87.398657	85.046464	87.398657	8

**G6** (Note that the same warning message will appear as it did for Span 3, G1 & G8. Enter the Std values for LRFD values)

	PS Precast I										
ck	concrete Reinfo	orcement									
	Material	Support number	Start distance (ft)	Length (ft)	End distance (ft)	Structural thickness (in)	Start effective flange width (Std) (in)	End effective flange width (Std) (in)	Start effective flange width (LRFD) (in)	End effective flange width (LRFD) (in)	n
,	Class AA $\sim$	1 ~	0	81.727304	81.727304	7.75	83.609307	87.133454	83.609307	87.133454	8

The Superstructure Definitions are now complete. Bridge Alternatives can now be created.

# Bridge Alternatives

Double-click on **BRIDGE ALTERNATIVES** in the **Bridge Workspace** tree and enter the data as shown below.

Bridge Alternative			_	υх
Alternative name: AS-BU	ILT			
Description Substrue	ctures			
Description:				
Horizontal curvatu	re	Global positioning		
Reference line length:	201.0718 ft	Distance: 0	ft	
Start bearing	End bearing	Offset: 0	ft	
Starting station:	0 ft	Elevation:	ft	
Bearing:	N 90^ 0' 0.00" E			
Bridge alignment		Start tangent length:		ft
O Curved		Curve length:		ft
Tangent, curved	l, tangent	Radius:		ft
Tangent, curved		Direction: Left		
		End tangent length:		ft
Superstructure wizard	Culvert wizard			
wizard				Canad

Navigate to the **Substructures** tab and define the substructure locations as shown below.

tern	ative name: AS	-BUILT				
Alternative name:       AS-BUILT         Description       Substructures         Substructure       Station (ft)       Offset (ft)       Unit type         >       Bent 3       0       0       Abutment ~         Bent 4       133.5642       0       Pier ~         Bent 5       201.0718       0       Abutment ~						
	Substructure unit name	Station (ft)	Offset (ft)	Unit type		
>	Bent 3	0	0	Abutment 🗸		
	Bent 4	133.5642	0	Pier 🗸		
	Bent 5	201.0718	0	Abutment $\ {}^{\checkmark}$		

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

### SUPERSTRUCTURE

Double click on the **SUPERSTRUCTURES** node in the **Bridge Workspace** tree and enter **Span 3** as the **Superstructure Name**.

A Superstructure								-		$\times$
Superstructure nam	e: Span 3									
Description	Alternatives	Vehicle path	Engine	Substructures						
Description:					]					
Reference line	e									
Distance:	0.00	ft								
Offset:	0.00	ft								
Angle:	0.00	Degrees								
Starting statio	on: 0.00	ft								
						OK	Δι	anly	Cano	el
						OK		ניקי	canc	

Navigate to the Substructures tab and assign substructures to each support.

Sup	erstructure	•							-		×
perst	tructure na	me: Span 3			]						
Des	cription	Alternatives	Vehicle path	Engine	Substructure						
Sel	ect the sub	structure supp	orts:								
	Support	Substructure support									
Þ	1	Bent 3 🔹									-
	2	Bent 4 *	,								
											v
								New		Delete	
							01			Car	e e l

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

### SUPERSTRUCTURE ALTERNATIVES

Double click on the **SUPERSTRUCTURE ALTERNATIVES** node in the **Bridge Workspace** tree and enter **Span 3** as the **Alternative Name** and select **Span 3** as the **Superstructure Definition**.

Superstructure Alternat	ve			-		×
Alternative name:	Span 3					
Description:	re definition: Span 3 v re type: Girder nain members: 8 Length (ft) 132.0625					
Superstructure definition:	Span 3	~				
Superstructure type:	Girder					
Number of main members	8					
Span Length (ft)						
> 1 132.0625						
	OK		Apply		Cano	el

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

uperstructure name	Span 4					
Description Al	ternatives	Vehicle path	Engine	Substructures		
Description:						
Reference line						
Distance:	135.0659	ft				
Offset:	0	ft				
Angle:	0	Degrees				
Starting statio	n: 135.0659	ft				

Repeat the process for creating a Superstructure and Superstructure Alternative for Span 4. See images below.

A Sup	erstructur	e					-	- C	ı ×
Superst	tructure n	ame: Span 4							
Des	cription	Alternatives V	ehicle path Engine	Substructures					
Sel	ect the su	bstructure supports	:						
	Support	Substructure							
+	1	Bent 4 *							-
	2	Bent 5 -							
									Y
							New	Dele	ete
						OK	Apply		ancel
							. 46.9		
n c	uperstru	ucture Alternatio			 				~
	uperstru	Icture Alternatio	ve						^
Alter	native r	name:	Span 4						
Desc	ription:								
Supe	erstructu	ure definition:	Span 4		~	ĩ			
Supe	erstructu	ire type:	Girder						
Num	ber of r	main members:	6						
			Ū						
	Span	Length (ft)							
>	1	66.3642	-						
			-						
					OK	A	pply	Can	cel

See the completed Bridge Alternative below.



#### Stiffness Analysis

The **Stiffness Analysis** information can now be entered by double clicking on the **Stiffness Analysis** node in the **Bridge Workspace** tree. Navigate to the **Relative stiffness** tab of this window. For this example, 50% of the total span length is applied to Bent 4 and 25% to the other units as shown below.

Relative Stiffness Analysis - AS-BUILT				- C	ב	
Bearing data Bearing data (cont'd) Relative stiffness						
Longitudinal force distribution     Longitudinal forces, except friction, carried only by fixed bearings     Longitudinal forces carried by both fixed and expansion bearings     Simplified method of distribution     Refined method of distribution considering relative stiffness     User specify superstructure length for each load and each pier     Specify length unit	Br	idge alternative ust specify the	e contains multip lengths yourself.	le superstructur	es. Y	ou
Specify length percentage Compute superstructure length to apply to each pier		Substructure unit name	Superstructure length to apply to unit (ft)	Superstructure length to apply to unit (%)		
	•	Bent 3 Bent 4 Bent 5		25.0 50.0 25.0		4
						~

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

## Pier Data Entry

#### Piers

Double click on the **Bent 4** node in the **Bridge Workspace** tree and enter the information as shown below.

Input skew angle     Input bearing angle	ikew angle: 39.02 Degrees	Description:	
Finished groundline elevation: Soil density:	376.5 ft 0.12 kcf	Superstructure defined in BrDR	
Back superstructure longitudi     Consider as fixed     Consider as expansion     Pier location relative to bridge	Ahead superstructure Consider as fixed Consider as expa	ongitudinal direction	
Station: 133.5642 ft	Offset: 0 ft		
		Constant and Const	
Computed pier location relation       Station:     133.5642     ft       Offset:     0     ft	Computed pier coor X: 133.5642 Y: 0	ft ft	

#### **Pier Alternative**

Double click on the Pier Alternatives node in the Bridge Workspace tree. Select the Frame Pier and click Next.



A New Pier Alternative		$\times$
Туре:	RC Frame Pier	
Name:	Bent 4	]
Description:		
Units:	US Customary	
Number of columns:	3 🗘	
Columns have combined footings:		
	< Back Finish Car	ncel

Enter the information as shown below in the New Pier Alternative window and click Finish.

The following window will appear. There is no input required for this window.

escription Stiffness Reports			
Pescription:	↑ Units: US Customary		
	LRFD substructure design settings		
	Preliminary mode		
Columns	Default design settings: Preliminary Design Setting (US)		
	Override default		
Number of columns: 3	Design settings:	$\sim$	
Columns have combined footings: O Yes  No	Final mode		
	Default design settings: Final Design Setting (US)		
	Override default		
	Design settings:	$\sim$	
	Advanced DLA		
			_

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

#### Geometry

Double click on the **Geometry** node in the **Bridge Workspace** tree under **Bent 4**. Edit the dimensions in blue as shown below.



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

## Сар

Double click on the **Cap** node in the **Bridge Workspace** tree under **Bent 4**. Enter the information as shown below.

Pilling Pillin	Vedestals pan: Member	CL bearing	Đ	cap top conin	guration:	Sloped	Ca	p material:	0105	2 F 1 F 1	~	
Back sp	Pedestals pan: Member	CL bearing	Đ	posure factor:								
Back sp	pan: Nember	CL bearing										
N	/lember	CL bearing										
	61	station (ft)	9	Angle betw member and C (Degree	een CL L support es)	Bearing seat elevation (ft)	Pedestal width (ft)	Pedestal length (ft)				
	01	146.726	505	1	29.172937	408.8421	0	C				
	G2	142.315	911		129.02229	409.133767	6.5	2.5				
	G3	138.220	125		129.02229	409.399392	6.5	2.5				
	G4	134.124	339		129.02229	409.659808	6.5	2.5				
	G5	129.995	749		129.02229	409.920225	6.5	2.5				
	G6	125.899	963		129.02229	410.175433	6.5	2.5				
	G7	121.804	177		129.02229	410.420225	6.5	2.5				
>	G8	117.259	159	1	28.609122	410.68585	5.05	2.5				
head	span:											
incou	span.		0	Lbooring	Angle	hotwoon Cl	Popring	oot Dod	ortal	Dedectal		
	Merr	ber		station (ft)	member a	and CL support legrees)	elevatio (ft)	on wi	dth t)	length (ft)		
	G	1		150.056531		87.190847	410.519	183 7.	2031	2.3333		1
	G	2		144.134162		87.228565	410.909	808	9.5	2.3333		
	G	3		138.100331		87.232688	411.300	433	9.5	2.3333		
	G	4		132.033717		87.372234	411.68	585	9.5	2.3333		
	G	5		126.00318		87.486085	412.055	642	9.5	2.3333		
>	G	6		120.559635		87.076463	412.378	558 6.	2969	2.3333		

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

### Components

Double click on the **Components** node in the **Bridge Workspace** tree under **Cap**. Select **Straight Cantilever** for both the **Cap Left Cantilever** and **Cap Right Cantilever** as shown below.

A Cap Components - Bent 4 - Bent 4	-	×
Cap type 🖲 Beam 🔵 Inverted Tee Beam		
Cap left cantilever Cap right cantilever		
Straight Cantilever		
A Cap Components - Bent 4 - Bent 4	-	$\times$
Cap type  Beam  Inverted Tee Beam		
Cap left cantilever Cap right cantilever		
Straight Cantilever Sloped Cantilever		

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

#### Geometry

Double click on the **Geometry** node in the **Bridge Workspace** tree under **Cap**. Edit the dimensions in blue as shown below.



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

### Reinforcement

Double click on the **Reinforcement** node in the **Bridge Workspace** tree under **Cap**. Edit the information in both the **Flexural** and **Shear** tabs as shown below.

Rein																	
ural	Sł	near															
onai	itudin	al skin —															
Bar si	ize: {	8 ~	Bar spi	acing: 12	ir	n Barma	terial: Grade	e 60	~	Stimup c	lear cover:	2	in				
										ounop e		2					
rima	ary fle	xural															
R	einfo	rcement in	put metho	bd													
	O si	implified	Adv	anced	🗸 Reint	forcement f	ollows cap pr	rofile									
				Vertical					Charak .	Charlinka	E-						
	Set	Mea: from	sure cap	distance (in)	Bar size	Number	Materia	əl	distance (ft)	length (ft)	distar (ft)	nce sta	kat Hook rt end	at [	Developed at start	Developed at end	
>	1	Bottom	$\sim$	3.333333	11 ~	8	Grade 60	~	0.208333	53.58333	3 53.79	1666					-
	2	Bottom	~	51.333333	11 ~	8	Grade 60	~	0.208333	53.58333	3 53.79	1666					
													New		Duplicate	e Dele	ete
													New		Duplicate	e Dele	ete
													New	ОК	Duplicate	e Dele	ete Ca
													New	OK		e Dela	ete Ca
Reinf	forcen	nent - Bent	4 - Bent 4										New	OK	Duplicate	e Dele Apply	ete Ca
Reinf	forcen	nent - Bent	4 - Bent 4											OK	Duplicate	2 Dele	ete Ca
Reinf	forcen	nent - Bent ear	4 - Bent 4											OK ]	Duplicate	e Dela	ete Ca
Reinf	forcen Shi	nent - Bent ear Number of legs	4 - Bent 4 Ma	terial	Meas	ure from	Direc	tion	Start distance (ft)	Number of spaces	Spacing (in)	Length (ft)	End (ft)	ок ]	Duplicate X	2 Dela	ete Ca
Reinf Iral Bar	forcen Shi	nent - Bent ear Number of legs 4	4 - Bent 4 Mai Grade 60	terial V	Meas Left Edge o	ure from f Cap	Direct V Right	tion	Start distance (ft) 0.25	Number of spaces 1	Spacing (in) 0	Length (ft)	End distance (ft) 0.2	OK	Duplicate	e Dela	ete Ca
Reinf Iral Bar 5 5	forcer Shi size	nent - Bent ear Number of legs 4 4	4 - Bent 4 Ma Grade 60 Grade 60	terial v I	Meas Left Edge o Left Edge o	ure from f Cap f Cap	<ul> <li>✓ Right</li> <li>✓ Right</li> </ul>	tion V	Start distance (ft) 0.25 0.25	Number of spaces 1 6	Spacing (in) 0 7.5	Length (ft) 0 3.75	End distance (ft) 0.2	OK	Duplicate       X	2 Dele	ete Ca

5	$\sim$	4	Grade 60		Left Edge of Cap	$\sim$	Right	~	0.25	1	0	0	0.25
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	0.25	6	7.5	3.75	4
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	4	5	12	5	9
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	9	8	6	4	13
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	13	9	12	9	22
5	$\sim$	4	Grade 60	$\sim$	Left Edge of Cap	$\sim$	Right	~	22	8	6	4	26
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	26	2	12	2	28
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	28	8	6	4	32
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	32	9	12	9	41
5	$\sim$	4	Grade 60	$\sim$	Left Edge of Cap	$\sim$	Right	~	41	8	6	4	45
5	$\sim$	4	Grade 60	~	Left Edge of Cap	$\sim$	Right	~	45	5	12	5	50
5	$\sim$	4	Grade 60	$\sim$	Left Edge of Cap	$\sim$	Right	~	50	6	7.5	3.75	53.75
									Dup & Mi	rror	New	Duplicate	Delet
	5 5 5 5 5 5 5 5 5 5 5 5	5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~       5     ~	5        5        5        5        4       5        4       5        4       5        4       5        4       5        4       5        4       5        4       5        4       5        4       5        4	5         4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60           5          4         Grade 60	5          4         Grade 60            5          4         Grade 60	5        4       Grade 60        Left Edge of Cap         5        4	5        Grade 60        Left Edge of Cap          5        4       Grade 60        Left Edge of Cap	5       4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right         5        4       Grade 60       Left Edge of Cap       Right <t< td=""><td>5         4         Grade 60         V         Left Edge of Cap         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V           5         V         4         Grade 60         V         Left Edge of Ca</td><td>5         4         Grade 60         V         Left Edge of Cap         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.9           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         22           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         228           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         322           5         V         4         Grade 60         V         Left Edge of Cap         V         Right<!--</td--><td>5<math>\checkmark</math>4Grade 60<math>\checkmark</math>Left Edge of Cap<math>\checkmark</math>Right<math>\checkmark</math>0.2515<math>\checkmark</math>4Grade 60<math>\checkmark</math>Left Edge of Cap<math>\checkmark</math>Right<math>\checkmark</math>0.2565<math>\checkmark</math>4Grade 60<math>\checkmark</math>Left Edge of Cap<math>\checkmark</math>Right<math>\checkmark</math>455<math>\checkmark</math>4Grade 60<math>\checkmark</math>Left Edge of 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60<math>\checkmark</math>Left Edge of Cap<math>\checkmark</math>Right<math>\checkmark</math>45.55<math>\checkmark</math>4Grade 60<math>\checkmark</math>Left Edge of Cap<math>\checkmark</math>Right<math>\checkmark</math>45.65<math>\checkmark</math><td>5          4         Grade 60          Left Edge of Cap         ×         Right         ×         0.25         1         0           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         0.25         6         7.5           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         4         5         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         9         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         13         9         12           5         ×      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        V         4         Grade 60         V         Left Edge of Ca	5         4         Grade 60         V         Left Edge of Cap         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.9           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         0.25           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         22           5         V         4         Grade 60         V         Left Edge of Cap         V         Right         V         228           5         V         4         Grade 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      0           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         0.25         6         7.5           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         4         5         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         9         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         13         9         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         22         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         12         12         12         12         5         ×         4         Grade 60         ×</td><td>5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       0.25       1       0       0         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       0.25       6       7.5       3.75         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       4       5       12       5         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       9       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       22       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\sim</math>       22       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\sim</math>       28       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>&lt;</td></td>	5 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 0.2515 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 0.2565 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 455 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 455 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 1395 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 22.85 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 26.25 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 28.85 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 28.85 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 41.85 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 45.55 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 45.55 $\checkmark$ 4Grade 60 $\checkmark$ Left Edge of Cap $\checkmark$ Right $\checkmark$ 45.65 $\checkmark$ <td>5          4         Grade 60          Left Edge of Cap         ×         Right         ×         0.25         1         0           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         0.25         6         7.5           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         4         5         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         9         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         13         9         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         22         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         12         12         12         12         5         ×         4         Grade 60         ×</td> <td>5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       0.25       1       0       0         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       0.25       6       7.5       3.75         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       4       5       12       5         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       9       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\checkmark</math>       22       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\sim</math>       22       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>       Left Edge of Cap       <math>\sim</math>       Right       <math>\sim</math>       28       8       6       4         5       <math>\checkmark</math>       4       Grade 60       <math>\checkmark</math>&lt;</td>	5          4         Grade 60          Left Edge of Cap         ×         Right         ×         0.25         1         0           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         0.25         6         7.5           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         4         5         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         9         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         13         9         12           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         22         8         6           5         ×         4         Grade 60         ×         Left Edge of Cap         ×         Right         ×         12         12         12         12         5         ×         4         Grade 60         ×	5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\checkmark$ 0.25       1       0       0         5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\checkmark$ 0.25       6       7.5       3.75         5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\checkmark$ 4       5       12       5         5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\checkmark$ 9       8       6       4         5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\checkmark$ 22       8       6       4         5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\sim$ 22       8       6       4         5 $\checkmark$ 4       Grade 60 $\checkmark$ Left Edge of Cap $\sim$ Right $\sim$ 28       8       6       4         5 $\checkmark$ 4       Grade 60 $\checkmark$ <



### COLUMNS

Expand the COLUMNS and Columns1 nodes in the Bridge Workspace tree.



#### Column1 - Components

Double click on the **Components** node under **Columns1** and enter the information as shown below.

<b>A</b> (	Column Comp	onents - Bent 4	- Bent 4 - Colum	in1				-		×
Nu	imber of cross-	section segme	nts for column:	1 💭						
	Segment	Material	Segment vary	Cross-section type				ΠĪ		
Þ	1	Class AA 👻	None *	Round	-		^		Segmer	nt 1
									Segmer	nt 2
							v			
						OK	Apr	lv	Cano	el
						- Ch		.,	curre	

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

#### Column1 - Geometry



Double click on the Geometry node and edit the dimensions in blue as shown below.

#### Column1 – Reinforcement Definitions

Double click on the **Reinforcement Definitions** node and click the **Generate Pattern** button. Enter the following information and click **Apply**.

A Column Reinforcement Ber	t 4 - Bent 4	-	D X
	Name: Bundle bars		
**Y +*X Sta Ahead	Bar size Material X Y (in) (in)		Å. 
Generate pattern	New Du	plicate	Delete
	OK A	pply	Cancel

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

PS13 – 2 Simple Span Prestressed I Beam with a Multi-Column Pier on Drilled Shafts Example

🖨 Generate Pattern W	izard					×
Pattern name:	P1		Bundle type	Bar size:	11 🗸	
Column segment:	1	$\sim$	Single	Material:	Grade 60	~
Segment cross section:	Ro.	und	2 Parallel     2 Perpendicular	Clear cover:	3.625 in	
Top / bottom:	Тор	$\sim$	🔾 3 Bar	Number of bars:	17	
Overall trans. width:	48.000	in				
Overall long. width:	48.000	in				
						OK Cancel

The Column Reinforcement window will be populated as shown below.

🕰 Column Reinforcement - P1 - Be	ent 4 - Bent	4						_		Х
	Name:	P1								
	Bund	lle bars								
++Y	Bar	Ba	ar ze	Material	X (in)	Y (in)				
	> 1	11	$\sim$	Grade 60 🛛 🗸	19.67	0				-
+X	2	11	$\sim$	Grade 60 🛛 🗸	18.341729	-7.105624				
	3	11	$\sim$	Grade 60 🛛 🗸	14.536305	-13.251593				
l	4	11	$\sim$	Grade 60 🛛 🗸	8.767673	-17.607862				
↓ Sta Ahead	5	11	$\sim$	Grade 60 🛛 🗸	1.814919	-19.586091				
L L	6	11	$\sim$	Grade 60 🛛 🗸	-5.382951	-18.91911				
	7	11	$\sim$	Grade 60 🛛 🗸	-11.853823	-15.696999				
	8	11	$\sim$	Grade 60 🛛 🗸	-16.723771	-10.354921				
	9	11	$\sim$	Grade 60 🛛 🗸	-19.335081	-3.614353				
	10	11	$\sim$	Grade 60 🛛 🗸	-19.335081	3.614353				
	11	11	$\sim$	Grade 60 🛛 🗸	-16.723771	10.354921				
	12	11	$\sim$	Grade 60 🛛 🗸	-11.853823	15.696999				
	13	11	$\sim$	Grade 60 🛛 🗸	-5.382951	18.91911				
	14	11	$\sim$	Grade 60 🛛 🗸	1.814919	19.586091				
	15	11	$\sim$	Grade 60 🗸 🗸 🗸	8.767673	17.607862				
	16	11	$\sim$	Grade 60 🛛 🗸	14.536305	13.251593				
	17	11	$\sim$	Grade 60 🛛 🗸	18.341729	7.105624				
										w
Generate pattern						New	Duplicat	e	Delete	:
						ОК	Apply		Cance	

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

#### Column1 - Reinforcement

Double click on the **Reinforcement** node and enter the information in both the **Flexural** and **Shear** tabs as shown below.

exural	Shear										
Set	Start distance (ft)	Straight length (ft)	End distance (ft)	Pattern	Hook a start	t Hook at end	Developed at start	Developed at end	Follows profile		
▶ 1	0.000	28.040	28.040	P1 *			1	1			
							Ν	iew [	Duplicate	Dei	ete
								OK	Apply		Cance
olumn R lexural Shear r ) Ties	einforceme Shear O Spira	ent - Colur ent type — ils • Sp	nn1 - Bent	: 4 - Bent 4	1			ОК	Apply	_	Canc
olumn R exural Shear r O Ties	einforceme Shear Shear Shear	ent - Colur ent type Is () Sp	nn1 - Bent iirals desig	4 - Bent 4	1			ОК	Apply	-	Canc
olumn R exural Shear r O Ties Bar s	einforceme Shear Shear Spira ize Pitc (in)	ent - Colur ent type isls © Sp h Ma	nn1 - Bent iirals desig terial	: 4 - Bent 4 Ined as tie Start distance (ft)	s Length (ft)	End distance (ft)		ОК	Apply	-	Canc
olumn R lexural Shear r Ties Bar s	einforceme Shear Shear Spira ize Pitc (in) + 12.00	ent - Colur ent type lls	nn1 - Bent iirals desig terial (	4 - Bent 4 ined as tie Start distance (ft) 0.000	4 Is Length (ft) 19.040	End distance (ft) 19.040		ОК	Apply	-	Canco
olumn R Shear r Ties Bar s 5 5	einforceme Shear Shear Spira ize Pitc (in) + 12.00 + 6.00	ent - Colur ent type h Ma 00 Grade 00 Grade	irals desig	4 - Bent 4 Ined as tie Start distance (ft) 0.000 19.040	Length (ft) 19.040 9.000	End distance (ft) 19.040 28.040		OK	Apply	-	Canc
olumn R Shear r ○ Ties Bar s 5 5	einforceme Shear Shear Spira ize Pitc (in) + 12.00 + 6.00	ent - Colur ent type in Ma 00 Grade 00 Grade	irals desig	4 - Bent 4 Ined as tie Start (ft) 0.000 19.040	Length (ft) 19.040 9.000	End distance (ft) 19.040 28.040		OK	Apply		

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

### FOUNDATION ALTERNATIVES

Double click on the **FOUNDATION ALTERNATIVES** nodes in the **Bridge Workspace** tree. Select the **Single Drilled Shaft** in the **New Foundation Alternative Wizard** and click **Next**.

A New Foundation Alternative Wizar	rd X
Spread Footing	Footing
< Back	Next > Cancel Help
A New Foundation Alternative Wi	izard X
Туре:	Drilled-Shaft Foundation
Name:	C1 Shaft
Description:	< >
Units:	US Customary
Top of shaft elevation:	376.29 ft
Bottom of shaft elevation:	318.00 ft
Shaft diameter:	4.50 ft
Shaft material:	Class AA
Rock socket:	
Bottom of socket elevation:	ft
Socket diameter:	ft
Socket material:	Class AA 🗸
< Back	Finish Cancel Help

Enter the information as shown below and click **FINISH.** 

### C1 Shaft – Geometry

Double click on the Geometry node under C1 Shaft in the Bridge Workspace tree. Enter data as shown below.



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

#### C1 Shaft – Reinforcement Definitions

Double click on the Reinforcement Definitions node and click the Generate Pattern button.

A Drilled Shaft Reinforcement Def	- Bent 4 - Bent 4 - Column1		-	
	Name:			
	Bundle bars			
<sup>↑</sup> Y	Bar Bar Size Material	X Y (in) (in)		
+*				~
Sta Ahead				
				v
Generate pattern		New	Duplicate	Delete
		OK	Apply	Cancel

Enter the following information and click **OK**.

A Generate Pattern Wi	zard							×
Pattern name:	P2		Bundle type	Bar size:	11 👻			
Drilled shaft segment:	Shaft	~	Single	Material:	Grade 60		~	
Segment cross section:	Ro.	und	<ul> <li>2 Parallel</li> <li>2 Perpendicular</li> </ul>	Clear cover:	6.625	in		
Top / bottom:	Тор	$\sim$	🔾 3 Bar	Number of bars:	17			
Overall trans. width:	54.000	in						
Overall long. width:	54.000	in						
							OK	Cancel

The **Drilled Shaft Reinforcement Def** window will be populated as shown below.

ed Shaft Reinforcement Def -	· Bent 4	- Ber	nt 4 - C	olumn					_	
	Nam	e: P	2							
		Bundl	le bars							
▲+Y		Bar	Bi	ar ze	Materia	al I	X (in)	Y (in)		
	>	1	11	$\sim$	Grade 60	~	19.67	0		
+X		2	11	$\sim$	Grade 60	$\sim$	18.341729	-7.105624		
/		3	11	$\sim$	Grade 60	$\sim$	14.536305	-13.251593		
		4	11	$\sim$	Grade 60	$\sim$	8.767673	-17.607862		
- 7 -		5	11	$\sim$	Grade 60	$\sim$	1.814919	-19.586091		
Cta thead		6	11	$\sim$	Grade 60	$\sim$	-5.382951	-18.91911		
		7	11	$\sim$	Grade 60	$\sim$	-11.853823	-15.696999		
		8	11	$\sim$	Grade 60	$\sim$	-16.723771	-10.354921		
		9	11	$\sim$	Grade 60	$\sim$	-19.335081	-3.614353		
		10	11	$\sim$	Grade 60	$\sim$	-19.335081	3.614353		
		11	11	$\sim$	Grade 60	$\sim$	-16.723771	10.354921		
		12	11	$\sim$	Grade 60	$\sim$	-11.853823	15.696999		
		13	11	$\sim$	Grade 60	$\sim$	-5.382951	18.91911		
		14	11	$\sim$	Grade 60	$\sim$	1.814919	19.586091		
		15	11	$\sim$	Grade 60	$\sim$	8.767673	17.607862		
		16	11	$\sim$	Grade 60	$\sim$	14.536305	13.251593		
		17	11	$\sim$	Grade 60	$\sim$	18.341729	7.105624		
rate pattern								New	Duplicate	Delete
								ОК	Apply	Cancel

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

#### Column1 - Reinforcement

Double click on the **Reinforcement** node and enter the information in both the **Flexural** and **Shear** tabs as shown below.

lexura	Snear											
	Set	Start distance (ft)	Straight length (ft)	End distance (ft)	Pattern		Hook at start	Hook at end	Developed at start	Developed at end		
F	1	0.000	58.290	58.290	P2	*			1			l
								Nev	v Dup	plicate	Delete	

C		ear reint	orcement	type								
	Ъ	Ties (	) Spirals	Spirals des	signed as ti	es						
	Ba	ar size	Pitch (in)	Material	Start distance (ft)	Length (ft)	End distance (ft)					
Þ	5	*	6.00	Grade 60 👻	0.000	9.000	9.000					Ī
	5	*	12.00	Grade 60 👻	9.000	49.290	58.290					

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

The input for Column 1 is complete. Use the same process to enter Columns 2 and 3. The input windows for each of the columns are shown below.

#### Column 2


Generate Pattern Wi	zard										
attern name:	P1			Bund	lle type	Bar size:		11 🗸			
olumn segment:	1		~	🔘 Sir	ngle	Material:		Grade 60		$\sim$	
egment cross section:	Ro	und		021	Parallel	Clear co	/er:	3.625	in		
p / bottom:	Тор		~	031	Perpenc Bar	Number	of bars:	17			
verall trans. width:	48.000	in									
verall long. width:	48.000	in									
										OK	Cancel
Column Reinforce	ment - P1 -	Bent 4 ·	Bent	4						_	
		Nar	ne: I	P1							
			Bund	lle bars							
++Y	·7		Bar	B si	ar ze	Material	(	X in)	Y (in)		
		>	1	11	$\sim$	Grade 60 🛛 🗸		19.67	0		
<b>-</b>	+X		2	11	$\sim$	Grade 60 🛛 🗸	18	.341729	-7.105624		
			3	11	$\sim$	Grade 60 🛛 🗸	14	.536305	-13.251593		
l	}		4	11	$\sim$	Grade 60 $\sim$	8	.767673	-17.607862		
Sta Ahead			5	11	$\sim$	Grade 60 $\sim$	1	.814919	-19.586091		
v 🖕 L			6	11	$\sim$	Grade 60 🛛 🗸	-5	.382951	-18.91911		
			7	11	$\sim$	Grade 60 V	-11	.853823	-15.696999		
			8	11	$\sim$	Grade 60 $$	-16	.723771	-10.354921		
			9	11	$\sim$	Grade 60 v	-19	.335081	-3.614353		
			10	11	~	Grade 60 V	-19	.335081	3.614353		
			11	11	~	Grade 60 🗸 🗸	-16	.723771	10.354921		
			12	11	$\sim$	Grade 60 🛛 🗸	-11	.853823	15.696999		
			13	11	$\sim$	Grade 60 🗸 🗸	-5	.382951	18.91911		
			14	11	$\sim$	Grade 60 🛛 🗸	1	.814919	19.586091		
			15	11	$\sim$	Grade 60 🗸 🗸	8	.767673	17.607862		
			16	11	$\sim$	Grade 60 🛛 🗸	14	.536305	13.251593		
			17	11	$\sim$	Grade 60 🛛 🗸	18	.341729	7.105624		
Generate pattern									New	Duplicate	Delete
									OK	Apply	Cancel

Set       Start distance (ft)       Straight length (ft)       End distance (ft)       Pattern (ft)       Hook at start       Hook at end       Developed at start       Developed at end       Folio profi         I       0.000       28.800       P1       Image: Comparison of the start       Image: C	ows file
(ff)	
	1
New	Duplicate Delete
OK	Apply Cano
Shear reinforcement type O Ties O Spirals O Spirals designed as ties	
Bar size Pitch (in) Material Start distance (ft) (ft) (ft) (ft)	
▶ 5 ▼ 12.0000 Grade 60 ▼ 0.000 19.800 19.800	

# C2 Shaft

A New Foundation Alternative Wizard		×	
Spread Footing < Back Next >	Single Drilled	d Shaft	
A New Foundation Alternative Wiz	zard	>	<
Туре:	Drilled-Shaft	Foundation	
Name:	C2 Shaft		
Description:		$\sim$	
Units:	US Customar	у 🗸	
Top of shaft elevation:	376.29	ft	
Bottom of shaft elevation:	318.00	ft	
Shaft diameter:	4.50	ft	
Shaft material:	Class AA	~	
Rock socket:			
Bottom of socket elevation:		ft	
Socket diameter:		ft	
Socket material:	Class AA	$\sim$	
< Back	Finish	Cancel Help	





				Nan	ne: P2	2									
					Bundle	e bars	;								
	A	FY			Bar	E	Bar ize	Materia	al	X (in)	Y (in)				
1	í - i	Ì,	、 、	>	1	11	$\sim$	Grade 60	~	19.67		0			
	· _ · _ · ‡		\ +X }-►		2	11	$\sim$	Grade 60	~	18.341729	-7.1	05624			
ľ			,		3	11	$\sim$	Grade 60	~	14.536305	-13.2	51593			
``	`				4	11	$\sim$	Grade 60	~	8.767673	-17.6	07862			
	Т				5	11	$\sim$	Grade 60	~	1.814919	-19.5	36091			
ts	ta Ahea	d			6	11	$\sim$	Grade 60	~	-5.382951	-18.9	91911			
-	L	-			7	11	$\sim$	Grade 60	~	-11.853823	-15.6	96999			
					8	11	$\sim$	Grade 60	~	-16.723771	-10.3	54921			
					9	11	$\sim$	Grade 60	~	-19.335081	-3.6	14353			
					10	11	$\sim$	Grade 60	~	-19.335081	3.6	14353			
					11	11	$\sim$	Grade 60	~	-16.723771	10.3	54921			
					12	11	$\sim$	Grade 60	~	-11.853823	15.6	96999			
					13	11	$\sim$	Grade 60	~	-5.382951	18.	91911			
					14	11	$\sim$	Grade 60	~	1.814919	19.5	36091			
					15	11	$\sim$	Grade 60	~	8.767673	17.6	07862			
					16	11	~	Grada 60		14 52 5205	12.2				
							×	Grade 00		14.550505	13.2	51593			
ienera	ate patter	n			17	11	~	Grade 60	~	18.341729	7.10	05624	Duplicate	Dele	te
Jenera Drilled	ate patter d Shaft Re ral She	n inforceme ear	ent - Bent 4 Start distanc	4 - B	17 ent 4 - ·	11 Colur	mn2	Grade 60 Grade 60	~	Hook at	Hook at	Developed	Duplicate Apply — Developed	Dele Cano	te :el
Drilled	ate patter d Shaft Re ral She So	n inforceme ear	ent - Bent 4 Start distanc (ft)	4 - B	17 ent 4 - Straigh length (ft)	11 Colur	mn2 End stance (ft)	Grade 60 Grade 60 Patte	~	Hook at start	Hook at end	Developed at start	Duplicate Apply — Developed at end		te tel
Genera Drilled	ate patter d Shaft Re ral She Si 1	n inforceme ear et	Start distanc (ft) 0.00	4 - B	17 ent 4 Straigh length (ft) 58.290	11 Colur	End stance (ft) 58.290	Patte	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Hook at start	Hook at end	Developed at start	Duplicate Apply Developed at end		te
Drilled	d Shaft Re ral She f Shaft Re ad Shaft Re ral She ral She ral She	n inforceme ear et einforcem ear orcement f	ent - Bent 4 distanc (ft) ent - Bent type © Spiral	4 - B e 10 4 - B	17 ent 4	11 Colur t di 0 Colu	mn2 End stance (ft) 58.290 mn2 s	Patte	2	Hook at start	Hook at end	Developed at start	Duplicate Apply Developed at end		ete ::el
Drilled	d Shaft Re ral She f Shaft Re si d Shaft Re ral She ral She bear reinfo Ties C Bar size	n inforceme ear et inforcement Spirals Pitch (in)	ent - Bent 4 distanc (ft) 0.00 ent - Bent type () Spiral Materia	4 - B e i0 4 - B	17 ent 4 - Straigh length (ft) 58.290 ent 4 - signed Stai distai (ft)	t di Colur Colur	mn2 End stance (ft) 58.290 mn2 s Length (ft)	Patte		Hook at start	Hook at end	Developed at start	Duplicate Apply Developed at end		tte cel
Genera Drilled Flexur Flexur Flexur	d Shaft Re ral She d Shaft Re sh d Shaft Re ral Sh hear reinfo Ties C Bar size 5	n inforceme ear et inforcem ear orcement f ) Spirals Pitch (in) 6.00	ent - Bent 4 Start distanc (ft) 0.00 ent - Bent - type ( Spiral Materia Grade 60	4 - B e 4 - B	17 ent 4 Straight length (ft) 58.290 ient 4 - signed Staa distaa (ft) (ft)	t di Colur Colur as tie	mn2 End stance (ft) 58.290 mn2 s Length (ft) 9.000	Patte P2 Patte P2 P2		Hook at start	Hook at end	Developed at start	Duplicate Apply		rte cel

#### Column 3



A Generate Pattern Wiza	ard											×
Pattern name:	P1			- Bury	lle ture	Par cizes	44					
Column segment:	1		$\sim$	Si	nale type	Bar size:		rada 60		2		
				02	Parallel	Clear co		625	lin	•		
Segment cross section:	Rou	nd		02	Perpen	dicular Number	of bars: 17	7	] ""			
Top / bottom:	Тор		$\sim$	03	Bar	Number	or bars.					
Overall trans. width:	48.000	in										
Overall long. width:	48.000	in										
										OK	Cancel	
A Column Reinforcem	pent - D1 - B	ent /	Rent	4								×
		circ 4	bene	-								~
		Nar	ne: 🛛	P1								
			Bund	lle bars								
++Y			Bar	B si	ar ze	Material	X (in)		Y (in)			
		>	1	11	$\sim$	Grade 60 🗸 🗸 🗸		19.67	0			-
	+X		2	11	~	Grade 60 🗸 🗸	18.34	1729	-7.105624			
			3	11	$\sim$	Grade 60 🗸 🗸	14.53	6305	-13.251593			
	]		4	11	$\sim$	Grade 60 🗸 🗸	8.76	7673	-17.607862			
T A Sta Abead			5	11	$\sim$	Grade 60 🗸 🗸	1.81	4919	-19.586091			
			6	11	$\sim$	Grade 60 V	-5.38	2951	-18.91911			
			7	11	~	Grade 60 🗸 🗸	-11.85	3823	-15.696999			
			8	11	$\sim$	Grade 60 🗸 🗸	-16.72	3771	-10.354921			
			9	11	$\sim$	Grade 60 🗸 🗸	-19.33	5081	-3.614353			
			10	11	$\sim$	Grade 60 🗸 🗸	-19.33	5081	3.614353			
			11	11	$\sim$	Grade 60 V	-16.72	3771	10.354921			
			12	11	$\sim$	Grade 60 V	-11.85	3823	15.696999			
			13	11	$\sim$	Grade 60 V	-5.38	2951	18.91911			
			14	11	$\sim$	Grade 60 V	1.81	4919	19.586091			
			15	11	$\sim$	Grade 60 V	8.76	7673	17.607862			
			16	11	$\sim$	Grade 60 V	14.53	6305	13.251593			
			17	11	$\sim$	Grade 60 V	18.34	1729	7.105624			
				-								Ŧ
Generate pattern									New	Duplicate	Delete	
									ОК	Apply	Cancel	

lev	ural	Shear										
	Set	Start distance (ft)	Straight length (ft)	End distance (ft)	Pattern	Hook a start	t Hook at end	Developed at start	Developed at end	Follows profile		
Þ	1	0.000	29.570	29.570	P1 *			1	V			-
le	umn K kural	Shear	ent - Colur	nn3 - Ben	: 4 - Bent 4	ł					_	
Flex	umn K kural Shear r ) Ties	Shear einforcem	ent type als	nn3 - Ben	t 4 - Bent 4	s					_	
Flex	kural Shear r	Shear einforcem Spir ize Pit (ir	ent type als  Sp Ch Ma	nn3 - Ben birals desig	ned as tie Start distance (ft)	s Length (ft)	End distance (ft)				_	
Flex	kural Shear r ) Ties Bar s	Shear einforcem Spii ize Pit (ir 12.0	ent type als Sp ch Ma	pirals desig terial	Ined as tie Start distance (ft) 0.000	s Length (ft) 20.570	End distance (ft) 20.570				_	

#### C3 Shaft







#### A Drilled Shaft Reinforcement Def - Bent 4 - Bent 4 - Column3 $\times$ Name: P2 Bundle bars Bar Х Material Bar size (in) (in) Grade 60 11 $\sim$ $\sim$ 19.67 0 +X 2 11 $\sim$ Grade 60 $\sim$ 18.341729 -7.105624 3 11 $\sim$ Grade 60 $\sim$ 14.536305 -13.251593 Grade 60 4 11 $\sim$ 8.767673 -17.607862 $\sim$ 5 11 $\sim$ Grade 60 1.814919 -19.586091 $\sim$ 6 11 $\sim$ Grade 60 -5.382951 -18.91911 $\sim$ Sta Ahead 7 11 $\sim$ Grade 60 $\sim$ -11.853823 -15.696999 8 11 $\sim$ Grade 60 $\sim$ -16.723771 -10.354921 9 11 $\sim$ Grade 60 $\sim$ -19.335081 -3.614353 10 11 $\sim$ Grade 60 $\sim$ -19.335081 3.614353 11 11 $\sim$ Grade 60 $\sim$ -16.723771 10.354921 11 Grade 60 -11.853823 15.696999 12 $\sim$ $\sim$ 13 11 $\sim$ Grade 60 -5.382951 18.91911 $\sim$ Grade 60 19.586091 14 11 $\sim$ $\sim$ 1.814919 15 11 $\sim$ Grade 60 $\sim$ 8.767673 17.607862 16 11 $\sim$ Grade 60 $\sim$ 14.536305 13.251593 17 $\sim$ Grade 60 18.341729 7.105624 11 $\sim$ Generate pattern New Duplicate Delete OK Cancel Apply A Drilled Shaft Reinforcement - Bent 4 - Bent 4 - Column3 $\times$ Shear Flexural Start Straight End Developed Hook at Hook at Developed Set distance length distance Pattern start end at start at end (ft) (ft) (ft) 1 0.000 58.290 58.290 P2 \* $\checkmark$

A Drilled Shaft Reinforcement - Bent 4 - Bent 4 - Column3 × Flexural Shear Shear reinforcement type O Ties O Spirals 
Spirals designed as ties End Start Pitch Length Bar size Material distance distance (in) (ft) (ft) (ft) ▶ 5 . 6.00 Grade 60 0.000 9.000 9.000 12.00 Grade 60 5 . . 9.000 49.290 58.290

All the data entry for the pier columns is now complete.

## Analysis and Results

Typically, the Superstructure Loads and Substructure Loads windows can be opened and have the program automatically compute the loads to be applied to the substructure unit. However, Bent 4 in this example cannot be analyzed with the current version of the program. The is due to the splayed framing plans and the varying overhangs of this structure from the back span to the ahead span.

The superstructure can still be analyzed. To perform an **LRFR or LFR** rating, select the **Analysis Settings** button on the **Analysis** group of the **DESIGN/RATE** ribbon. The window shown below opens.

Br Bridg	e Workspace - PS13	ANALYSIS	REPORTS	?	-	×
BRIDGE WORKSPACE	WORKSPACE TOOLS VIEW	DESIGN/RATE	REPORTING			~
a 🚑 📾 📰	📄 📄 🍫 🔆	2 🖪				
Analysis Analyze Analysis Settings Events	Tabular Specification Engine Rest Results Check Detail Outputs Gra	ults Save ph Results				
Analysis	Results					

Choose the desired rating method and vehicles. See images below for analysis settings for both LRFR and LFR analysis.

#### LRFR

O Design review   Rating		Rating metho	od:	LRFR	~		
nalysis type: Line Girder une / Impact loading type: As Requested	▼	Apply prefere	ence setting:	None	~		
Vehicles Output Engine Description Traffic direction: Both directions Vehicle selection	~	Veh	Refresh icle summar	Temporary vehicles	Advanced	]	
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Click **OK** to apply the data and close the window.

The entire structure, an individual superstructure or an individual member alternative can be analyzed by selecting either of them on the **Bridge Workspace** tree as shown below.

Select the G1 (E)(C) member alternative for superstructure Span 3 in the Bridge Workspace. Next click the Analyze button on the Analysis group of the DESIGN/RATE ribbon to perform the rating.



## Tabular Results

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

Bridge Workspace - PS13	ANALYSIS	REPORTS	?	-	×
BRIDGE WORKSPACE WORKSPACE TOOLS VIEW	DESIGN/RATE	REPORTING			^
Analysis Analyze Analysis Events Analysis Analyze Analysis Analyze Events Analysis Analyze Analysis Analyze Analysis Results Check Detail Outputs Gra	llts Save ph Results				

	LRFR	and	LFR	results	for	Span	3.	<b>G1</b>	are	shown	below.
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## LRFR

Analys	iis Resu	llts - G1									- 0	×
Report type Rating Res	e: sults Su	immary V	Lane/Impact	loading typ uested	e Detailed	Display Forma Single rating	t level per ro	w ~				
Live L	.oad	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	59.52	1.653	66.17	1 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested	é b
HL-93	(US)	Truck + Lane	LRFR	Operating	77.16	2.143	66.17	1 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested	ł
HL-93	(US)	Tandem + Lane	LRFR	Inventory	70.67	1.963	66.17	1 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested	ł
HL-93	(US)	Tandem + Lane	LRFR	Operating	91.61	2.545	66.17	1 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested	ł
AASHTO LR Analysis pre	RFR Eng	gine Version 7.5.0 ce setting: None	.3001								Clo	• se

### LFR

Analysis Results - G1											- 0	×
	Print											
Repo	rt type:		Lane	e/Impact loa	ding type	Display F	ormat					
Rati	Rating Results Summary <ul> <li>As requested</li> <li>Detailed</li> <li>Single rating level per row</li> <li>Image: Single rating level per row</li> </ul>											
L	ive Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane	
H	IS 20-44	Axle Load	LFR	Inventory	65.31	1.814	66.17	1 - (50.0)	PS Tensile Stress - Concrete	As Requested	As Requested	-
H	IS 20-44	Axle Load	LFR	Operating	146.81	4.078	66.17	1 - (50.0)	Design Flexure - Concrete	As Requested	As Requested	
H	IS 20-44	Lane	LFR	Inventory	68.75	1.910	66.17	1 - (50.0)	PS Tensile Stress - Concrete	As Requested	As Requested	
ŀ	IS 20-44	Lane	LFR	Operating	154.56	4.293	66.17	1 - (50.0)	Design Flexure - Concrete	As Requested	As Requested	
												-
AASH	TO LFR E	naine Versia	on 7.5.0.3001									
			N									
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Analy	sis prefer	ence setting	g: None									