



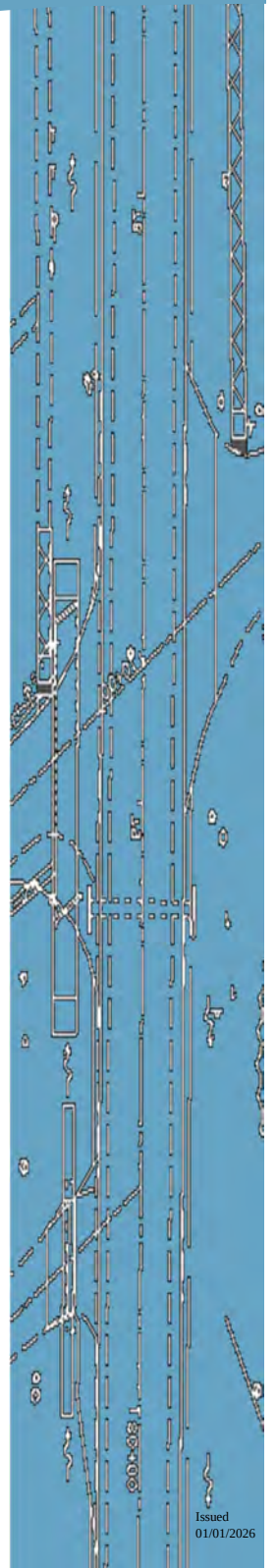
OpenBridge Modeler

Tapered Bridge

Exercise Manual

Bureau of Bridges and Structures

CADD Support Group



Issued
01/01/2026

Table of Contents

Chapter 1 – Setup and Point Control 1 - 10

Chapter 2 – Create Bridge and Support Lines..... 11 - 15

Chapter 3 – Place and Modify Deck 16 - 26

Chapter 4 – Beam Layout and Beams 27 - 34

Chapter 5 – Permanent Bracing 35 - 41

Chapter 6 – Bearings and Abutments..... 42 - 49

Chapter 7 – Concrete Diaphragms 50 - 63

Chapter 8 – Approach Slabs 64 - 91

Chapter 9 – Constant Slope Parapets 92 - 104

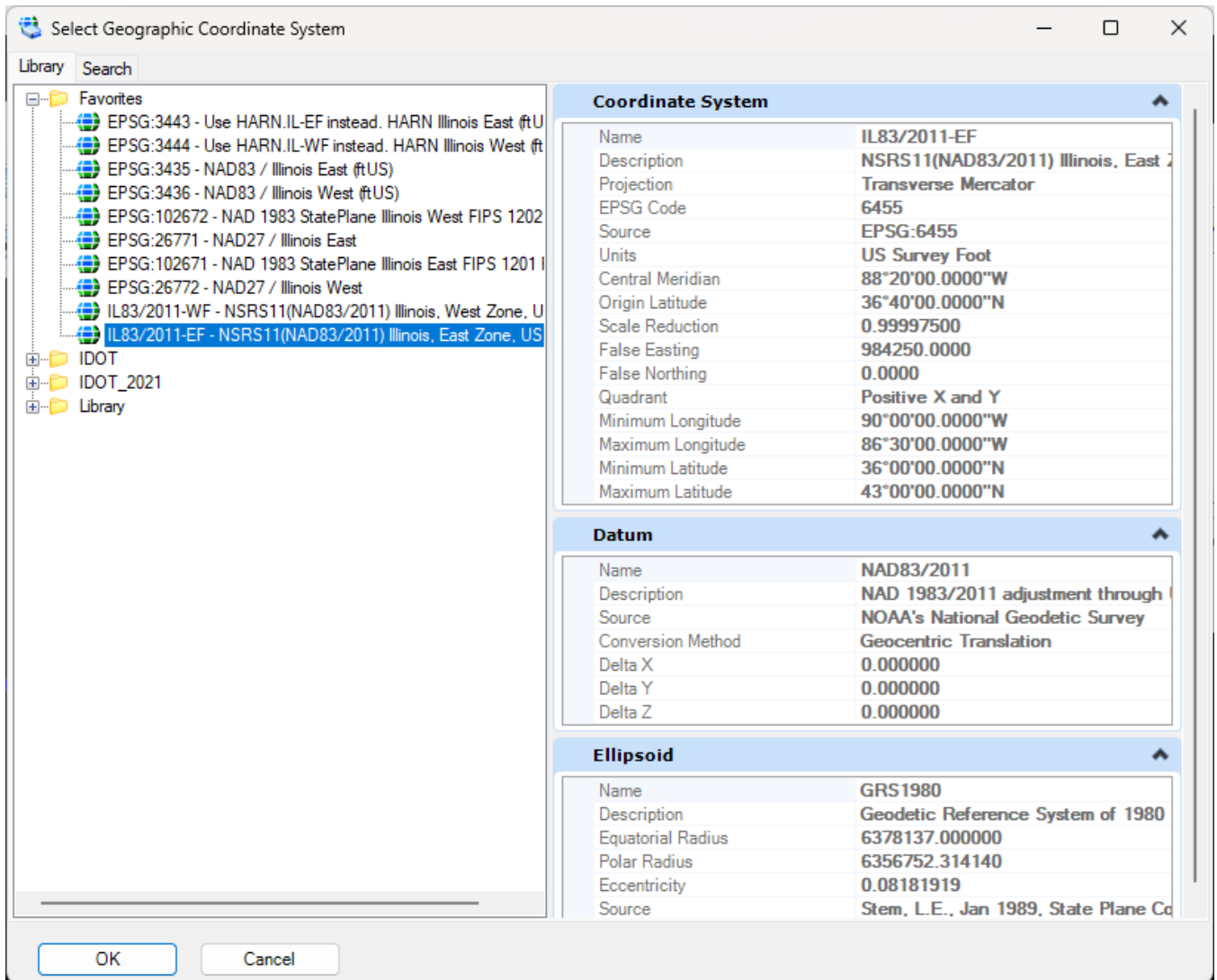
Chapter 10 – Parapet and Curb Tapers..... 105 - 118

Chapter 11 – Concrete Diaphragm Chamfers 119 - 129

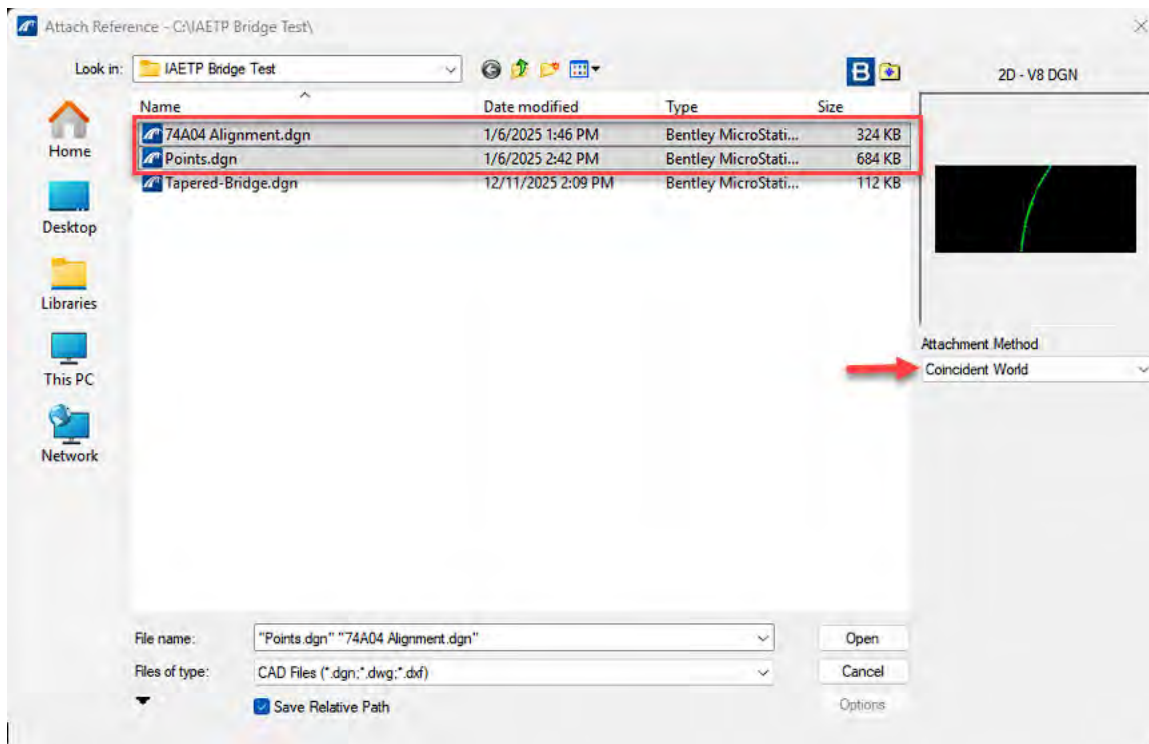
Chapter 12 – ProSteel Permanent Bracing 130 - 168

Chapter 1 – Setup and Point Control

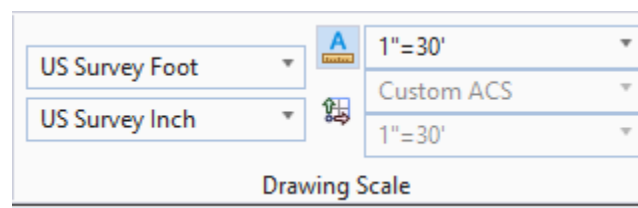
- 1) Create a new file, naming it “**Tapered-Bridge.dgn**” (Use the IDOT Bridge-3D seed file in C:\IDOT_CONNECT\Configuration\Organization-Civil\IDOT_Bridge_Standards\OpenBridge Modeler\Seed\).
Note that by default, the configuration points to the “IDOT_Standards” folder as opposed to the “IDOT_Bridge_Standards” folder.
- 2) Set the Geographic Coordinate System to “**IL83/2011-EF**” as shown below:



- 3) Attach the files, **“74A04 Alignment.dgn”** and **“Points.dgn”** using the attachment method of **“Coincident World”** from within the provided dataset.

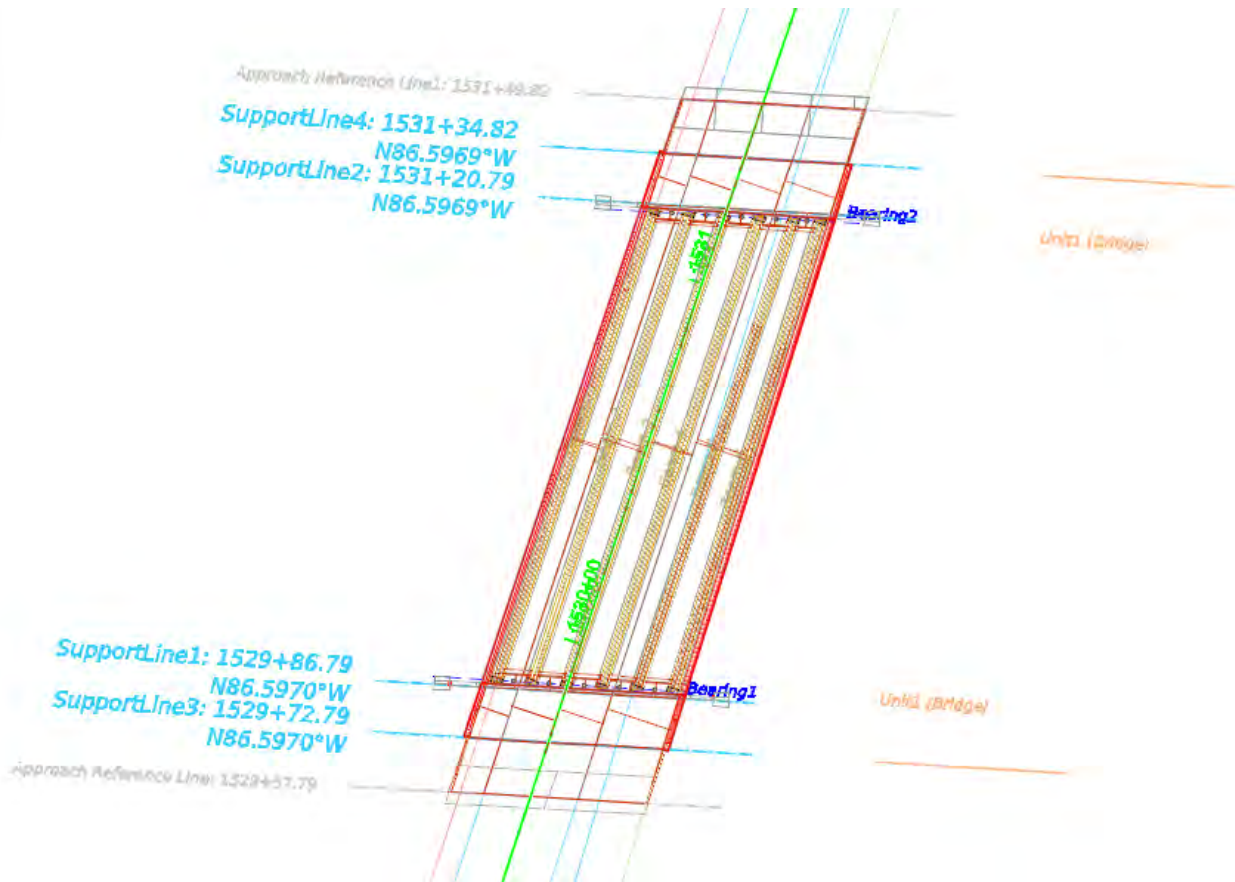


- 4) Adjust your **“Drawing Scale”** to something that makes the stationing readable, such as 1”=30’.



The bridge to be modeled is tapered. There is a ramp that runs across the bridge on the right side, approaching from the South. The horizontal alignment is curved, but the left side of the bridge is parallel to the local tangent at Sta. 1530+53.76. The right side is a straight line running from the back of the approach curb on the South side of the approach slab to the back of the approach curb on the North end of the approach slab. A line representing the local tangent as well as circles defining points along lines that define the outer edge of the approach slab curbs exists in the referenced file, "**Points.dgn**".

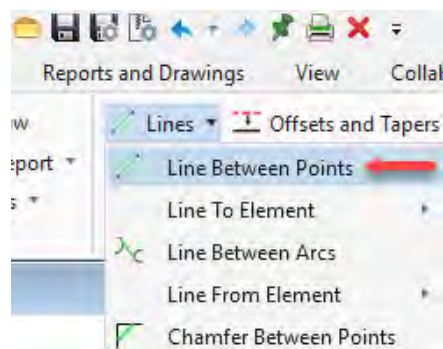
In order for the deck to appear correctly, we will be making use of "**Point Controls**" after the initial deck placement. The lines used will be created using horizontal alignment line and offset tools.



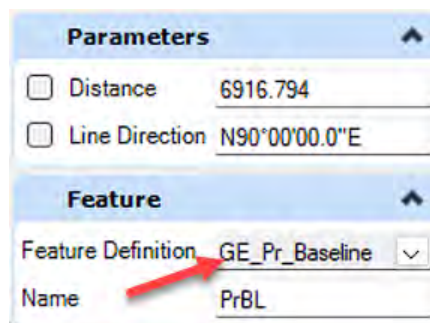
- 5) Turn on **“Civil AccuDraw”**. (Note that you will need to toggle it off and turn the standard AccuDraw on once the following six civil lines are created).



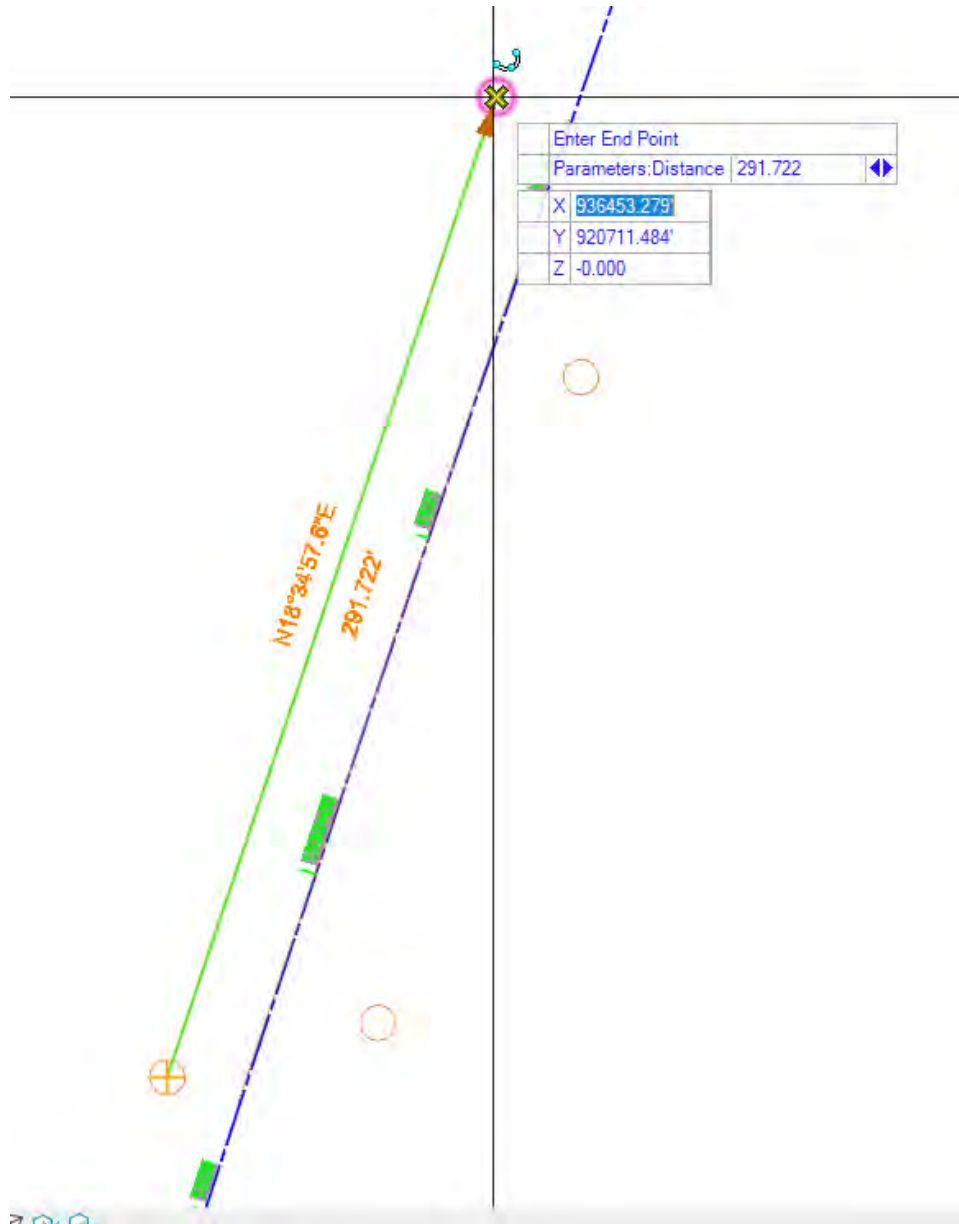
- 6) From within the **“OpenBridge Modeler”** workflow, choose the **“Line Between Points”** command in the **“Horizontal”** tool group.



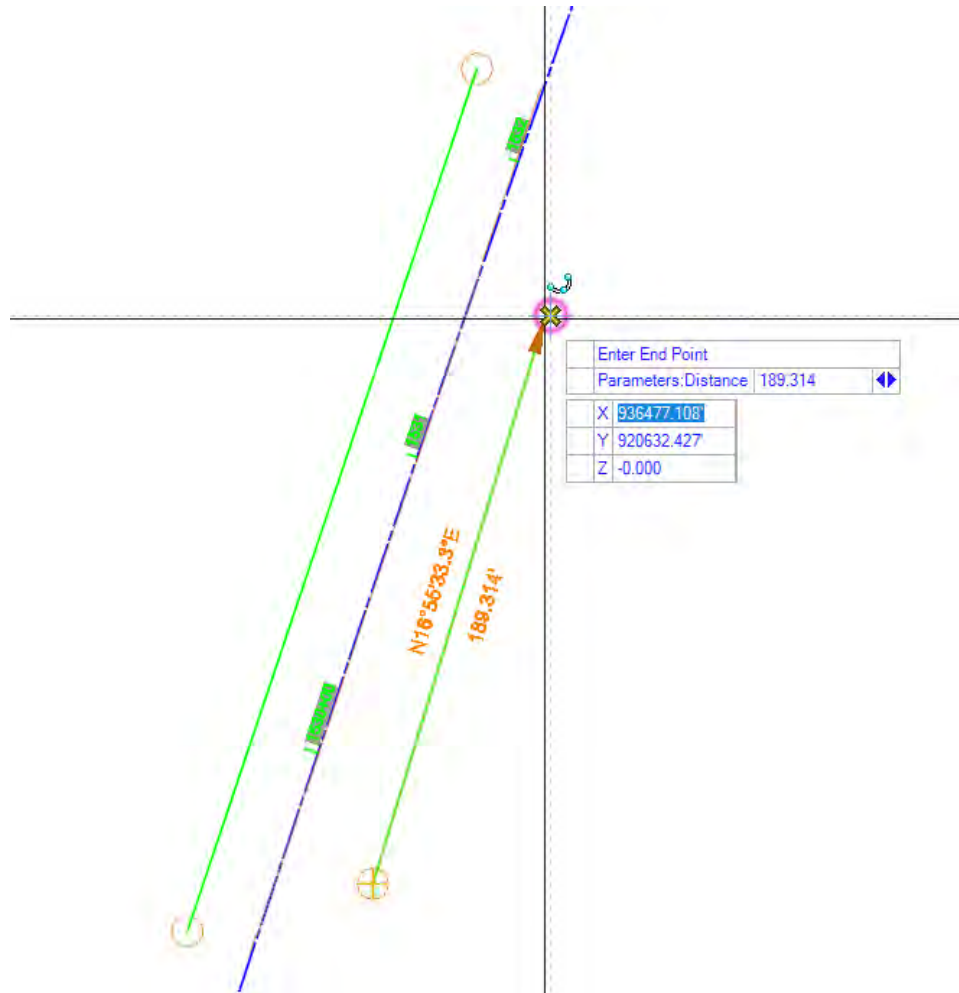
- 7) Choose the **“GE_Pr_Baseline”** Feature Definition.



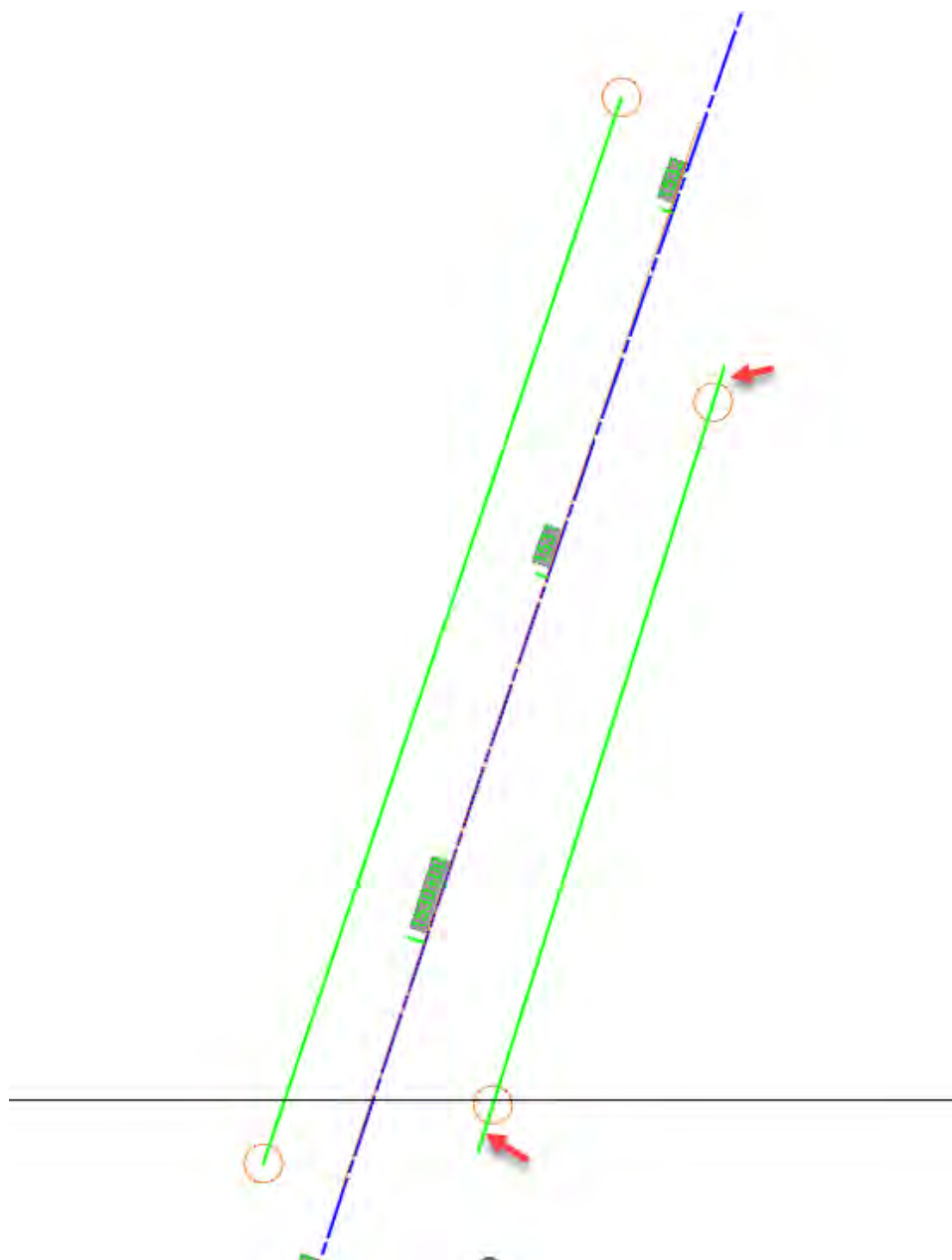
8) Create the line using the circles to the left of the centerline.



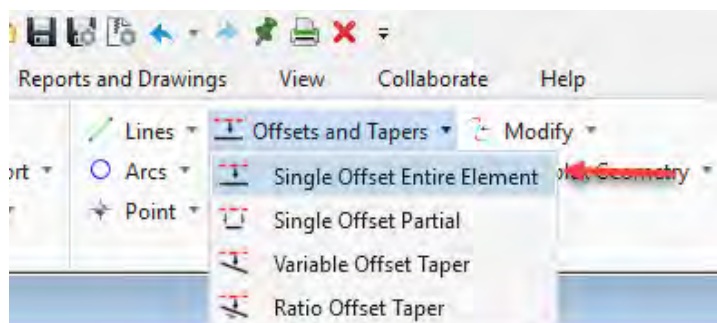
- 9) With the “Line” command still active, create the second line using the circles to the right of the centerline.



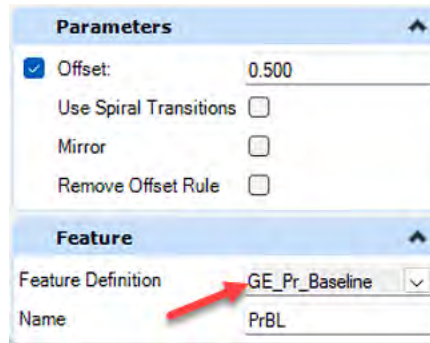
- 10) Using the **“Extend Line”** tool from within the **“Modify”** group of commands in the **“Home”** tab of the **“Drawing”** workflow, arbitrarily extend the right line beyond the circles.



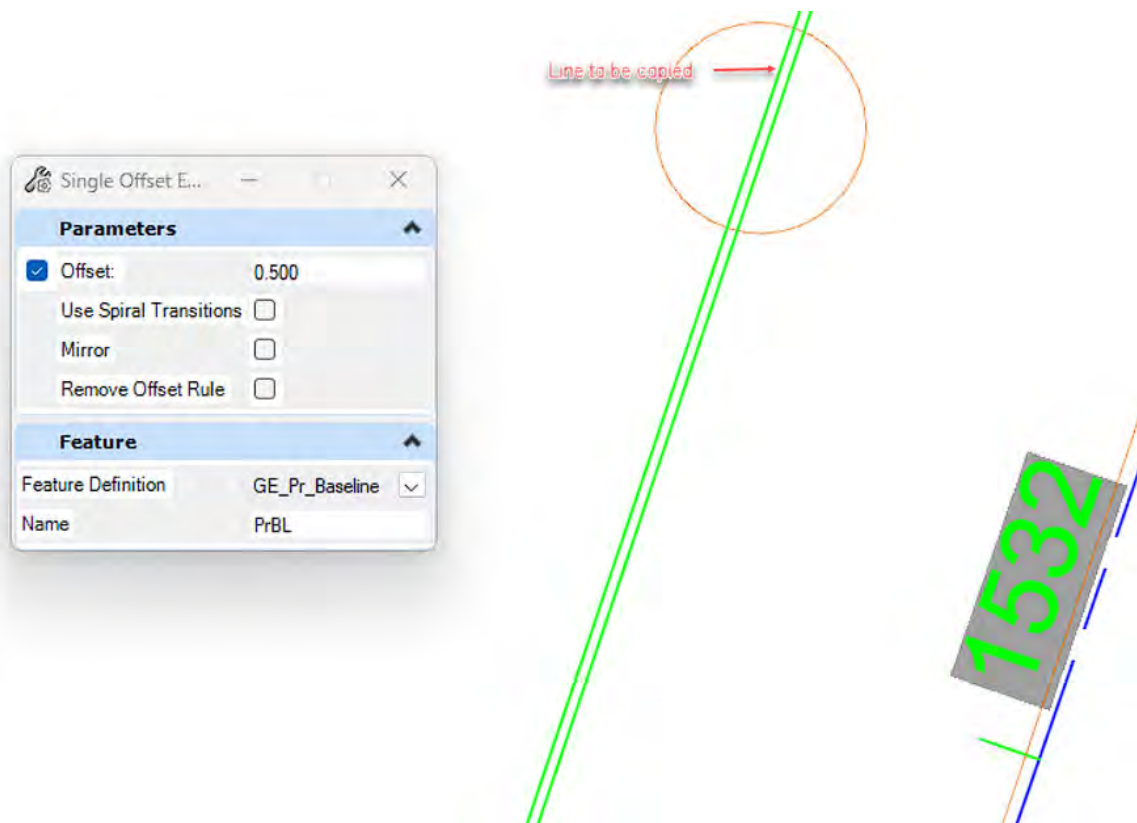
- 11) Within the **“Horizontal”** group of commands in the **“Civil”** tab of the **“OpenBridge Modeler”** workflow, select, **“Single Offset Entire Element”**.



12) Change the Feature Definition to “**GE_Pr_Baseline**” and the Offset to “**0.5**”

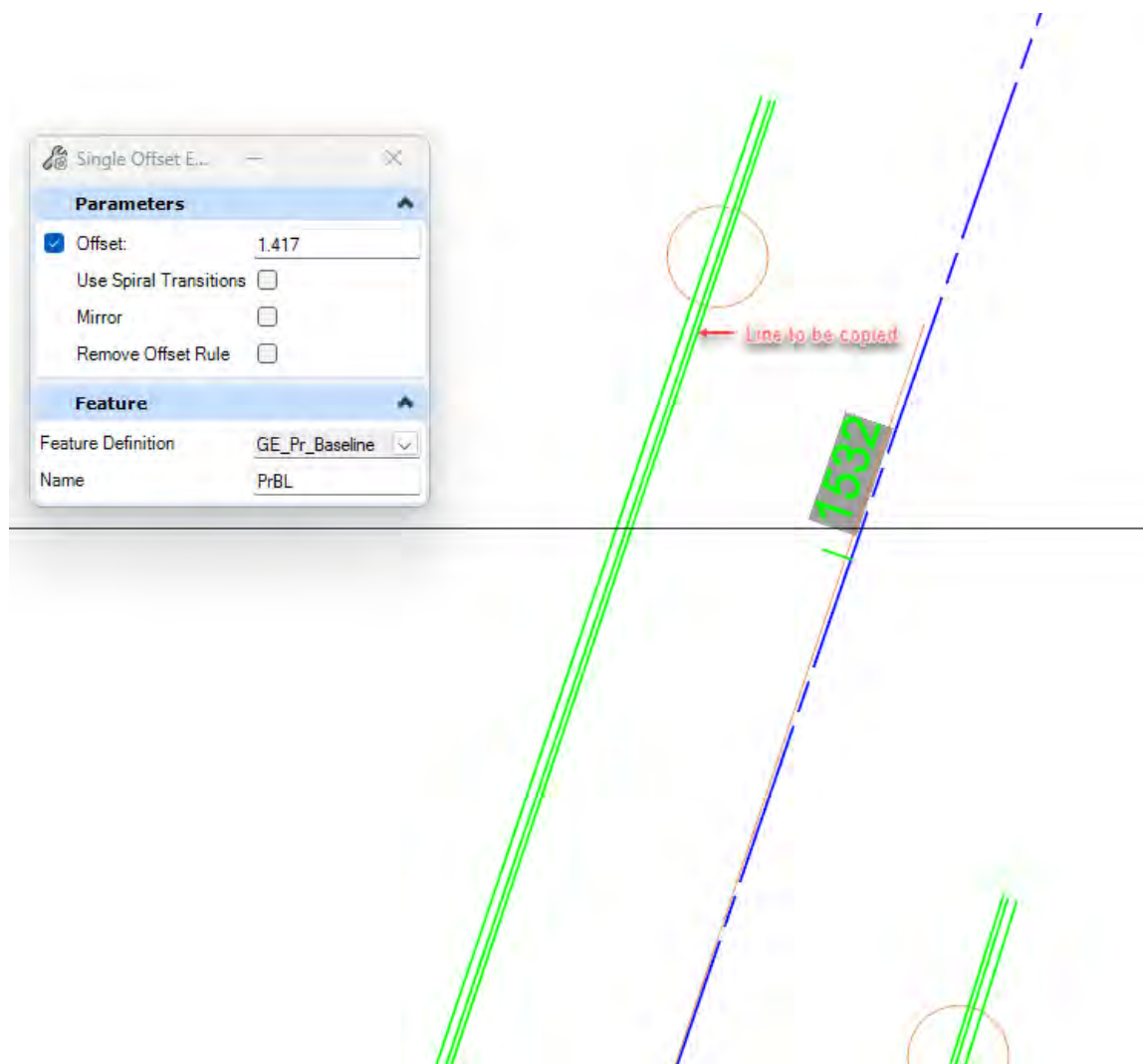


13) Select the line to the left of the centerline and offset it to the right (You will need to left-click twice). This will define the curb line for the approach curb as well as the curb line for the parapet.



14) Do the same for the line to the right of the centerline, copying it to the left, towards the centerline.

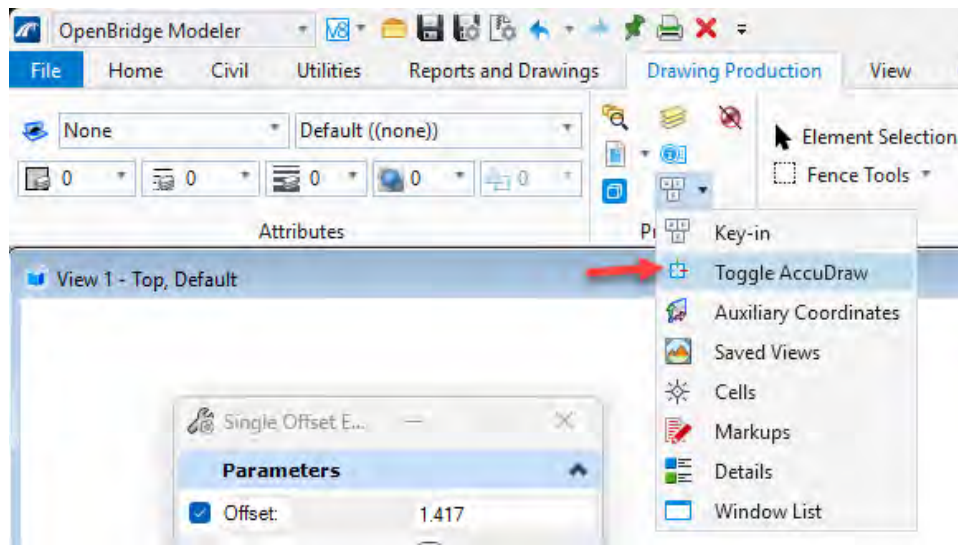
- 15) With the **“Single Offset Entire Element”** command still active, change the offset value to 1’-5” (1.4167 ft).
- 16) Copy the interior lines (curb line) to the outside (away from the centerline). This will define the outside of the deck which will also be the outside edge of the parapet. Also do this for the curb line to the right of the centerline.



- 17) If previously turned on, toggle off **“Civil AccuDraw”**.

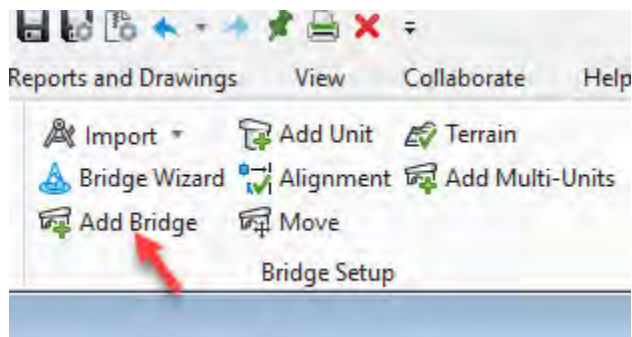


- 18) From the **“Primary”** group under the **“Drawing Production”** tab, toggle **“AccuDraw”** on if it was previously toggled off.



Chapter 2 – Create Bridge and Support Lines

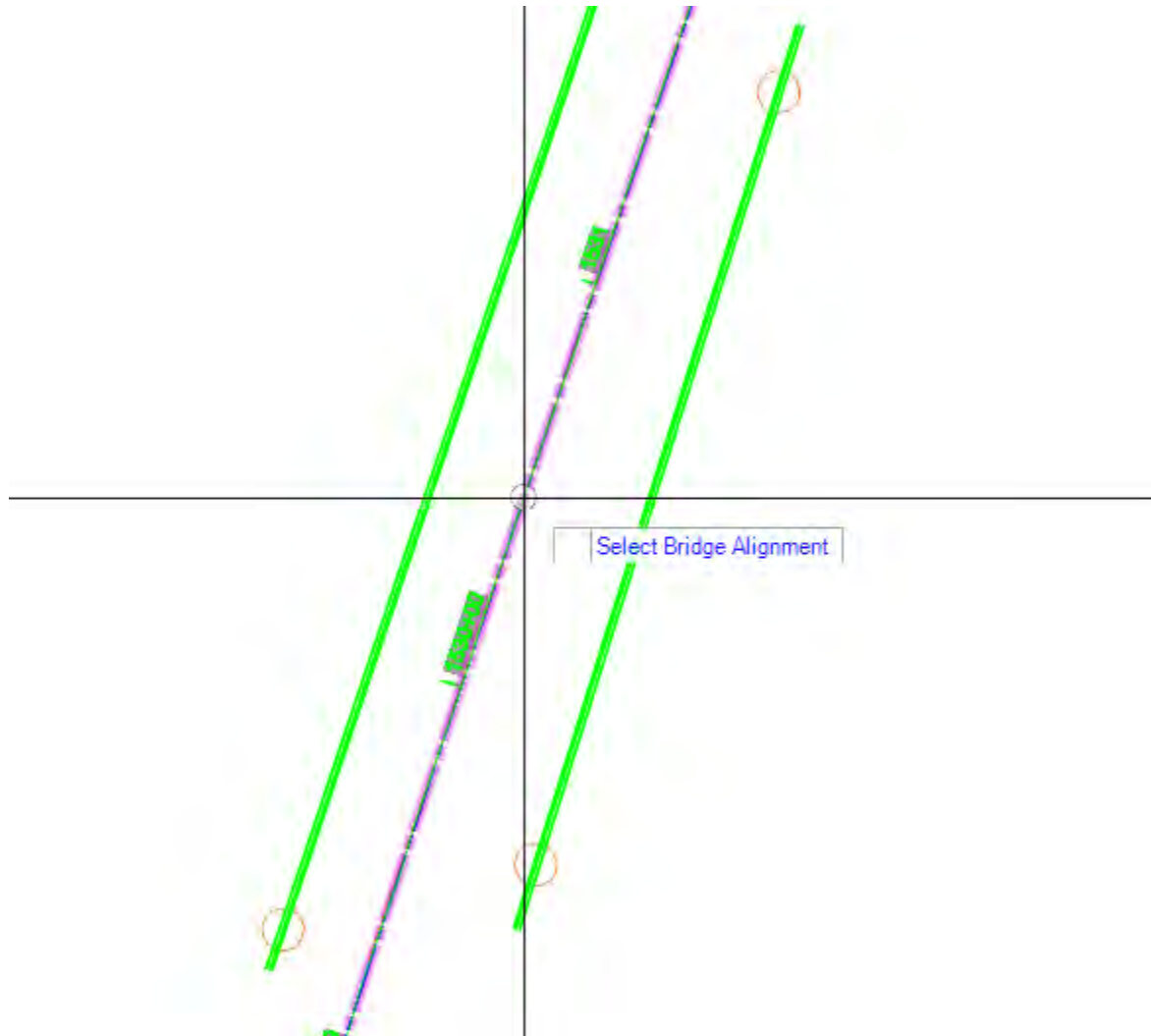
- 1) In the “**OpenBridge Modeler**” workflow, select “**Add Bridge**” in the “**Bridge Setup**” group in the “**Home**” tab.



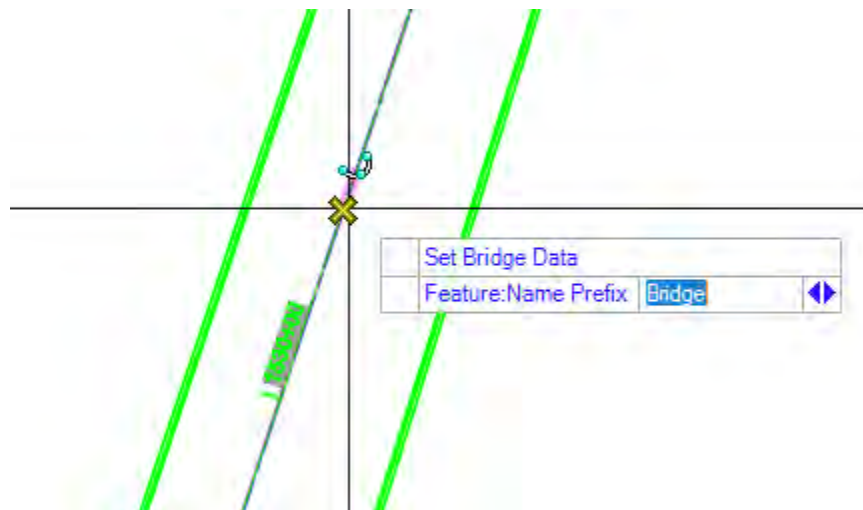
- 2) Complete the dialog as shown below:

A screenshot of the 'Add Bridge' dialog box. The dialog is divided into three main sections: 'Main', 'Unit', and 'Feature'.
Main Section:
- Description: Tapered Bridge
- Structure Number: 025-0113
- Requires Road Alignment: ☐
- Use Road Alignment For Stationing: ☐
Unit Section:
- Name: Unit1
- Description: (empty field)
- Bridge Type: Beam Slab (P/S or RC Concrete Girders) (dropdown menu)
Feature Section:
- Feature Definition: Bridge_decorations (dropdown menu)
- Name Prefix: Bridge

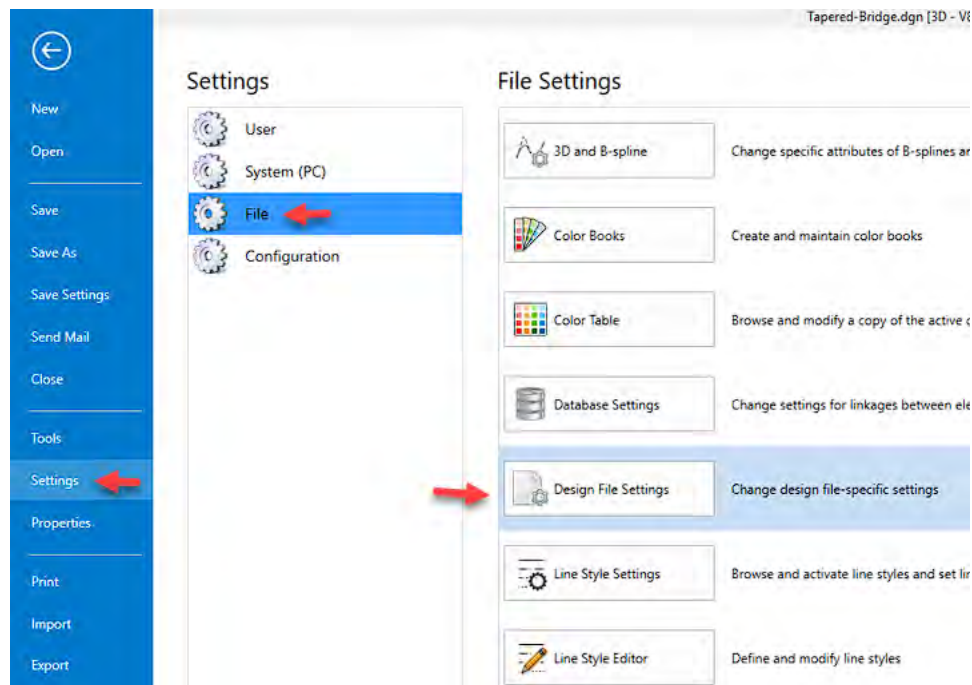
3) Select the bridge alignment.



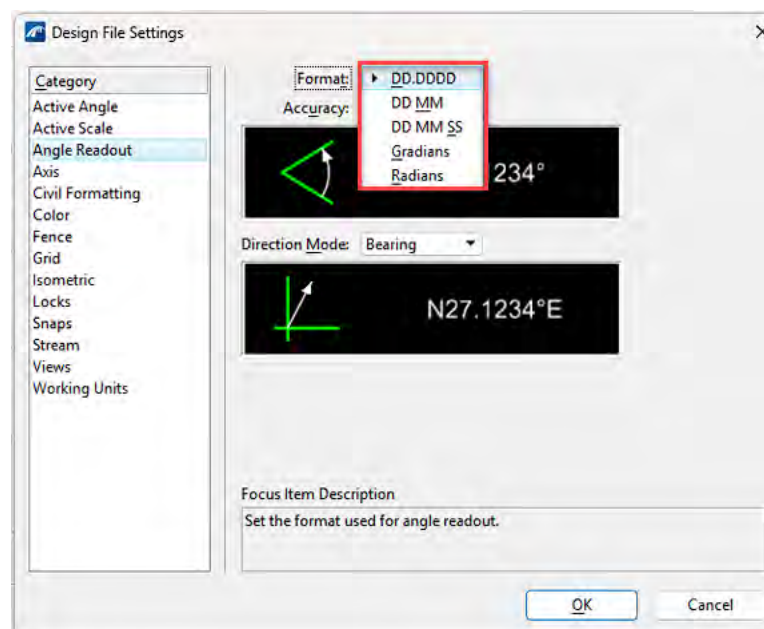
4) Accept the “**Feature Name Prefix**” of “**Bridge**”.



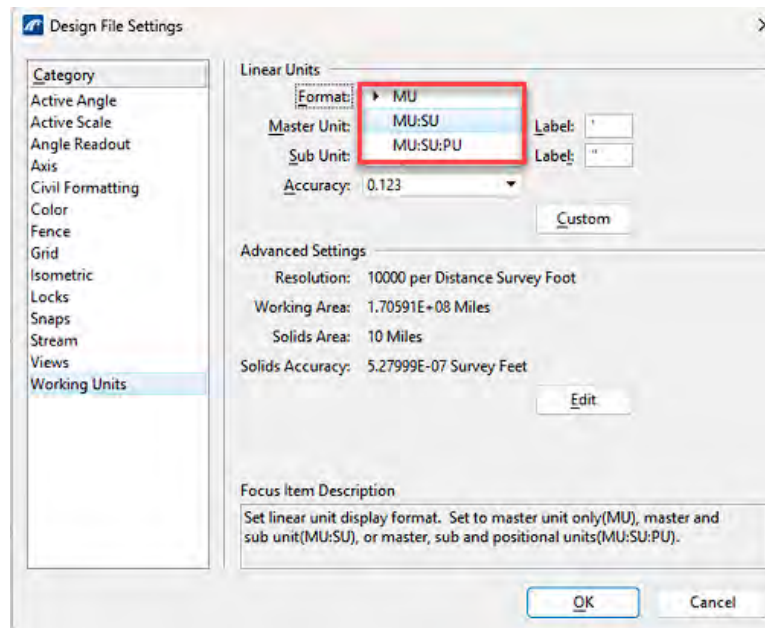
- 5) Before actually placing the support lines, we will change how OBM reports the angles and the dimensions. Click on **“File”**, **“Settings”**, **“File”**, then **“Design File Settings”**.



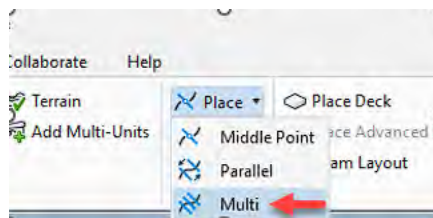
- 6) Select **“Angle Readout”** and change the format to **“DD.DDDD”** using the dropdown.



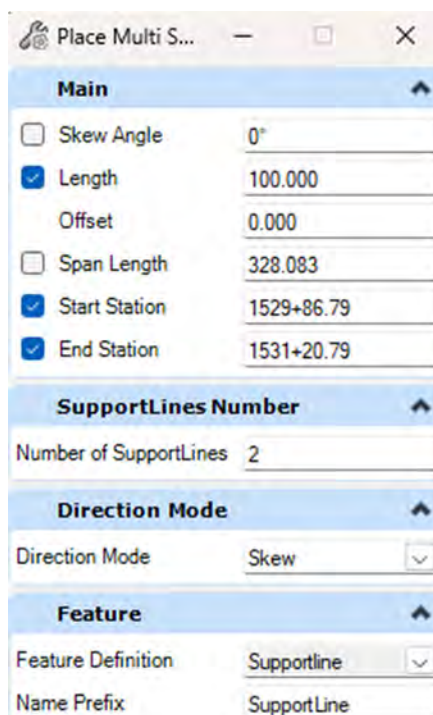
- 7) Also, select “**Working Units**” and change the format from “**MU**” to “**MU:SU**” using the dropdown, then “**OK**”.
Return to the model.



- 8) In the “**OpenBridge Modeler**” workflow, Select “**Place Multi**” in the “**SupportLine**” group in the “**Home**” tab.



- 9) Enter the data as show:



10) Left-click multiple times until the **“Place Multi SupportLines”** dialog box appears.

#	Name	Station	Angle	Span Length	Length	Horizontal O...
1	SupportLine1	1529+86.79	15°00'00"	0.000	100.000	0.000
2	SupportLine2	1531+20.79	15°00'00"	134.000	100.000	0.000

OK Cancel

11) Modify the skew angles. The skew reported in the dialog is that of a tangent to the centerline curve at the given station. We desire the skew angle to be 15 degrees with respect to the local tangent. Modify the values as shown below to accomplish this:

#	Name	Station	Angle	Span Length	Length	Horizontal O...
1	SupportLine1	1529+86.79	-14.9559°	0.000	100.000	0.000
2	SupportLine2	1531+20.79	-15.4035°	134.000	100.000	0.000

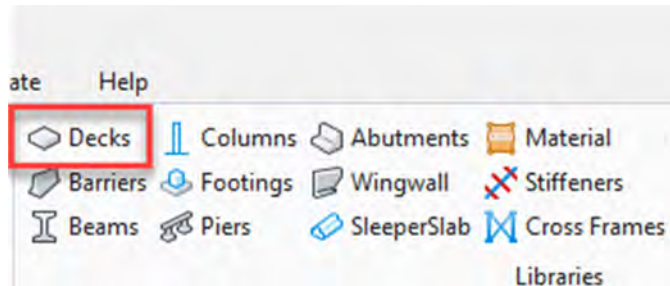
OK Cancel

12) Select **“OK”**, then reset to exit the command.

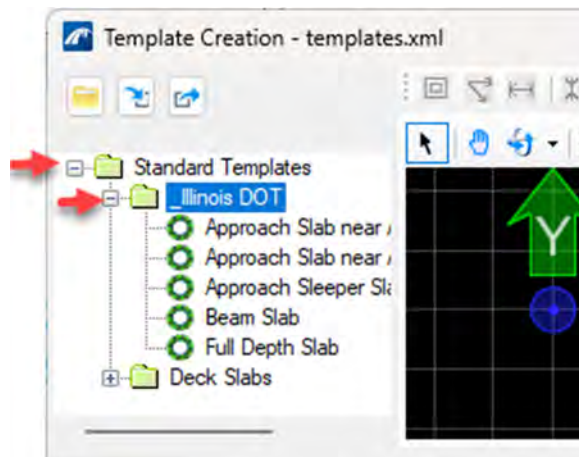


Chapter 3 – Place and Modify Deck

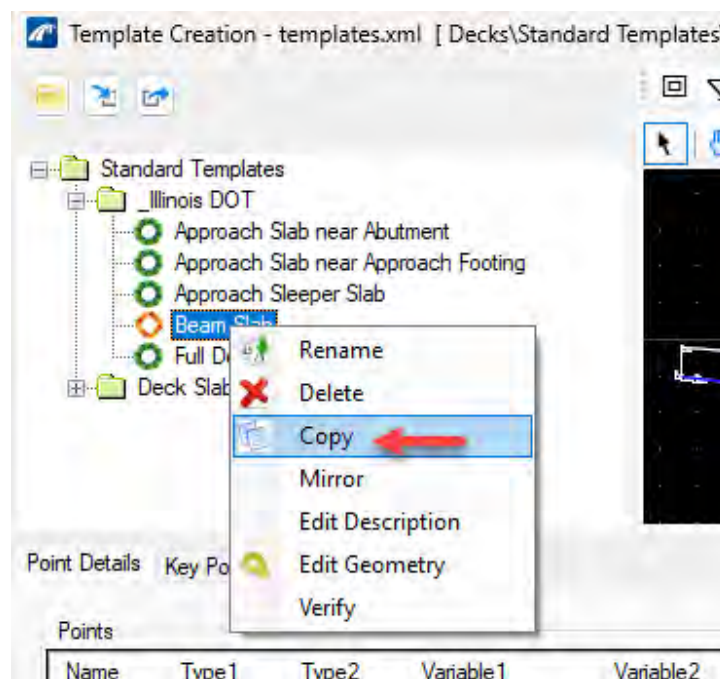
- 1) In the “**OpenBridge Modeler**” workflow, Select “**Decks**” in the “**Libraries**” group under the “**Utilities**” tab.



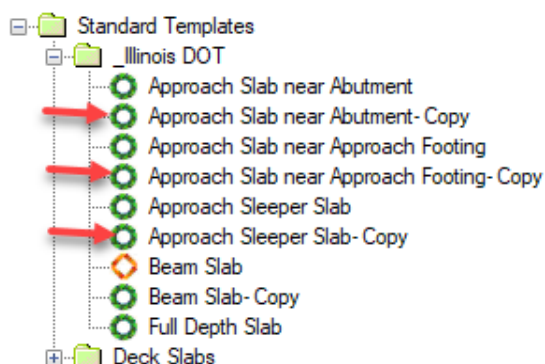
- 2) Expand the “**Standard Templates**” and “**_illinois DOT**” folders.



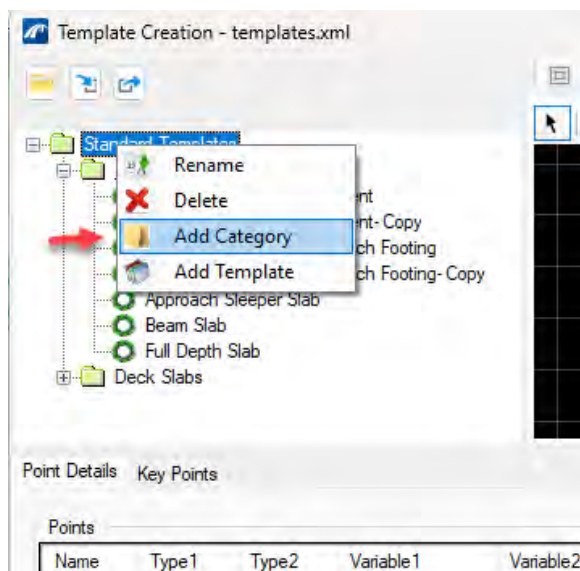
- 3) Select the “**Beam Slab**” template, right-click, and then “**Copy**”.



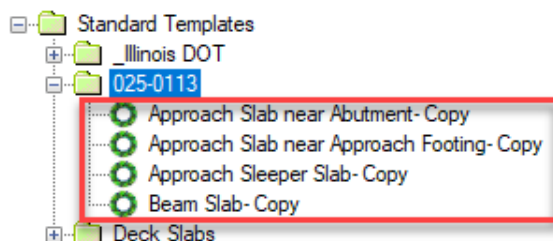
- 4) Do the same to copy the “**Approach Slab near Abutment**”, “**Approach Slab near Approach Footing**”, and “**Approach Sleeper Slab**”.



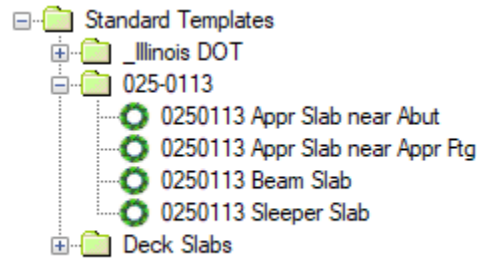
- 5) Right-click on “**Standard Templates**” and select “**Add Category**”, giving it the name, “**025-0113**”.



- 6) One at a time, left-click and drag the four copied template into the newly created category.

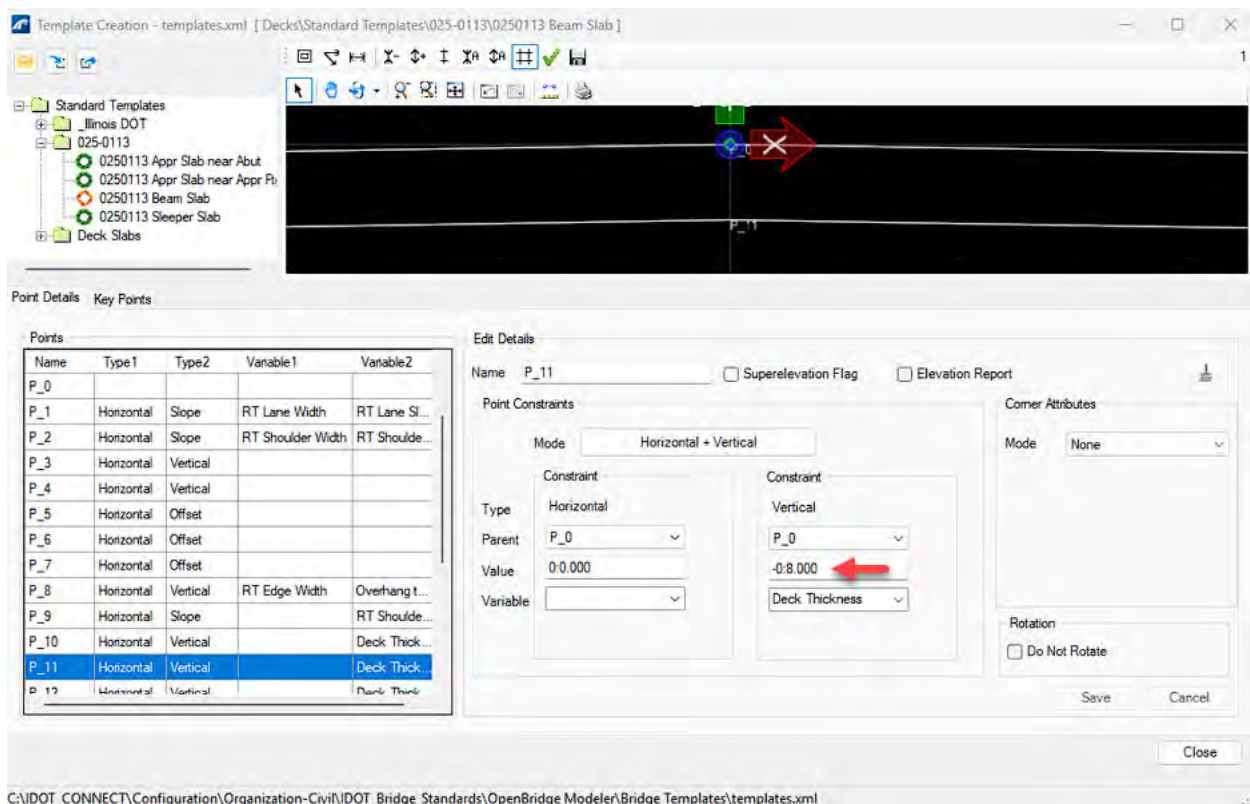


- 7) Right-click on each template and rename to something unique, such as:

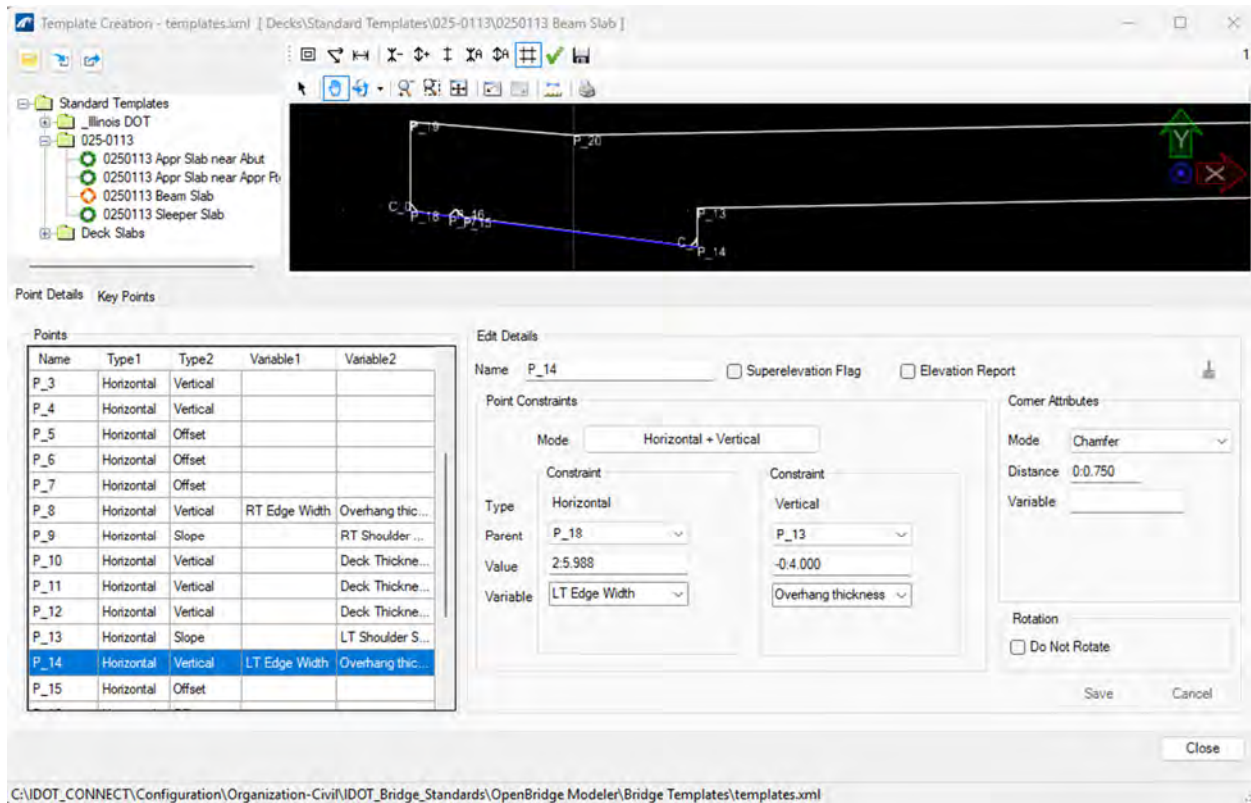


(You do not want to keep the same name as any other template in the library, even if it is placed under a separate category/folder in the template library).

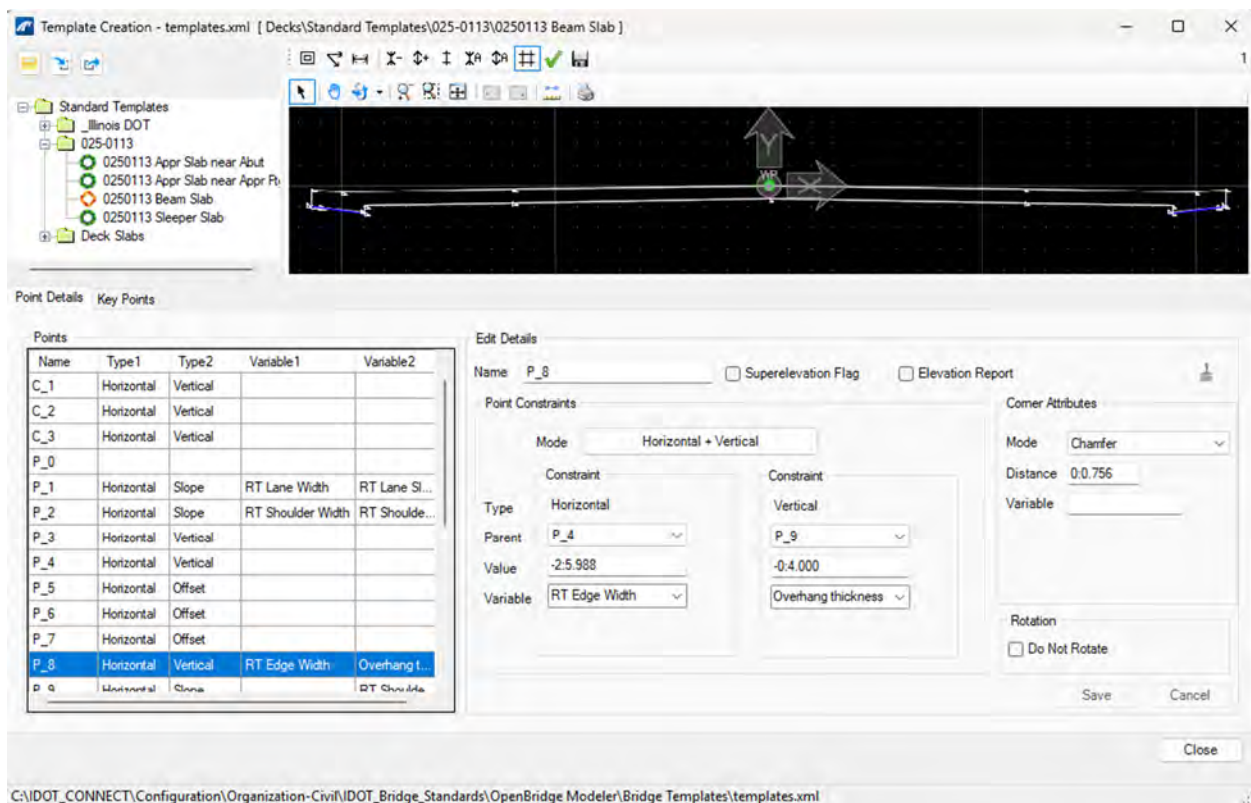
- 8) Select the “**0250113 Beam Slab**” template to make it active.
- 9) Select point “**P_11**” and verify that the vertical value is “**- 8 inches.**” If it is not, change it, then “**Save**”.



10) Select “**P_14**” and adjust as shown below and click “**Save**”.

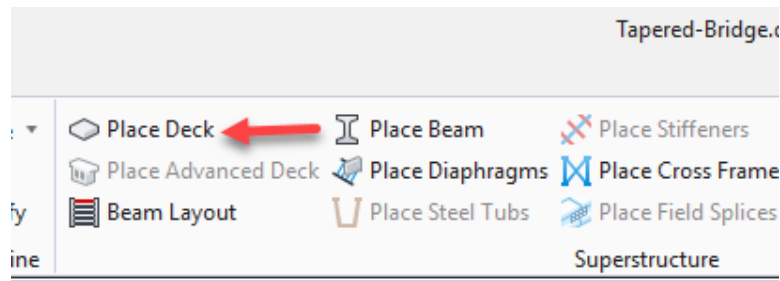


11) Select “**P_8**”, adjust as shown below, click “**Save**”, then close the dialog.



12) Close the dialog.

- 13) From the **“Home”** tab of the **“OpenBridge Modeler”** workflow, select **“Place Deck”** in the **“Superstructure”** tools group.



- 14) Complete the dialog as shown below, selecting the **“0250113 Beam Slab”** template.

The screenshot shows the 'Place Deck' dialog box. The 'Deck' section is expanded, showing the following fields:

- Template Name: 0250113 Beam Slab
- Start Station Offset: 1:0.420
- End Station Offset: -1:0.420
- Horizontal Offset: 0:0.000
- Vertical Offset: 0:0.000
- Add Constraints: ☐
- Chord Tolerance: 0.100
- Max Dist Between Sections: 3:3.370
- Analytical Deck: ☐

The 'Deck Breakbacks' section is also expanded, showing the following fields:

- Left Start Breakback Distance: 0:0.000
- Right Start Breakback Distance: 0:0.000
- Left End Breakback Distance: 0:0.000
- Right End Breakback Distance: 0:0.000

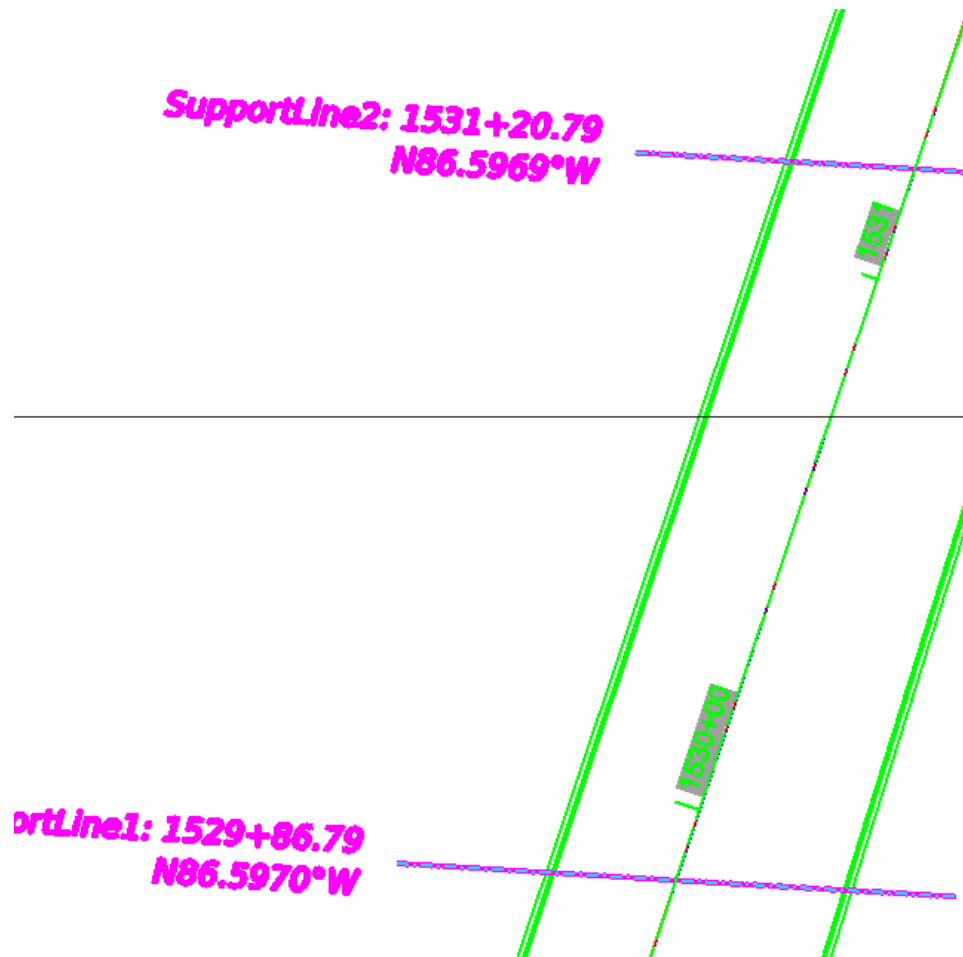
The 'Material' section is expanded, showing the following field:

- Deck Material: Concrete Supersti

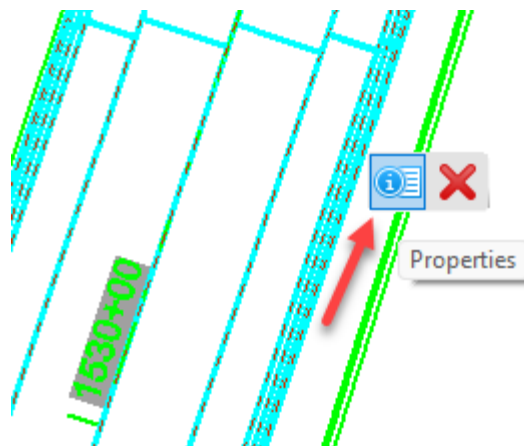
The 'Feature' section is expanded, showing the following fields:

- Feature Definition: Deck
- Name Prefix: Deck

- 15) Following the directions (either at the cursor or in lower left hand corner of the screen), select “**SupportLine1**”, then “**SupportLine2**”, then accept.



- 16) Using the Selection tool, pick the deck, bump the mouse, then click on “**Properties**”.



17) Within the **“Properties”** dialog, select the **“...”** next to **“SELECT to Edit”** for the **“Point Control”**.

Bridge Name	Bridge
Bridge Description	Tapered Bridge
Bridge Structure #	025-0113
State Element Number	12
NBI Element Number	12

Name	Deck
Description	
Template	0250113 Beam Slab
Analytical Deck	False
Start Station	1529+87.83
End Station	1531+19.75
Start Station Offset	1' 0.420"
End Station Offset	-1' 0.420"
Horizontal Offset	0' 0.000"
Vertical Offset	0' 0.000"
Chord Tolerance	0' 3.937"
Max Dist Between Sec	3' 3.370"
Variable Constraint	SELECT to Edit
Point Control	SELECT to Edit ...
Top Surface Area	5652.631 Sq.*

Left Start Breakback C	0' 0.000"
Right Start Breakback C	0' 0.000"
Left End Breakback Di	0' 0.000"
Right End Breakback I	0' 0.000"

Volume	3893.930 Cu.*
Surface Area	11651.527 Sq.*

Feature Definition	Deck
--------------------	------

Deck Material	Concrete Superstructure (-
---------------	----------------------------

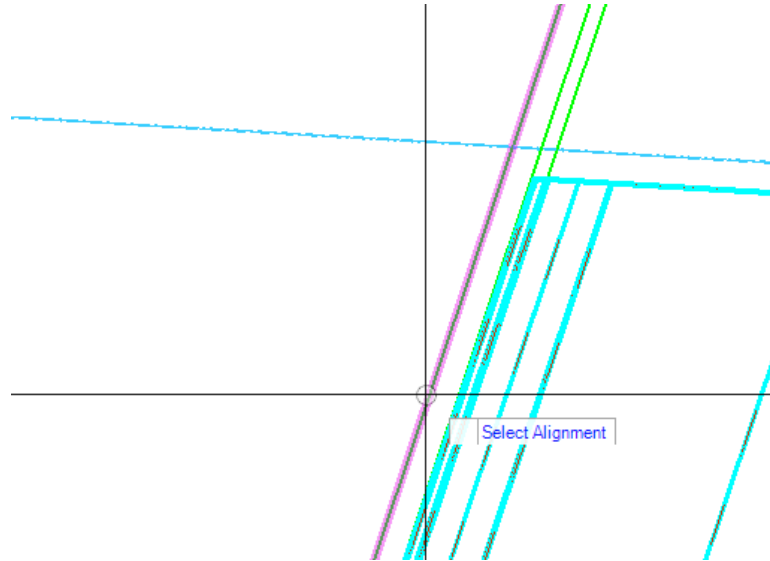
18) Select the point **“P_19”** and change the **“Direction”** drop-down from **“None”** to **“Horizontal”**. Click **“Select”**.

Edit Point Controls

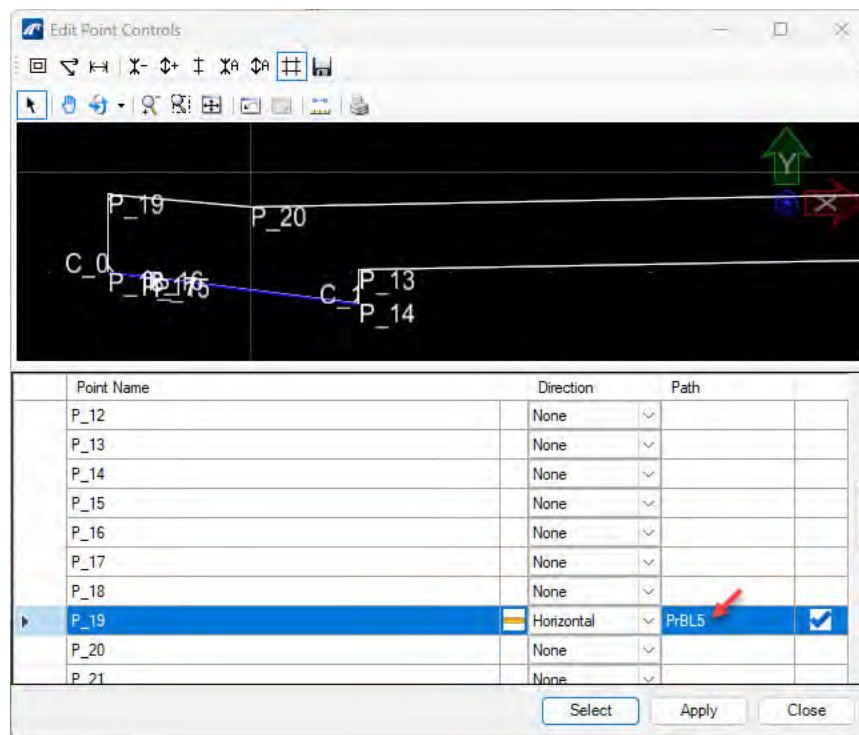
Point Name	Direction	Path
P_14	None	
P_15	None	
P_16	None	
P_17	None	
P_18	None	
P_19	None	
P_20	Horizontal	
P_21	Vertical	
C_0	Both	
C_1	None	

Select Apply Close

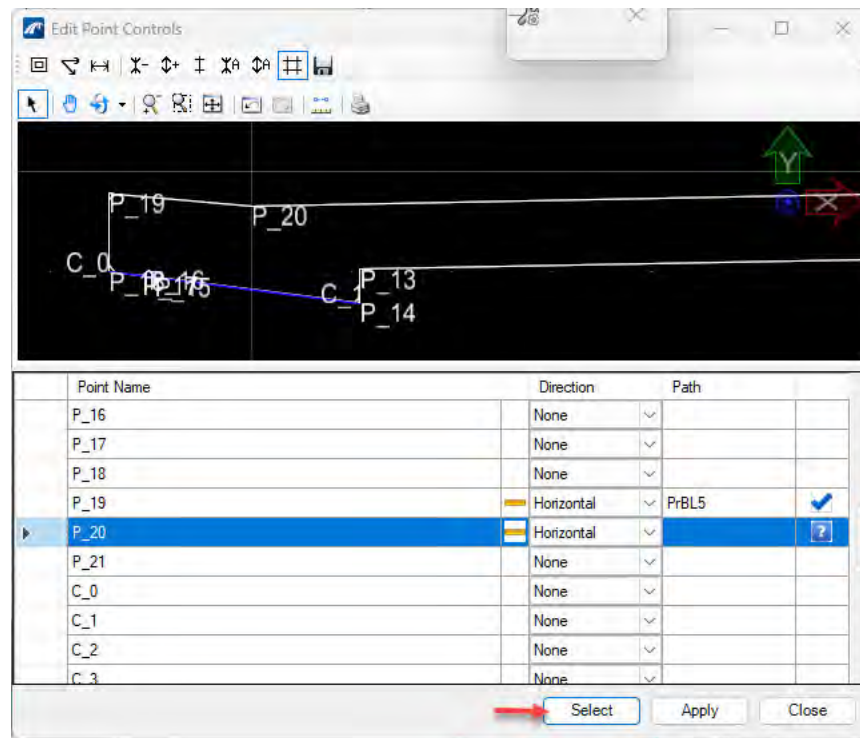
19) Pick the outer left line that we created to define the outside edge of deck.



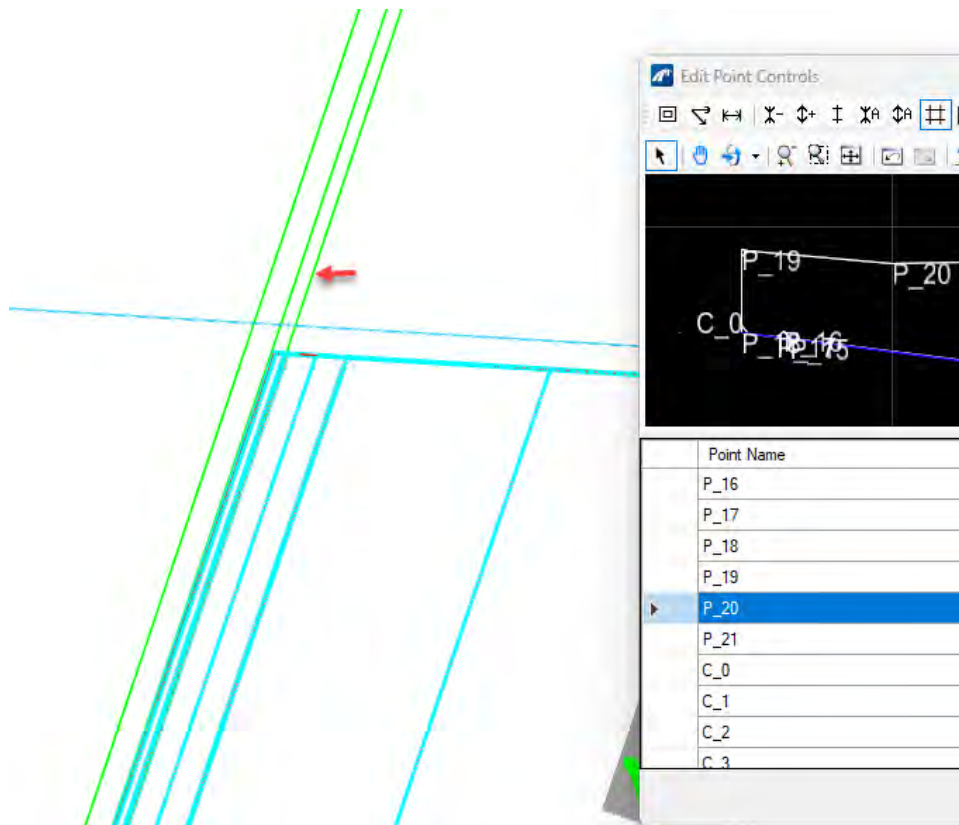
20) The path should now be defined in the dialog.



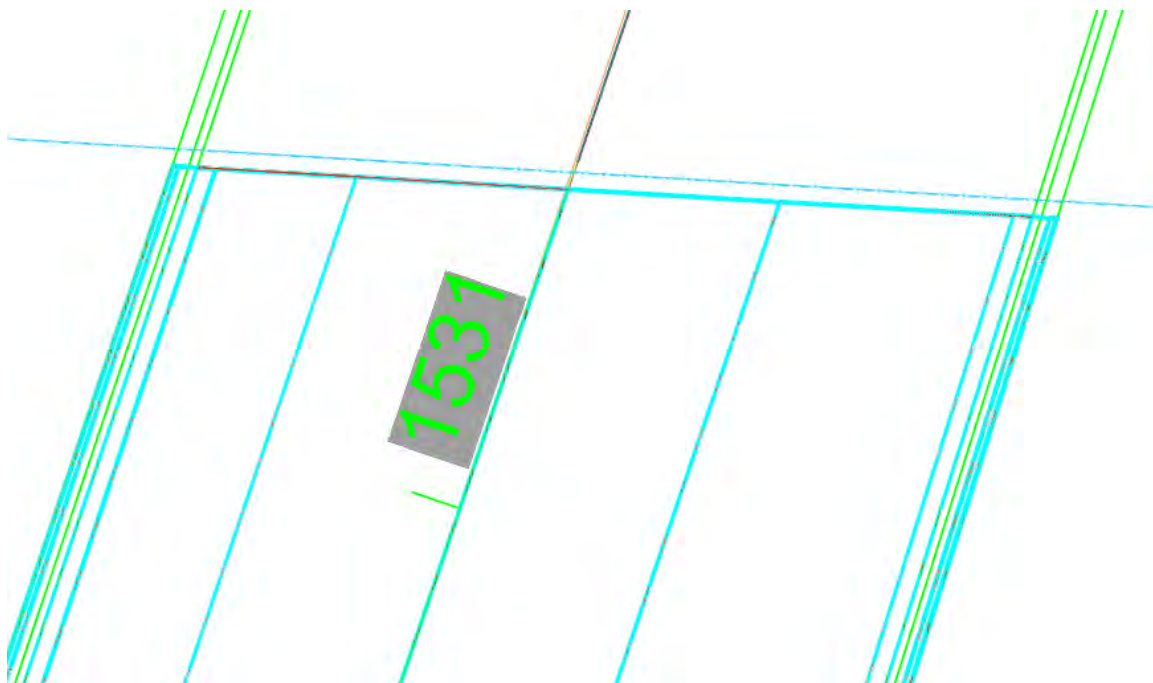
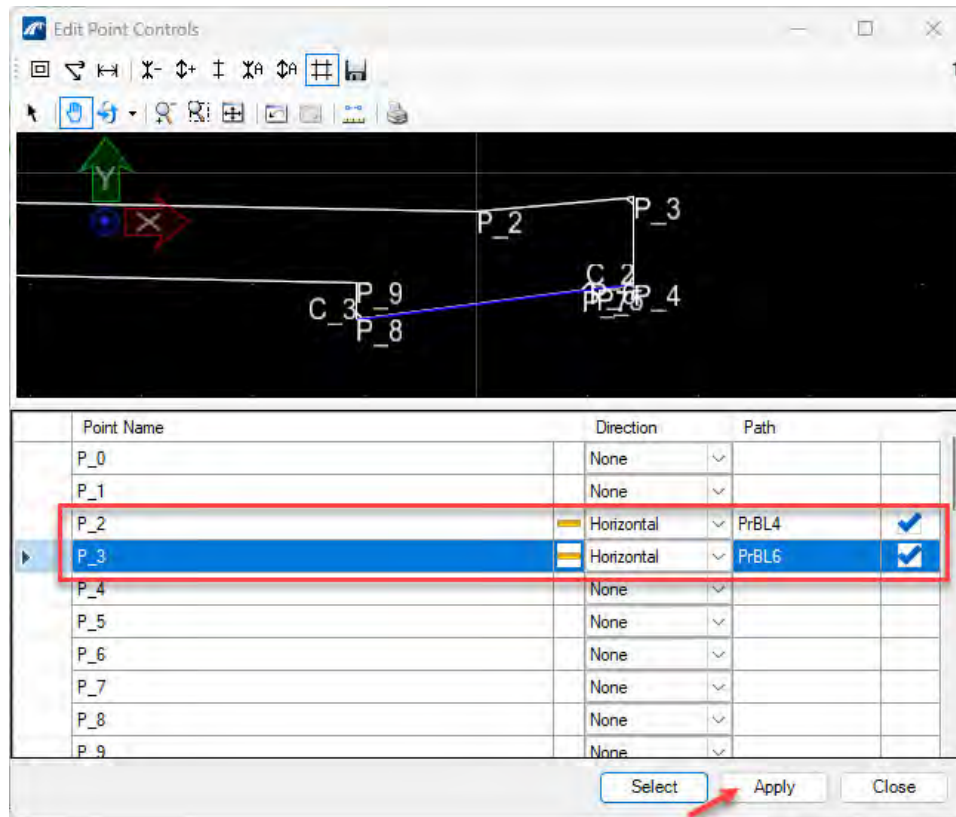
21) Pick point “P_20”, change the “Direction” to “Horizontal”, then click “Select”.



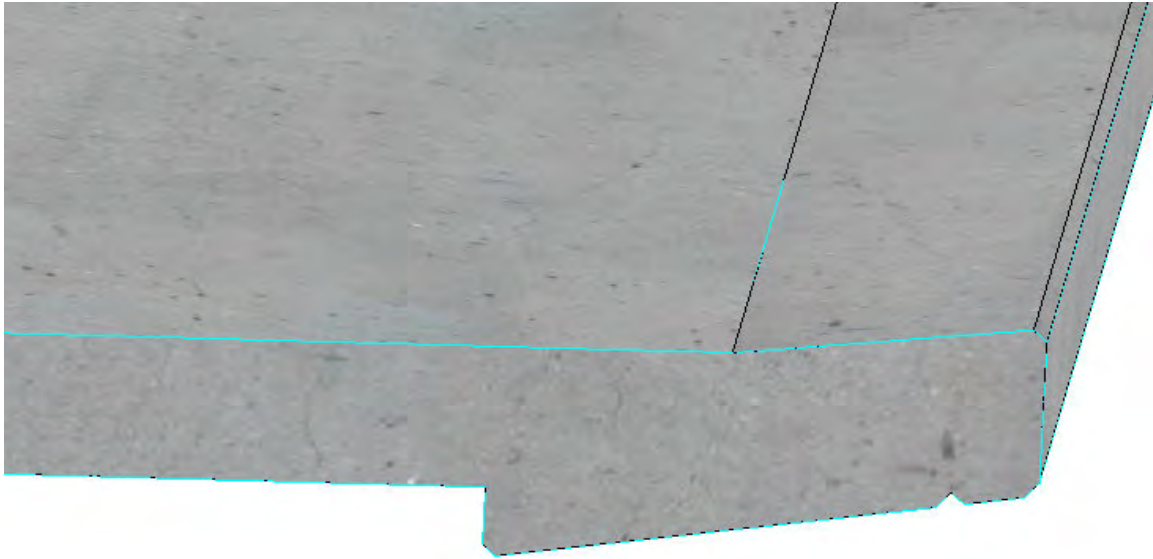
22) Select the point control line that represents the flow line for both the parapet as well as the approach curb.



23) Do the same for both points “P_2” and “P_3” and select “Apply”.

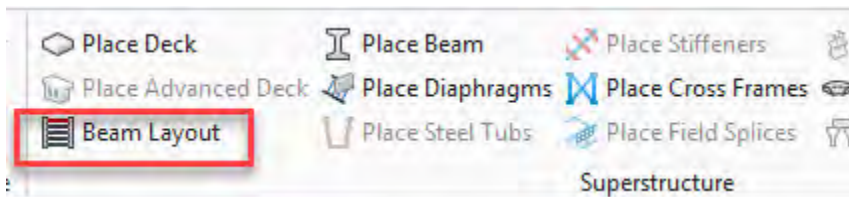


24) Render the view if desired and rotate it to verify that the deck appears correctly.

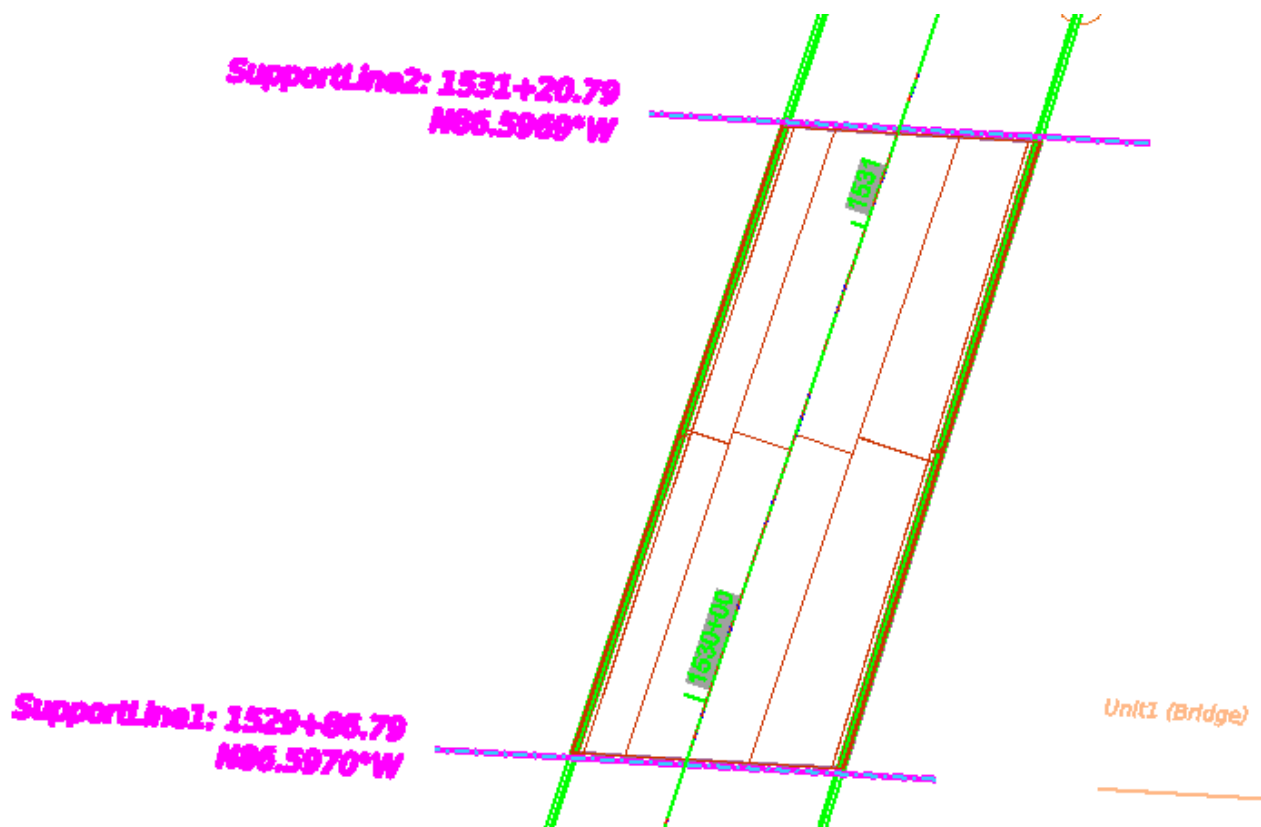


Chapter 4 – Beam Layout and Beams

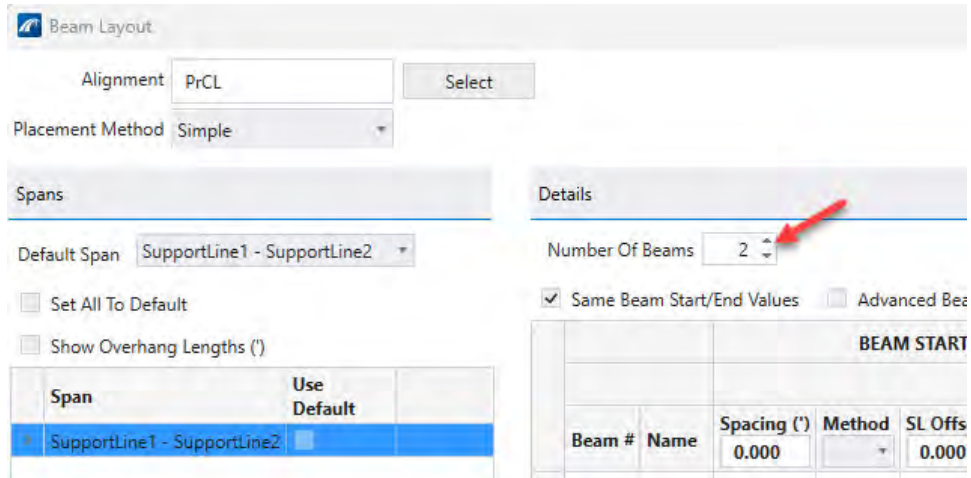
- 1) In the “**OpenBridge Modeler**” workflow, Select “**Beam Layout**” in the “**Superstructure**” group under the “**Home**” tab.



- 2) Select “**SupportLine1**”, then “**SupportLine2**” and accept.



3) Increase the “**Number of Beams**” to 6.



Beam Layout

Alignment: PrCL [Select]

Placement Method: Simple

Spans

Default Span: SupportLine1 - SupportLine2

☐ Set All To Default

☐ Show Overhang Lengths (')

Span	Use Default
SupportLine1 - SupportLine2	☒

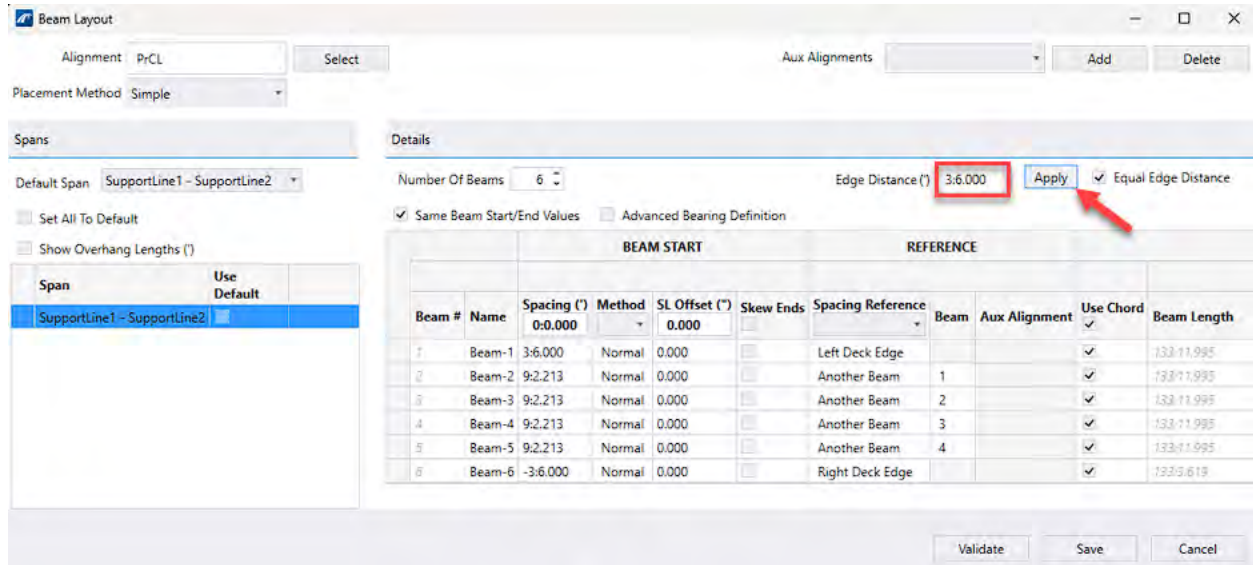
Details

Number Of Beams: 2

☒ Same Beam Start/End Values ☐ Advanced Be

Beam #	Name	Spacing (')	Method	SL Offs
		0.000		0.000

4) Make “**Edge Distance**” to be 3’-6” and then “**Apply**”.



Beam Layout

Alignment: PrCL [Select]

Placement Method: Simple

Aux Alignments: [Add] [Delete]

Spans

Default Span: SupportLine1 - SupportLine2

☐ Set All To Default

☐ Show Overhang Lengths (')

Span	Use Default
SupportLine1 - SupportLine2	☒

Details

Number Of Beams: 6

Edge Distance ('): 3:6.000 [Apply] ☒ Equal Edge Distance

☒ Same Beam Start/End Values ☐ Advanced Bearing Definition

BEAM START					REFERENCE					
Beam #	Name	Spacing (')	Method	SL Offset (')	Skew Ends	Spacing Reference	Beam	Aux Alignment	Use Chord	Beam Length
1	Beam-1	3:6.000	Normal	0.000	☐	Left Deck Edge			☒	133:11.995
2	Beam-2	9:2.213	Normal	0.000	☐	Another Beam	1		☒	133:11.995
3	Beam-3	9:2.213	Normal	0.000	☐	Another Beam	2		☒	133:11.995
4	Beam-4	9:2.213	Normal	0.000	☐	Another Beam	3		☒	133:11.995
5	Beam-5	9:2.213	Normal	0.000	☐	Another Beam	4		☒	133:11.995
6	Beam-6	-3:6.000	Normal	0.000	☐	Right Deck Edge			☒	133:5.619

[Validate] [Save] [Cancel]

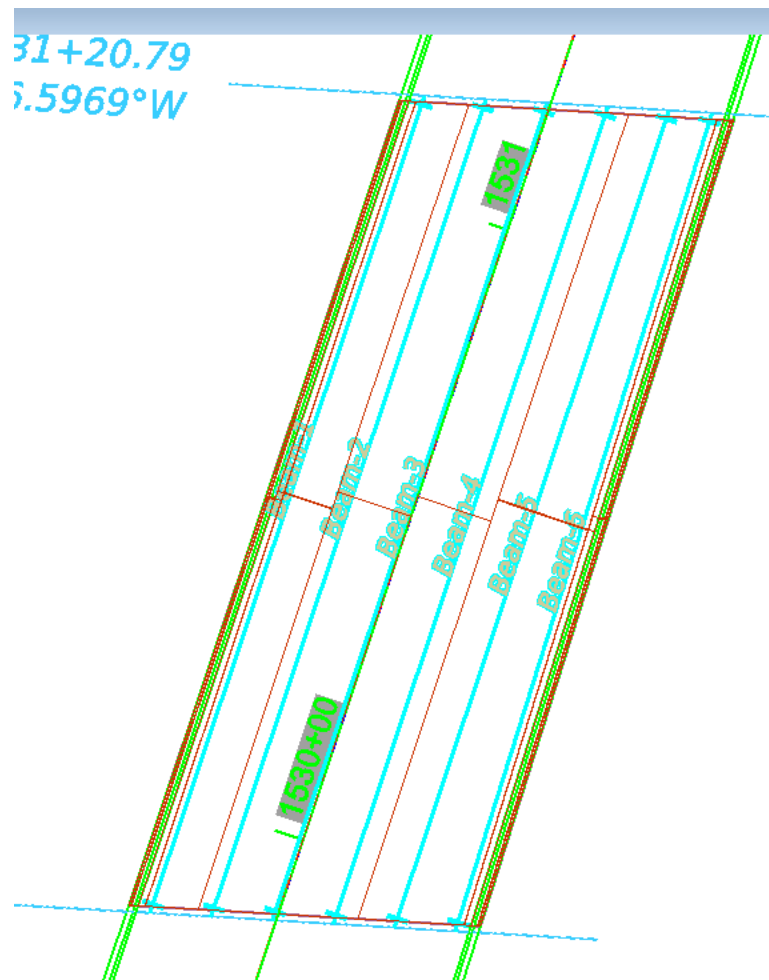
5) Change Default “**SL Offset**” to 16.944” and “**Enter**”.

BEAM START			
Method	SL Offset (")	Skew Ends	
	16.944		
Normal	16.944		
Normal	16.944		
Normal	16.944		
Normal	16.944		
Normal	16.944		

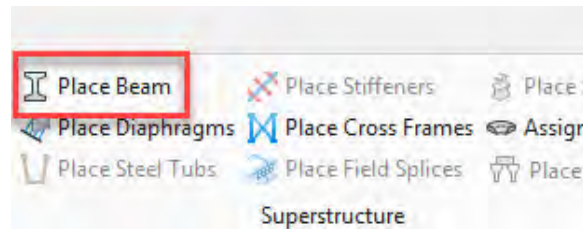
6) Change the Beam #6 “**SL Offset**” to **16.728**” and click “**Enter**”.

Beam #	Name	Spacing (')	Method	SL Offset (")
		0:0.000		16.944
1	Beam-1	3:6.000	Normal	16.944
2	Beam-2	9:2.213	Normal	16.944
3	Beam-3	9:2.213	Normal	16.944
4	Beam-4	9:2.213	Normal	16.944
5	Beam-5	9:2.213	Normal	16.944
6	Beam-6	-3:6.000	Normal	16.728

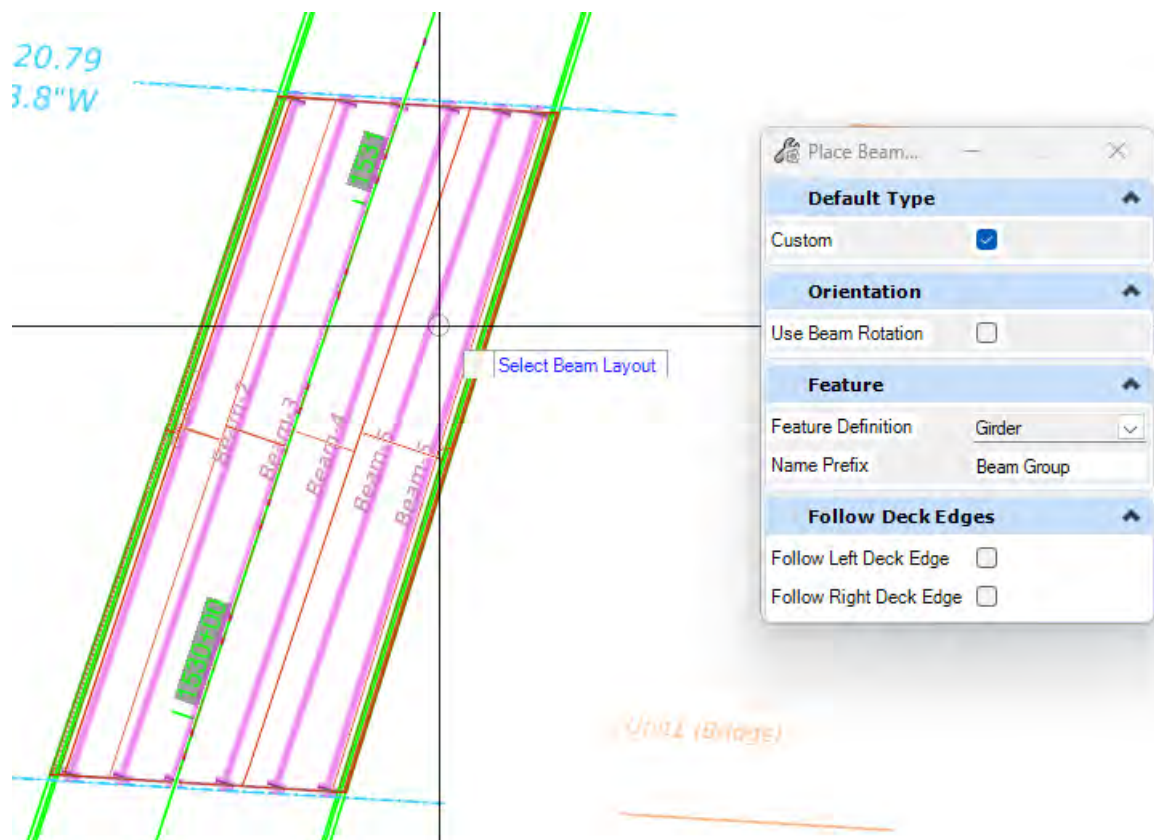
7) “**Validate**”, then “**Save**” in the lower right corner of the Beam Layout dialog box.



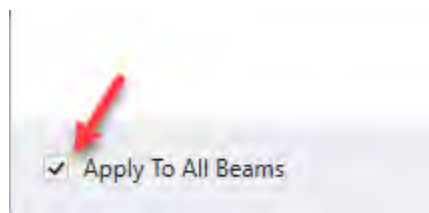
- 8) Select **“Place Beam”** in the **“Superstructure”** group of the **“Home”** tab in the **“OpenBridge Modeler”** workflow.



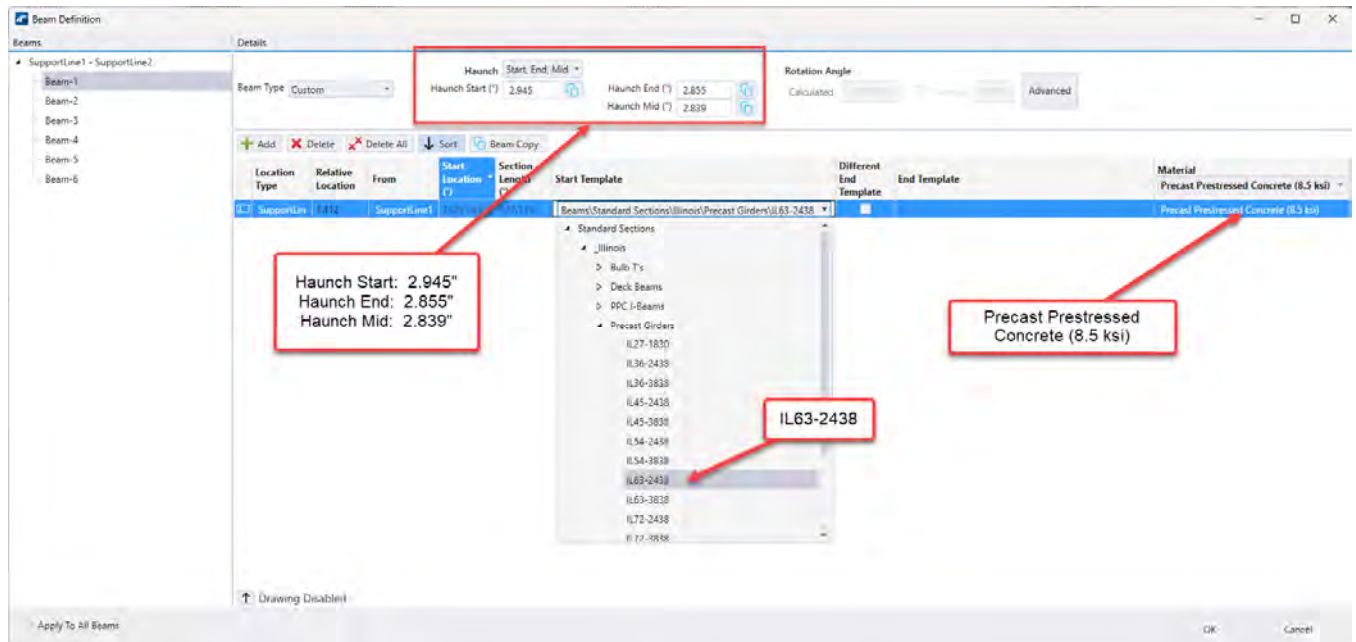
- 9) Change the settings as shown and pick on the previously created beam layout, then accept with the left mouse button.



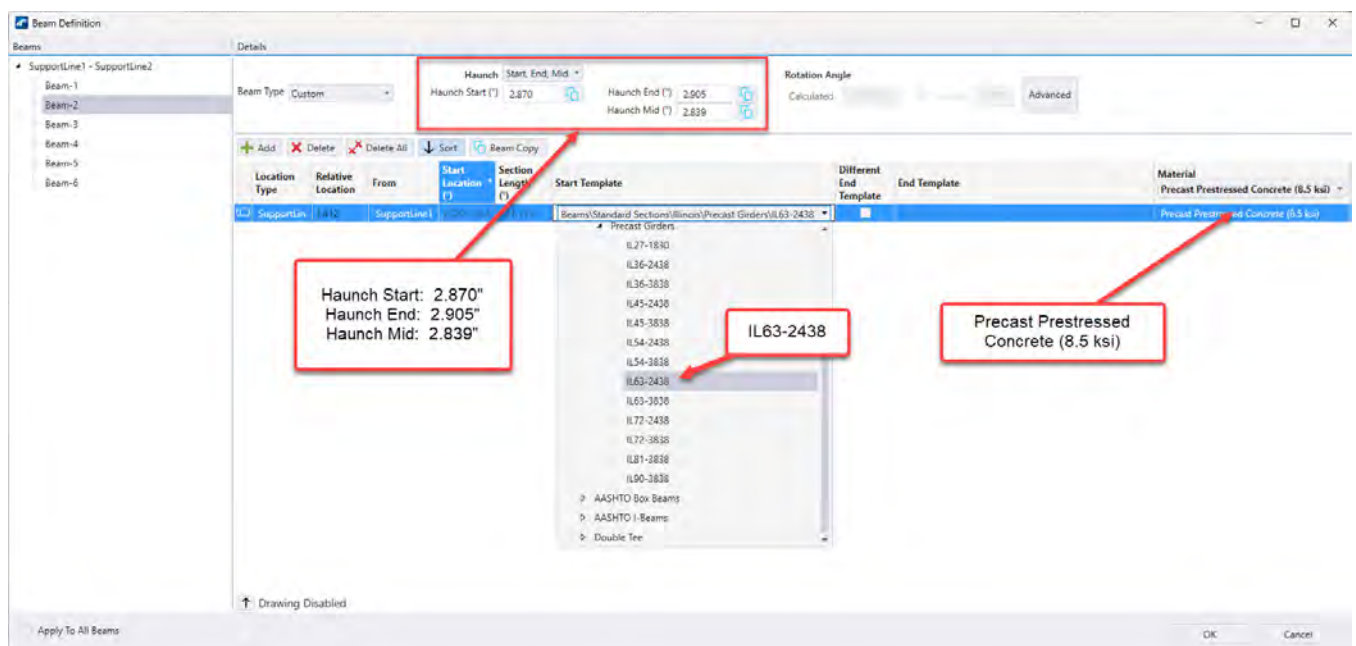
- 10) Turn off **“Apply To All beams”** in the lower left corner of the Beam Definition dialog.



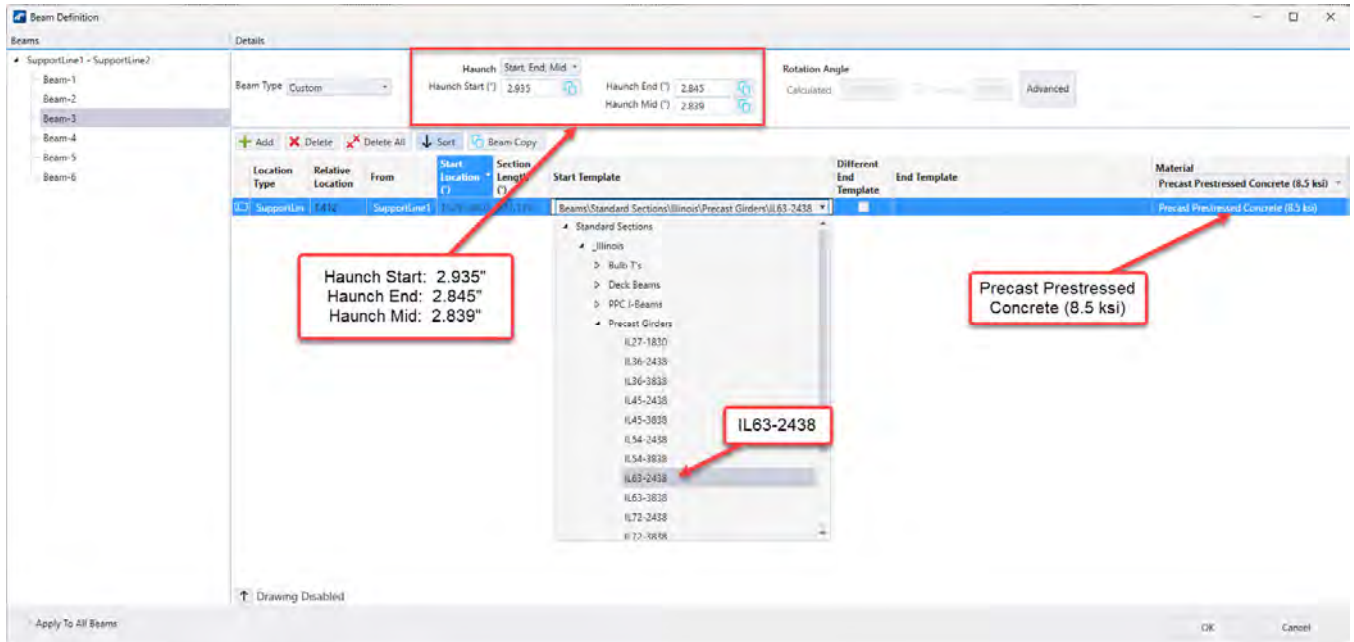
11) With Beam 1 selected, change the values as follows:



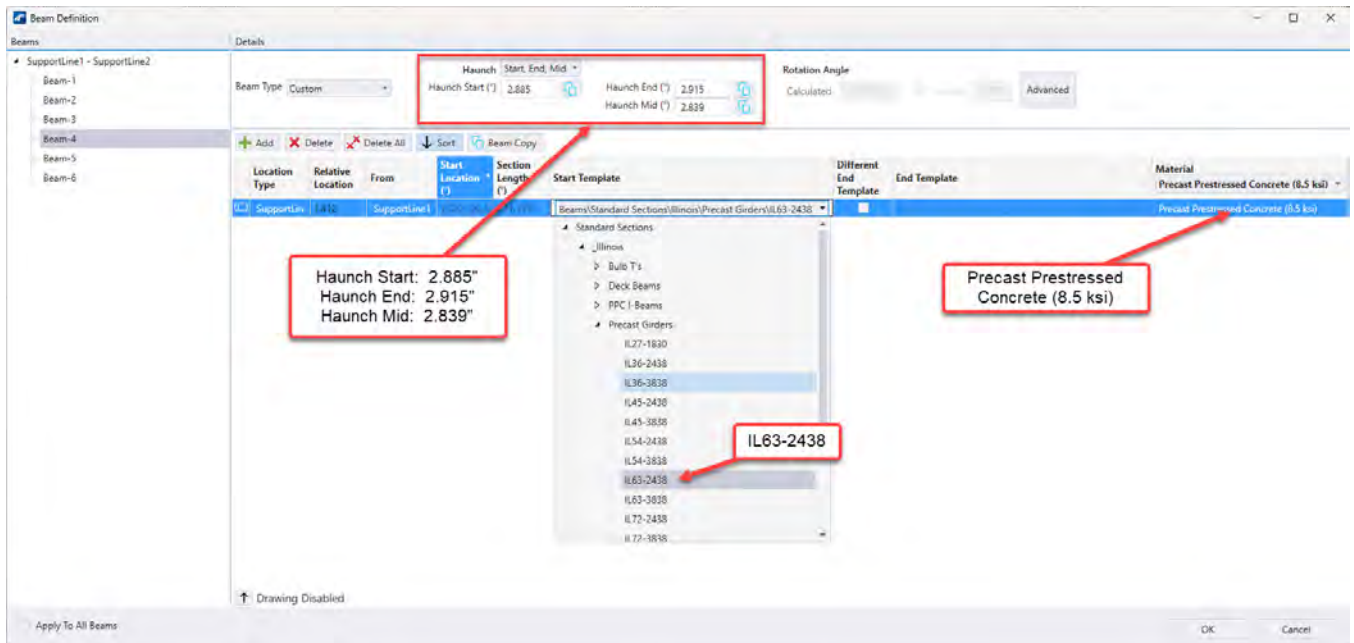
12) With Beam 2 selected, change the values as follows:



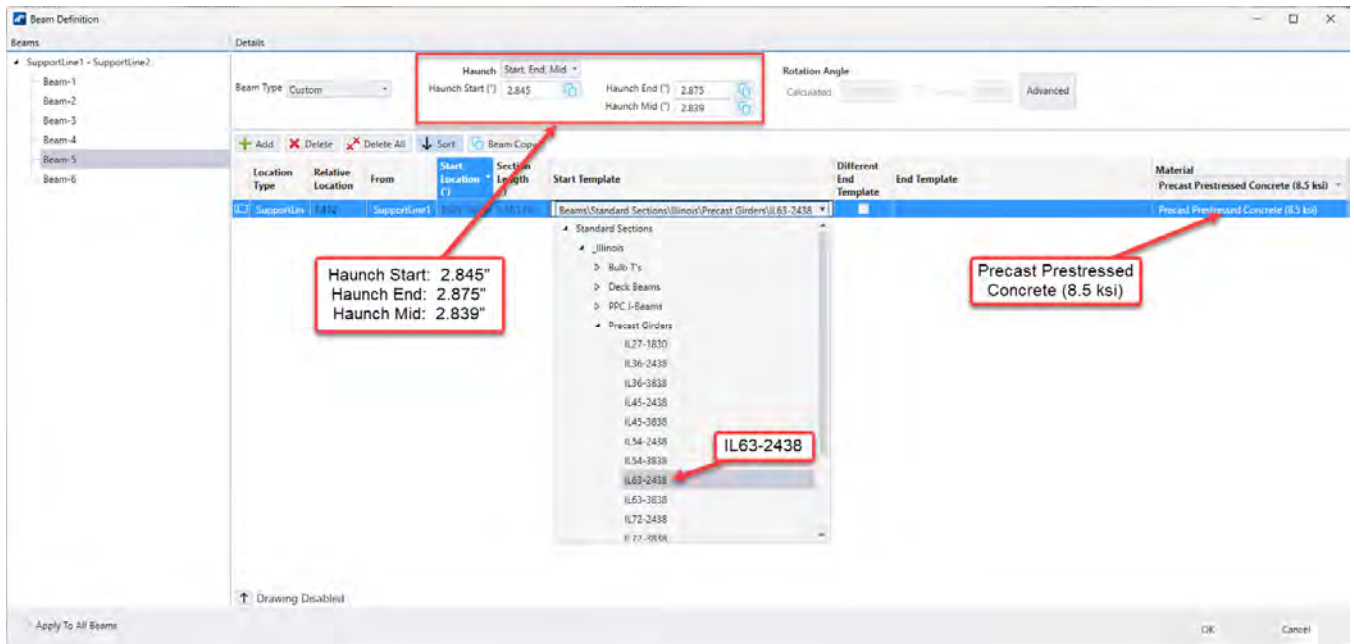
13) With Beam 3 selected, change the values as follows:



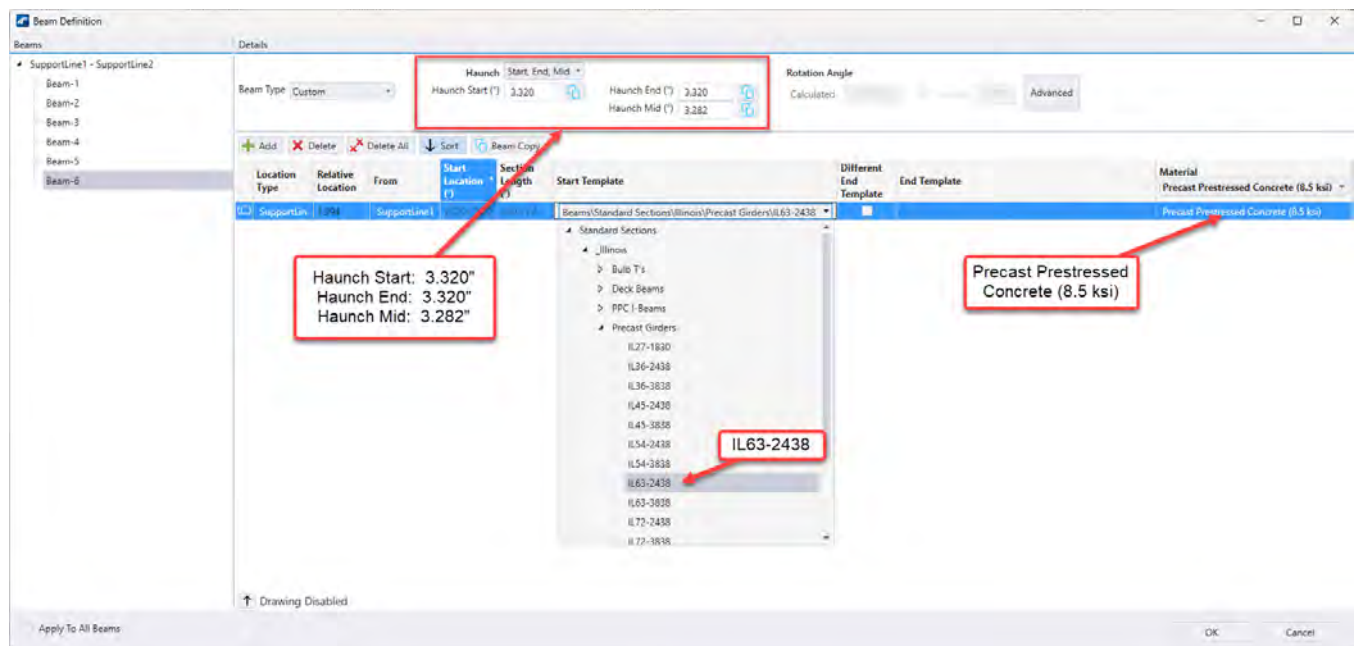
14) With Beam 4 selected, change the values as follows:



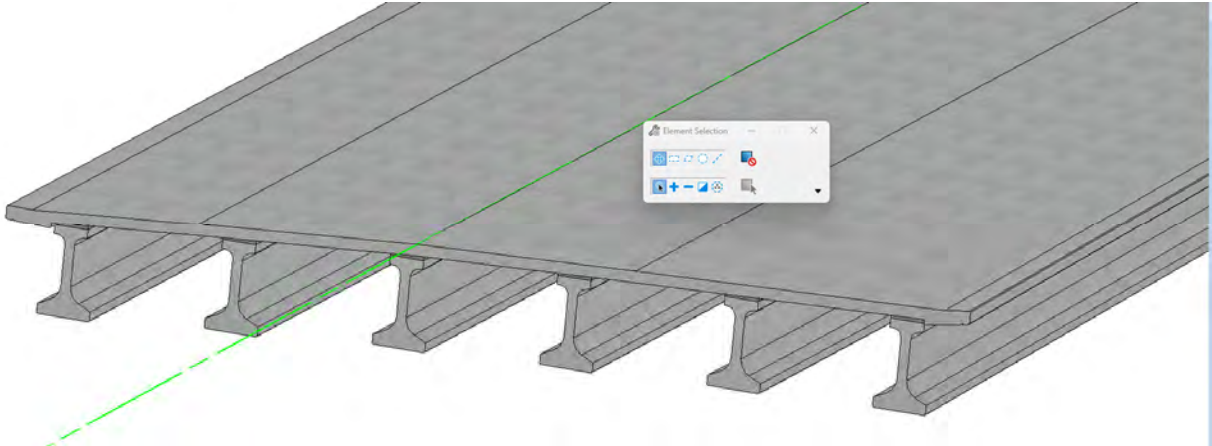
15) With Beam 5 selected, change the values as follows:



16) With Beam 6 selected, change the values as follows:



17) Select “**OK**” in the lower right corner of the Beam Definition dialog box.

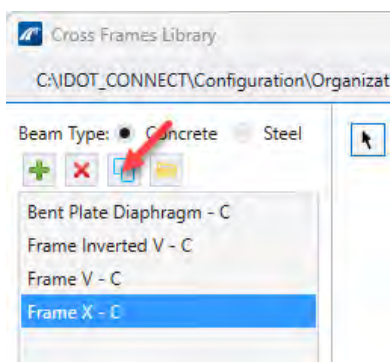


Chapter 5 – Permanent Bracing

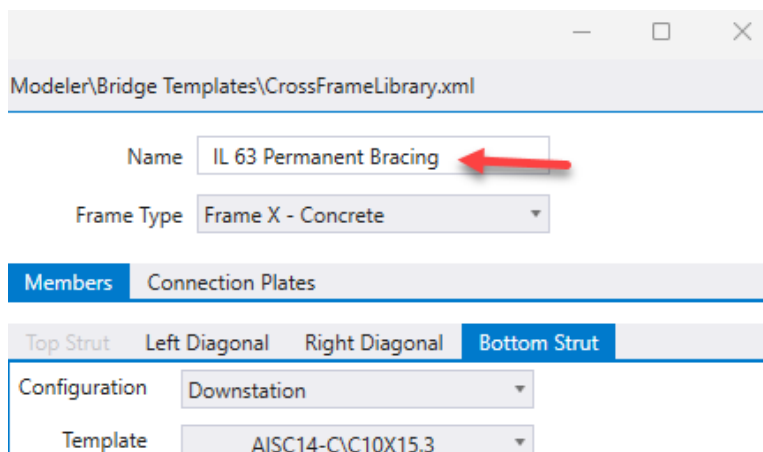
- 1) In the “**OpenBridge Modeler**” workflow, Select “**Cross Frames**” in the “**Libraries**” group under the “**Utilities**” tab.



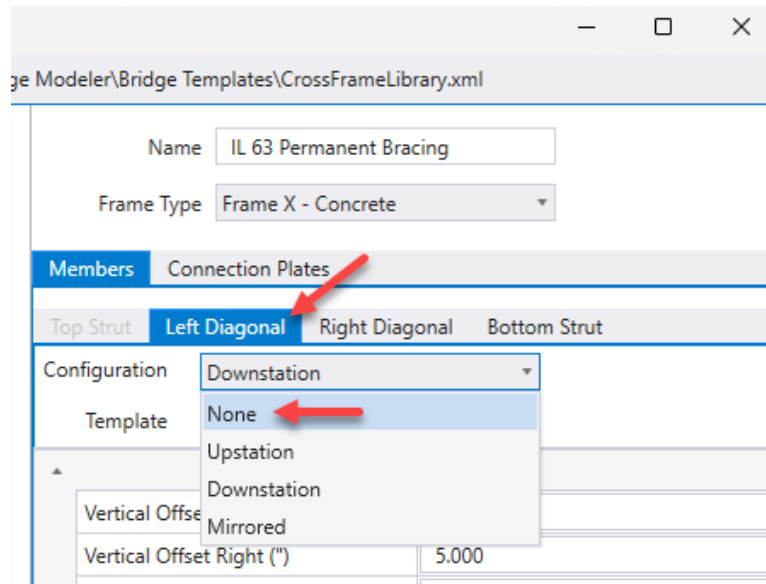
- 2) Select the “**Frame X – C**” cross frame template and “**Copy**”.



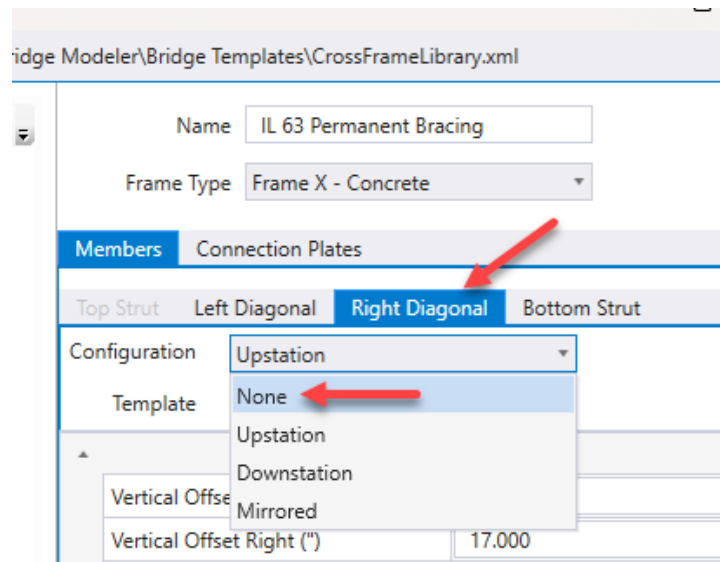
- 3) Rename the new Template to “**IL 63 Permanent Bracing**”.



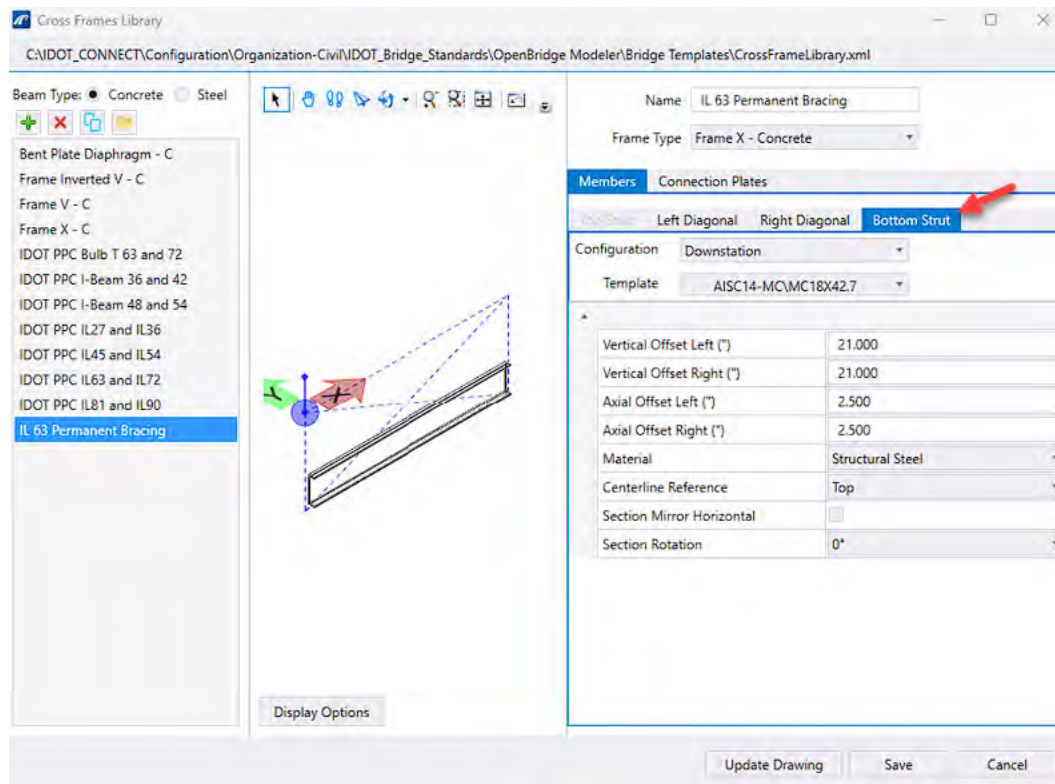
- 4) In the “**Left Diagonal**” tab, change the Configuration value to “**None**”.



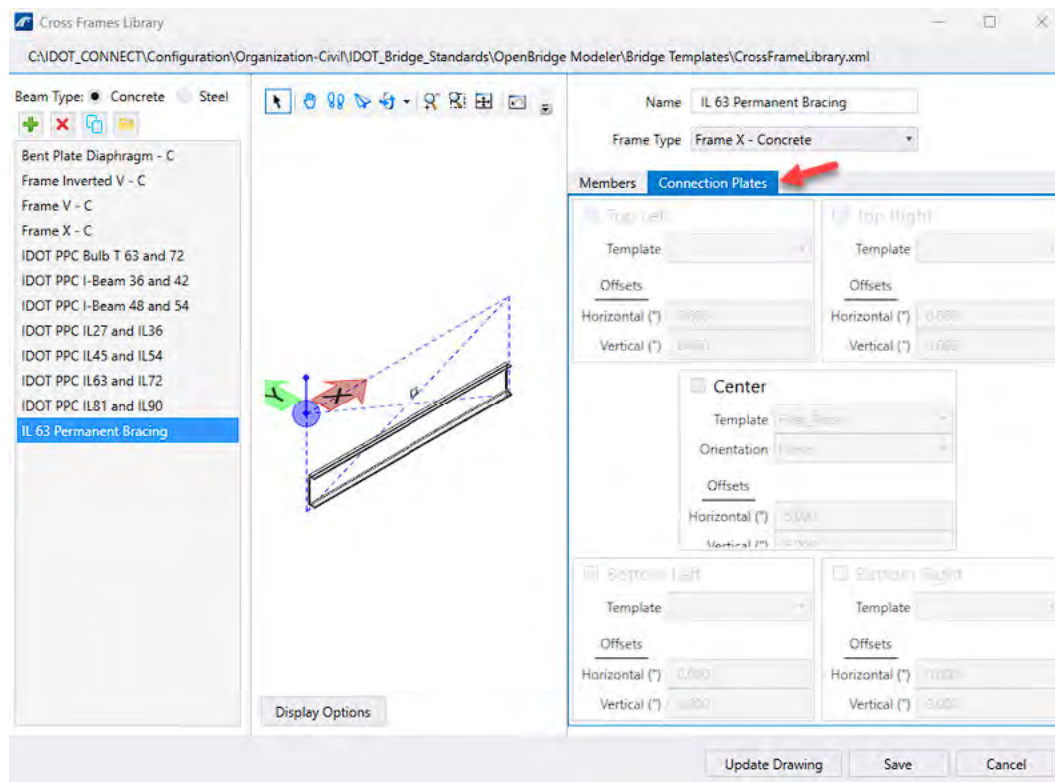
- 5) In the “**Right Diagonal**” tab, change the Configuration value to “**None**”.



- 6) In the “**Bottom Strut**” tab, change the values to those shown below (you can click on the “**Update Drawing**” button at the bottom of the dialog to see the results of the entered values):

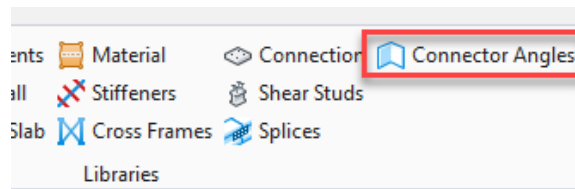


- 7) Select the “**Connection Plates**” tab, toggle off the “**Center**” connection plate, then “**Save**”.

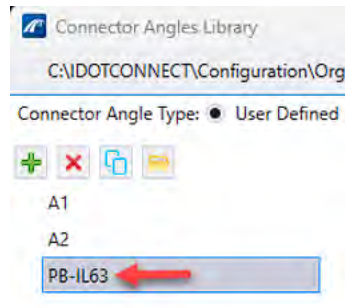


- 8) Click “**Save**” in the lower right corner.

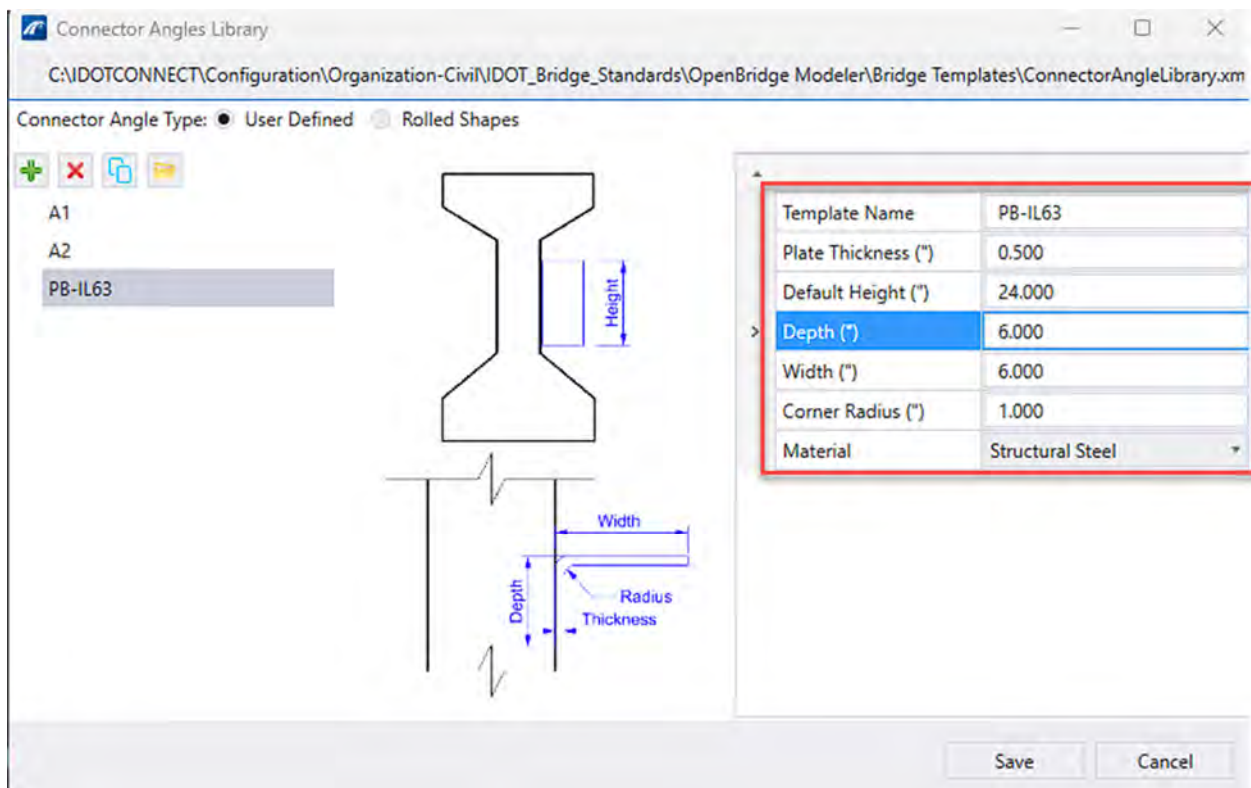
- 9) In the “**OpenBridge Modeler**” workflow, Select “**Connector Angles**” in the “**Libraries**” group in the “**Utilities**” tab.



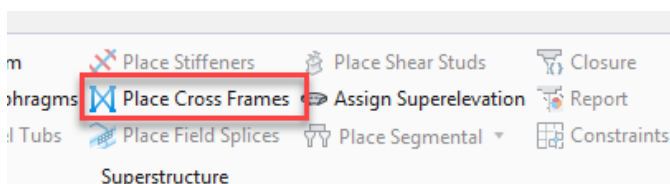
- 10) Select “PB-IL63”.



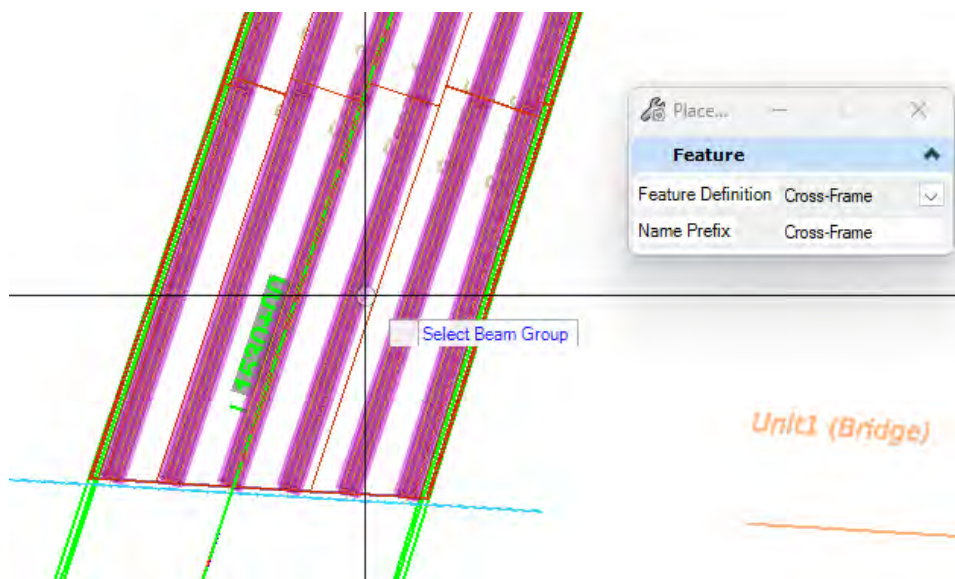
- 11) Change the dialog values to those shown, then “**Save**”.



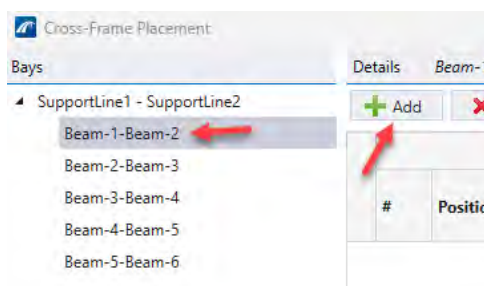
- 12) In the “**OpenBridge Modeler**” workflow, Select “**Place Cross Frame**” in the “**Superstructure**” group in the “**Home**” tab.



- 13) Select the Beam Group and Accept.



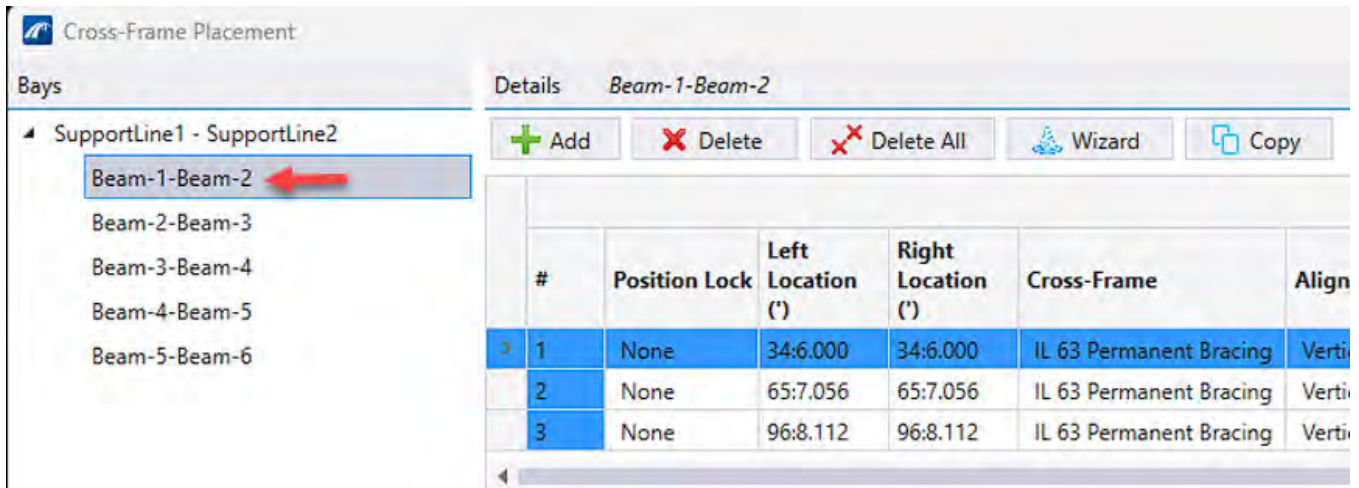
- 14) With “**Beam-1-Beam-2**” selected, click “**Add**” three times.



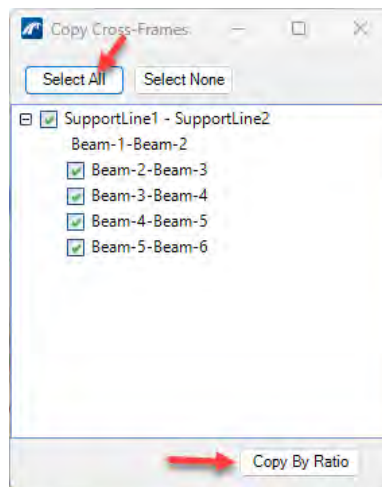
- 15) Change the values to those shown.

Details Beam-1-Beam-2												
CONNECTOR												
#	Position Lock	Left Location (')	Right Location (')	Cross-Frame	Align	Template	Left Height (')	Left Offset (')	Level	Right Height (')	Right Offset (')	Orientation
1	None	34:6.000	34:6.000	IL 63 Permanent Bracing	Vertical	Connector Angles\PB-IL63	2:0.000	2:1.000	☒	2:0.000	2:1.000	Upstation
2	None	65:7.056	65:7.056	IL 63 Permanent Bracing	Vertical	Connector Angles\PB-IL63	2:0.000	2:1.000	☐	2:0.000	2:1.000	Upstation
3	None	96:8.112	96:8.112	IL 63 Permanent Bracing	Vertical	Connector Angles\PB-IL63	2:0.000	2:1.000	☐	2:0.000	2:1.000	Upstation

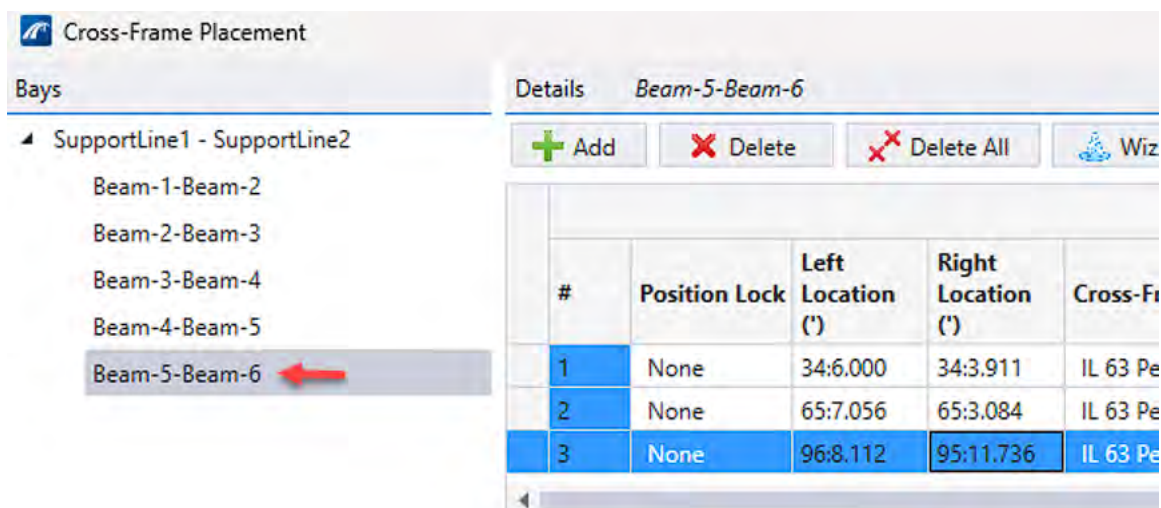
16) With the “**Beam-1-Beam-2**” row still selected, select “**Copy**”.



17) Pick “**Select All**”, then “**Copy By Ratio**”.



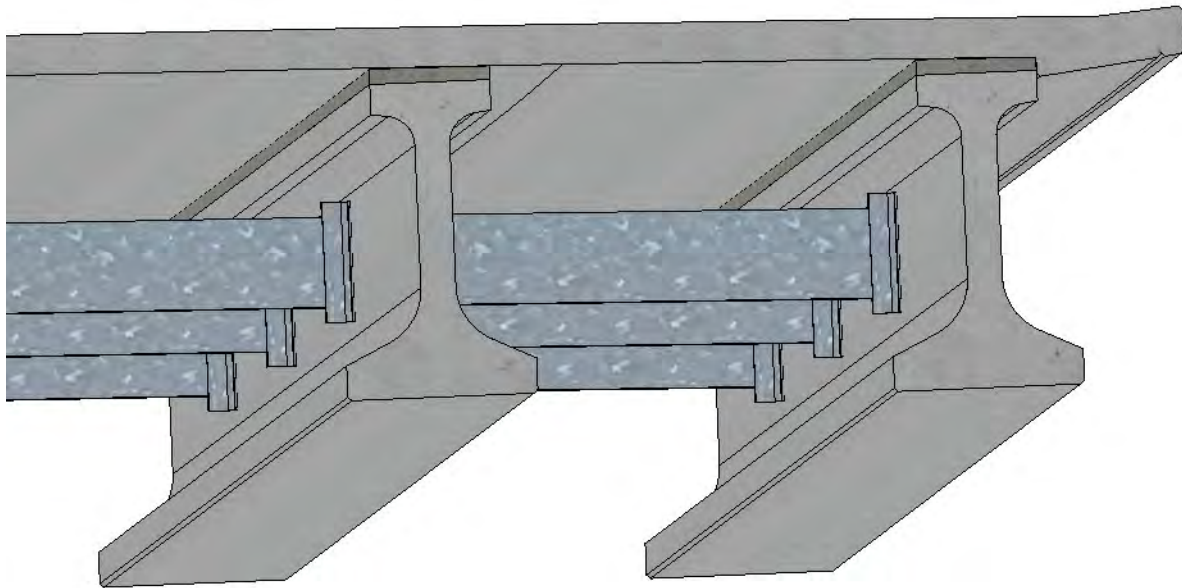
18) Select “**Beam-5-Beam-6**” and modify the “**Right Location**” values to those shown.



19) “**Validate**” if desired, then select “**Save**”.

CONNECTOR						
Left Height (')	Left Offset (')	Level	Right Height (')	Right Offset (')	Orientation	Double L
100	2.083	☒	2.000	2.083	Upstation	☒
100	2.083	☐	2.000	2.083	Upstation	☐
100	2.083	☐	2.000	2.083	Upstation	☐

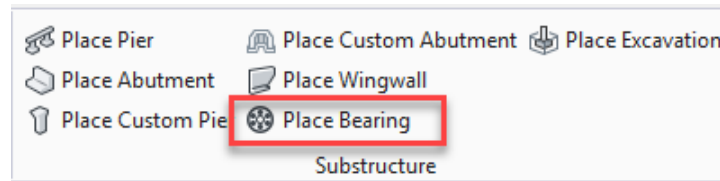
20) If desired, render the view and rotate to verify that the permanent bracing appears correctly (Note that holes or bolts are not placed by OBM. If desired, that must be done using the ProSteel tools of ProStructures).



Chapter 6 – Bearings & Abutments

Bearing Placement

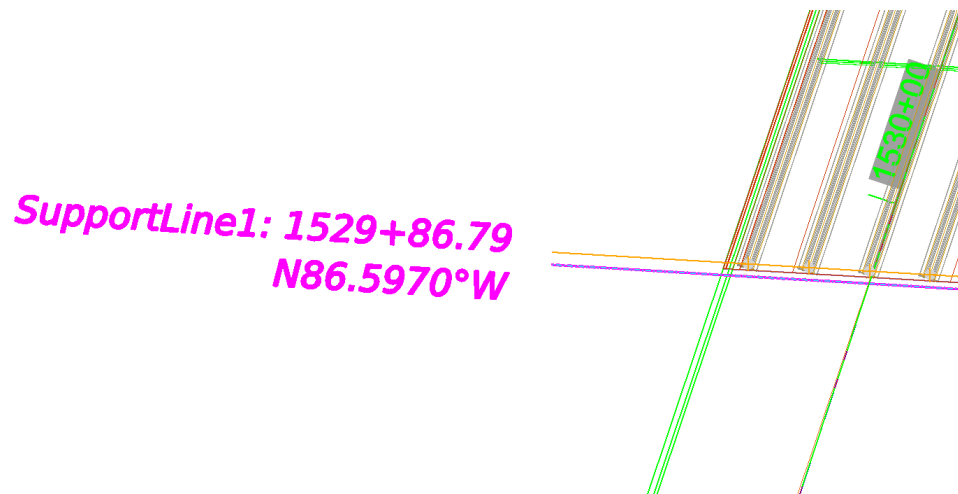
- 1) In the “**OpenBridge Modeler**” workflow, Select “**Place Bearing**” in the “**Substructure**” group in the “**Home**” tab.



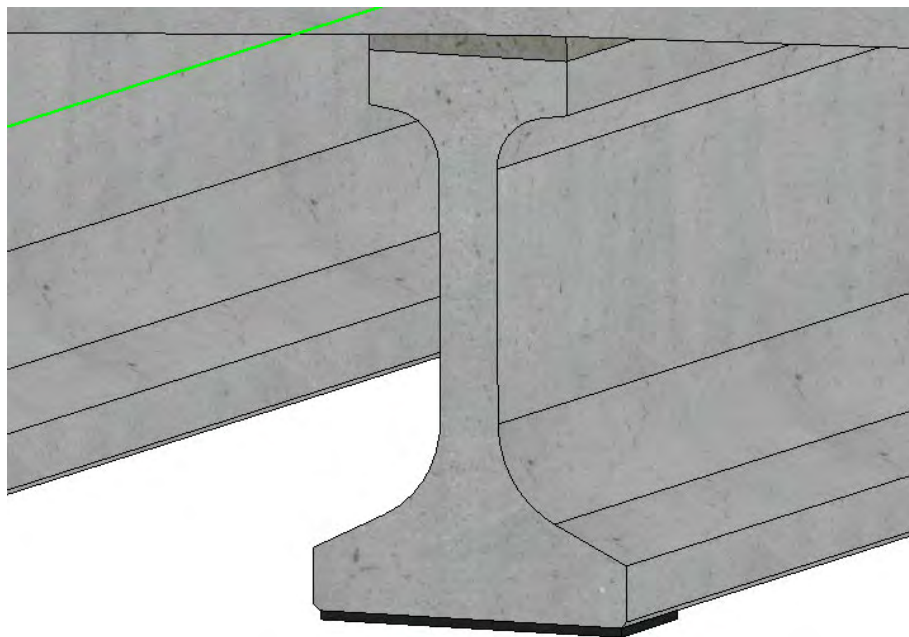
- 2) Modify the values of the Place Bearing dialog as follows:

The screenshot shows the 'Place Bearing' dialog box in OpenBridge Modeler. The dialog is divided into several sections: **Bearing**, **Grout Pad/Bevel Plate**, **Bearing Seat**, **Path**, **Material**, and **Feature**. The 'Bearing' section is expanded, showing fields for Bearing Type (Cube), Cube Width, W (3:0.500), Cube Depth, D (1:3.000), Cube Height (0:1.000), Orientation (Girder), Bearing Pay Unit (Each), and Bearing Name Prefix (Brg). The 'Grout Pad/Bevel Plate' section has a checkbox for 'Has Pad or Plate'. The 'Bearing Seat' section has a checkbox for 'Has Bearing Seats'. The 'Path' section has fields for 'Back Offset' (0:0.000) and 'Ahead Offset' (1:11.500). The 'Material' section has dropdowns for 'Pad or Plate Material', 'Bearing Material', and 'Bearing Seat Material'. The 'Feature' section has a dropdown for 'Feature Definition' (Bearing) and a text field for 'Group Name Prefix' (Bearing).

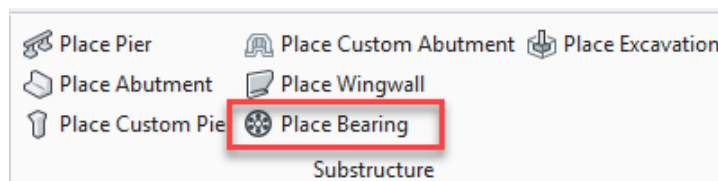
- 3) As prompted, select “**SupportLine 1**” and reset with a right mouse click.



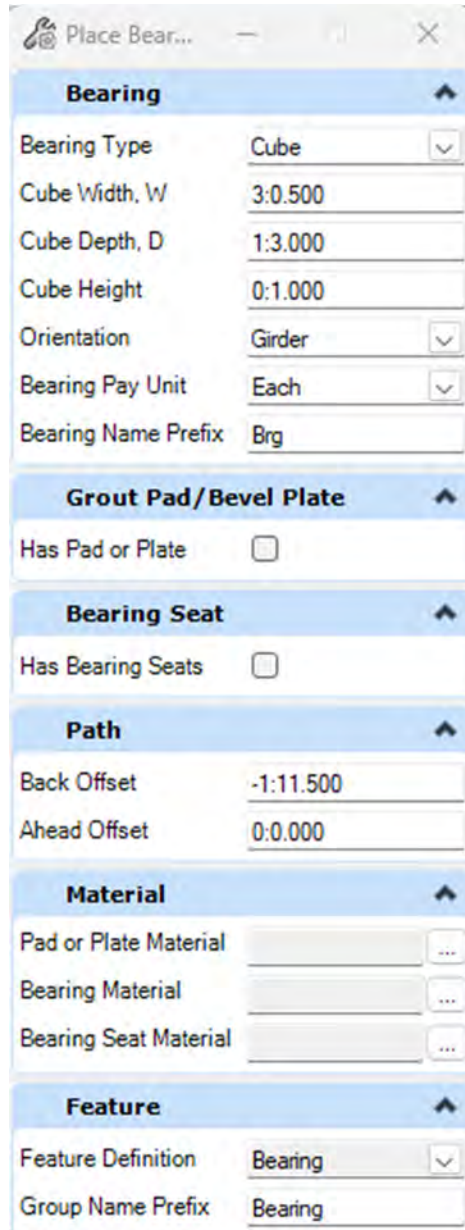
- 4) Left mouse click to accept the “**Ahead Offset**” of “**1’-11.500”**”.
- 5) The bearings are now placed at the South abutment.



- 6) In the “**OpenBridge Modeler**” workflow, Select “**Place Bearing**” in the “**Substructure**” group in the “**Home**” tab.



7) Modify the values of the Place Bearing dialog as follows:



Place Bear...

Bearing

Bearing Type: Cube

Cube Width, W: 3:0.500

Cube Depth, D: 1:3.000

Cube Height: 0:1.000

Orientation: Girder

Bearing Pay Unit: Each

Bearing Name Prefix: Brg

Grout Pad/Bevel Plate

Has Pad or Plate: ☐

Bearing Seat

Has Bearing Seats: ☐

Path

Back Offset: -1:11.500

Ahead Offset: 0:0.000

Material

Pad or Plate Material: ...

Bearing Material: ...

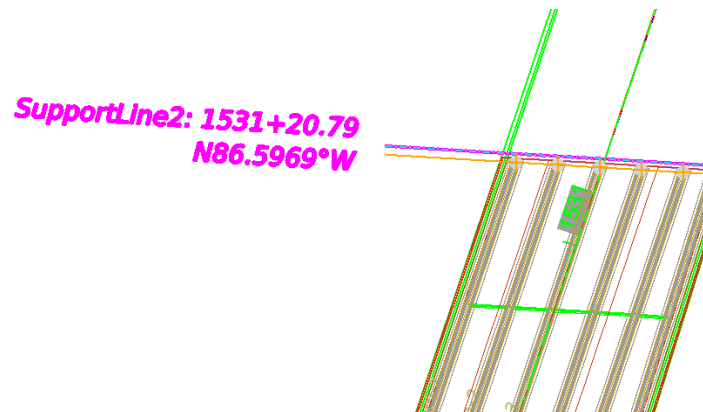
Bearing Seat Material: ...

Feature

Feature Definition: Bearing

Group Name Prefix: Bearing

8) As prompted, select “**SupportLine 2**” and reset with a right mouse click.

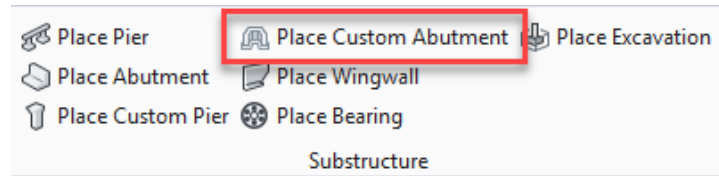


- 9) Left mouse click to accept the **“Back Offset”** of **“ - 11’-11.500”**.
- 10) The bearings are now placed at the North abutment.

Abutment Placement

Although we have a Generative Component specifically for Integral Abutments, it will not work for this structure for various reasons. Because of this, it is sometimes best to model substructure elements using the basic 3D MicroStation modeling tools within OpenBridge Modeler. For this exercise, the abutments have already been created. The cell library containing them just needs to be placed in the appropriate location of the IDOT configuration.

- 11) Using Windows Explorer, copy or move the file **“0250113 Abutments.cel”** in the dataset folder (**“c:\OBM Tapered Bridge\”**) into the configuration folder of **“c:\IDOT_CONNECT\Configuration\Organization-Civil\IDOT_Bridge_Standards\OpenBridge Modeler\Bridge Templates\Functional Components\”**.
- 12) From the **“Home”** tab, in the **“Substructure”** group, select **“Place Custom Abutment”**.



13) Modify the contents of the **“Place Custom Abutment”** dialog as shown:

The screenshot shows the 'Place Custom Abutment' dialog box with the 'Solid Placement' section expanded. The 'Cell' field is empty with a dropdown arrow. The 'Type' field is empty. The 'Active Angle' is set to 180°. The 'X-Scale' is 1.000, 'Y-Scale' is 1.000, and 'Z-Scale' is 1.000. The 'Horizontal Offset' is 4:8.472, 'Vertical Offset' is -3:9.984, and 'SupportLine Offset' is 0:0.000. The 'Cap Length Adjustment' is set to 'None'. The 'Ignore Support Line Skew' and 'Analytical Properties' checkboxes are unchecked. The 'Material' section shows 'Cap Material' as 'Concrete Structures', 'Footing Material' is empty, 'Pile Material' as 'Metal Shell, 14"x0.312"', and 'Concrete Pad Material' is empty. The 'Feature' section shows 'Feature Definition' as 'Abutment_steel_piles' and 'Name Prefix' as 'Abutment'.

Solid Placement	
Cell	
Type	
Active Angle	180°
X-Scale	1.000
Y-Scale	1.000
Z-Scale	1.000
Horizontal Offset	4:8.472
Vertical Offset	-3:9.984
SupportLine Offset	0:0.000
Cap Length Adjustment	None
Ignore Support Line Skew	☐
Analytical Properties	☐

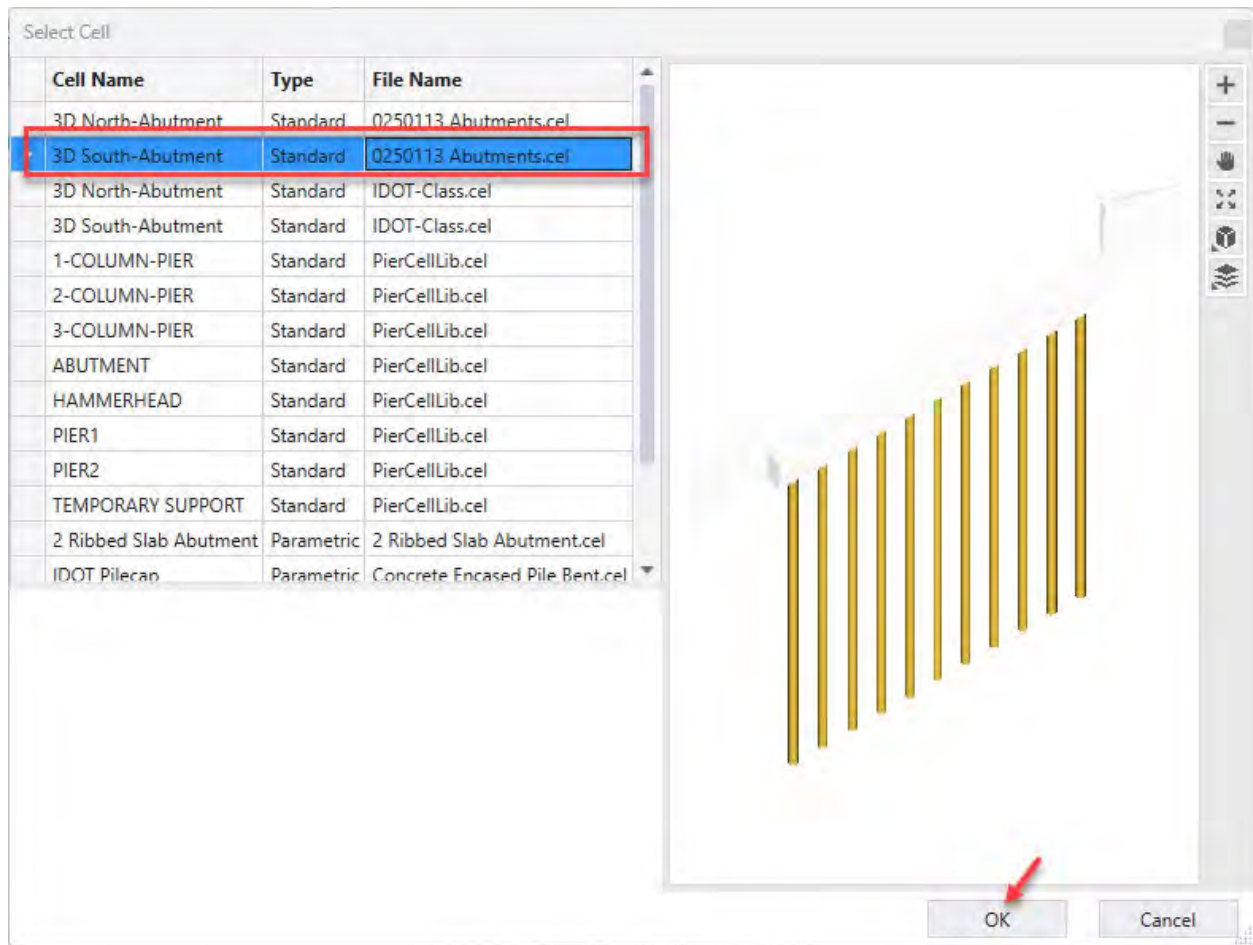
Material	
Cap Material	Concrete Structures
Footing Material	
Pile Material	Metal Shell, 14"x0.312"
Concrete Pad Material	

Feature	
Feature Definition	Abutment_steel_piles
Name Prefix	Abutment

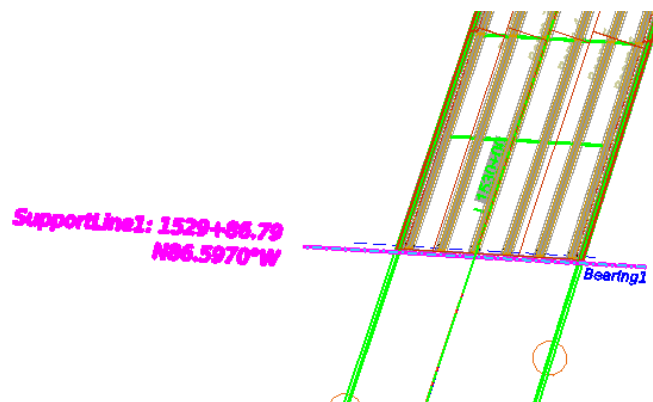
14) Pick “...” in the **“Cell”** row of the same dialog.

This screenshot is a close-up of the 'Cell' field in the 'Solid Placement' section of the 'Place Custom Abutment' dialog. A red box highlights the dropdown arrow (three dots) next to the empty 'Cell' field.

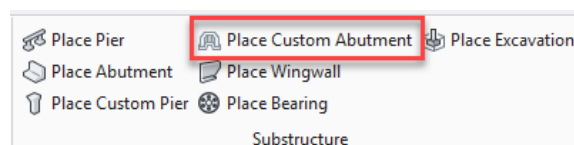
- 15) The two abutment cells should show up at the top of the list. Pick the **“3D South-Abutment”** since we are placing it first and then **“OK”**.



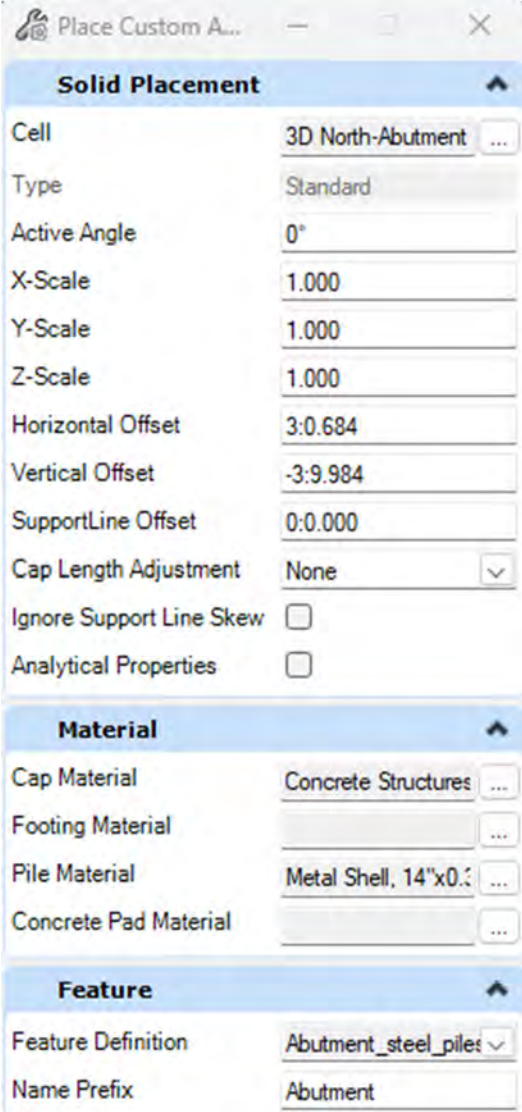
- 16) Select the South Abutment Support Line, **“SupportLine 1”** and then reset using the right mouse button.



- 17) Select the **“Place Custom Abutment”** command again.



- 18) Change the values in the “**Place Custom Abutment**” dialog to the following, while also picking the “**3D North-Abutment**” cell:



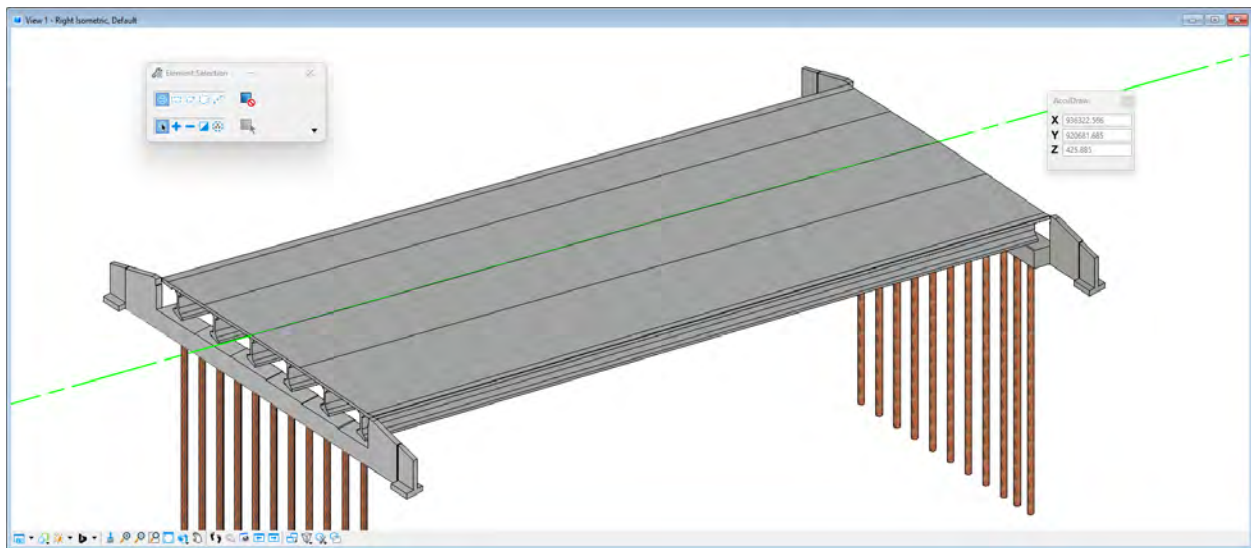
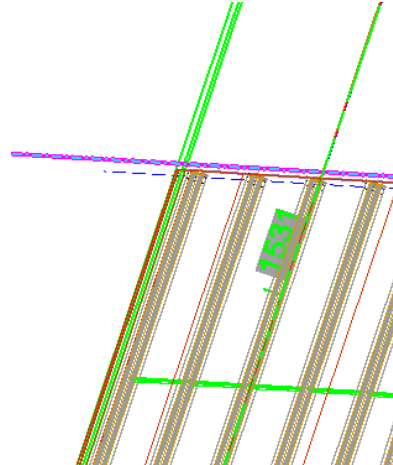
Solid Placement	
Cell	3D North-Abutment ...
Type	Standard
Active Angle	0°
X-Scale	1.000
Y-Scale	1.000
Z-Scale	1.000
Horizontal Offset	3:0.684
Vertical Offset	-3:9.984
SupportLine Offset	0:0.000
Cap Length Adjustment	None
Ignore Support Line Skew	☐
Analytical Properties	☐

Material	
Cap Material	Concrete Structures ...
Footing Material	...
Pile Material	Metal Shell, 14"x0.1 ...
Concrete Pad Material	...

Feature	
Feature Definition	Abutment_steel_piles
Name Prefix	Abutment

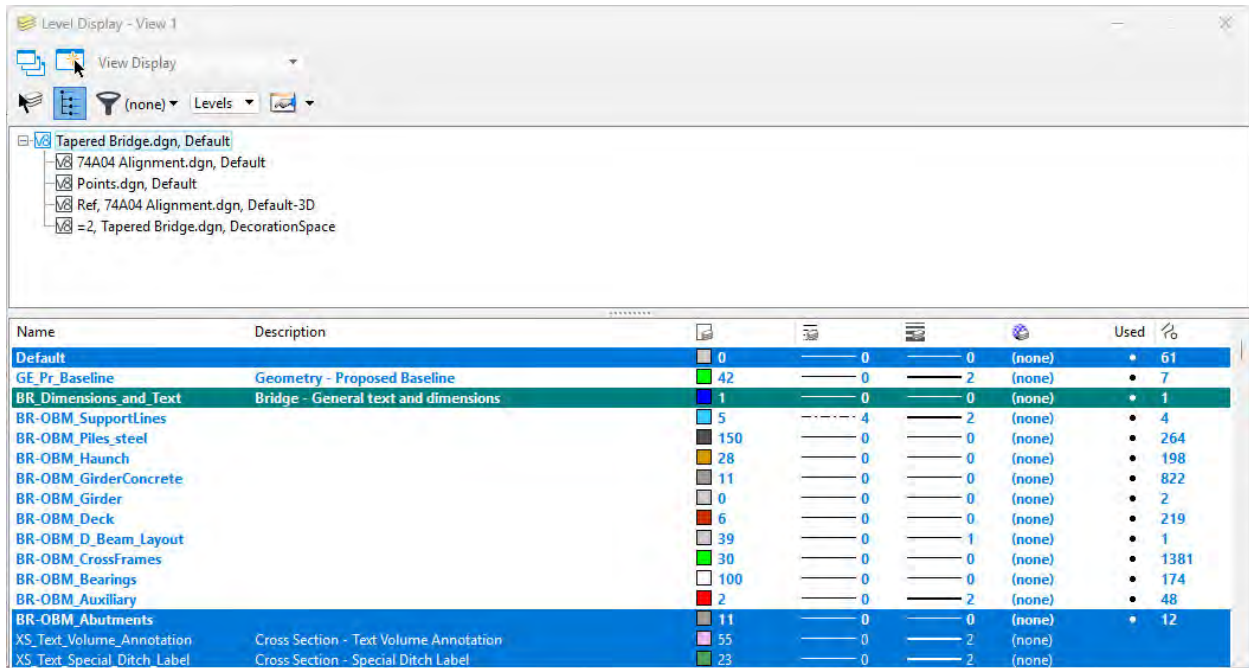
- 19) Select the North Abutment Support Line, "**SupportLine 2**" and then reset using the right mouse button.

SupportLine2: 1531+20.79
N86.5969°W

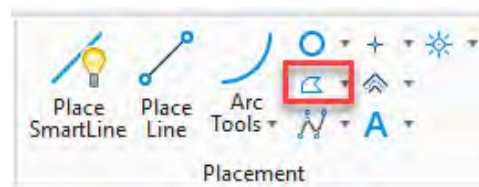


Chapter 7 – Concrete Diaphragms

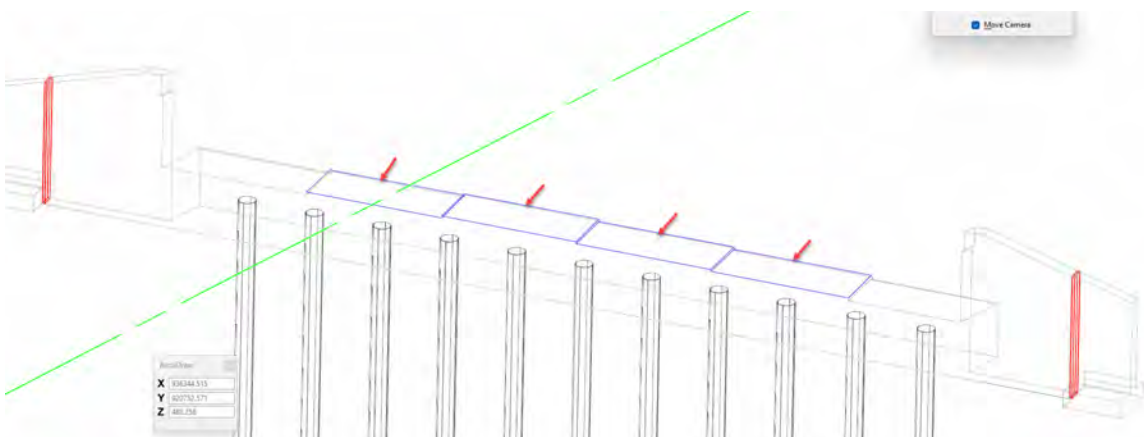
- 1) Rotate to a right Isometric view or a similar dynamic view.
- 2) In the Level Display dialog, turn off all levels except for “**BR-OBM_Abutments**”.
- 3) Make a level active, such as “**BR_Dimensions_and_Text**”.



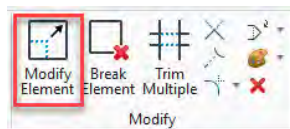
- 4) In the “**Drawing**” workflow, Select “**Place Shape**” in the “**Placement**” group in the “**Home**” tab.



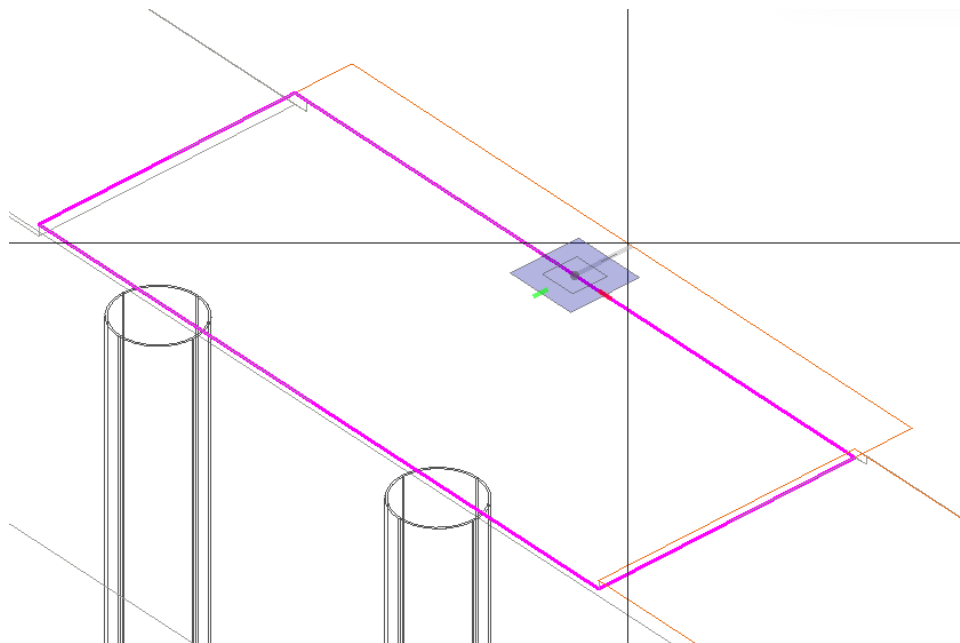
- 5) Create separate polygons for the four interior beam seats.



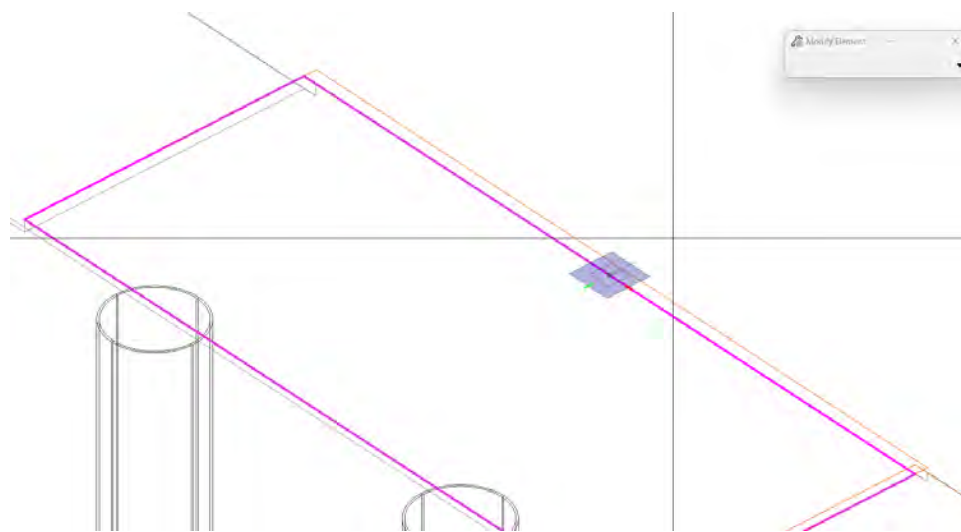
- 6) Select the “**Modify Element**” command.



- 7) Select the first line of one of the polygons just created at the front face of the abutment.

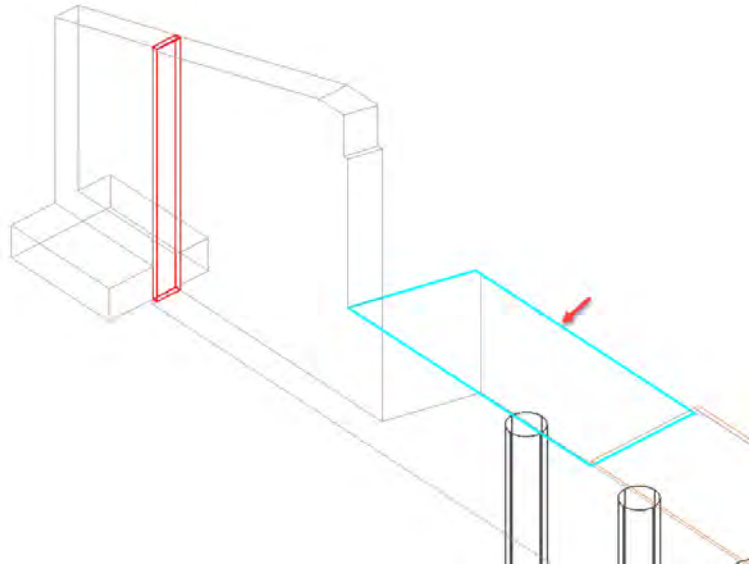


- 8) Ensure that the AccuDraw compass is oriented in the Top view by typing the letter “**T**” on the keyboard.
- 9) Type “**0:2**” and move the cursor away from the compass origin such that it locks to the axis leading away from the abutment.

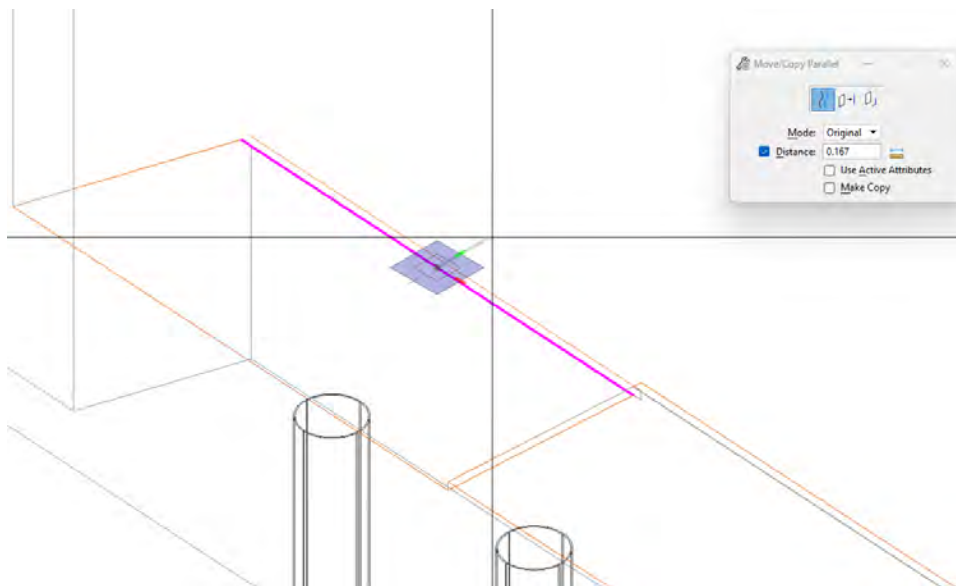


- 10) Do the same for the other three interior bearing seat polygons.

11) Using the standard **“Place Line”** tool, draw lines around the perimeters of both of the exterior beam seats.

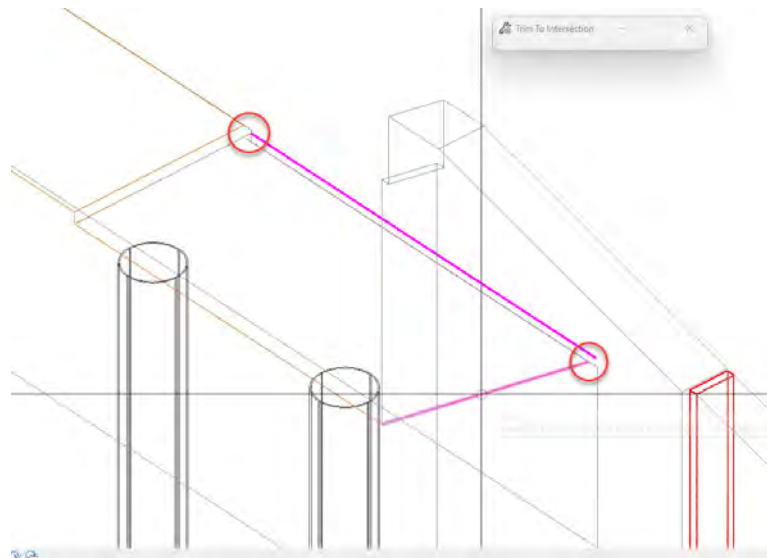


12) Using the **“Move/Copy Parallel”** tool, move the line near the front face 2” away, such that it is above the actual front face of the abutment. (Make sure the AccuDraw compass is in the Top view).

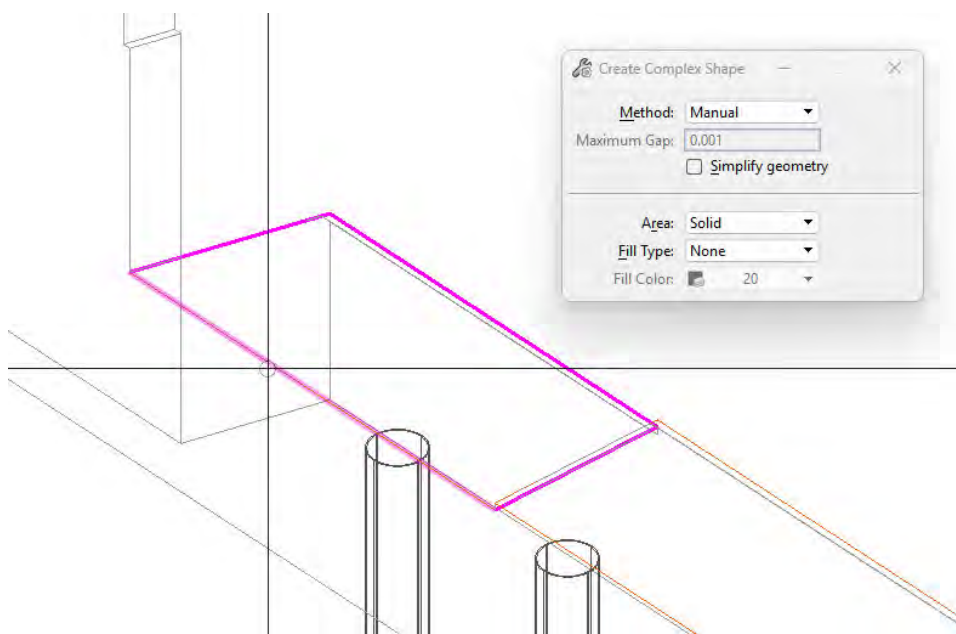


13) Do the same for the exterior beam seat at the opposite end of the abutment.

14) Using the “**Trim to Intersection**” command, close the two open corners for each exterior beam seat.

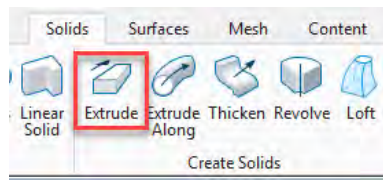


15) Using the “**Create Complex Shape**” command, group each set of four lines together so that they become closed shapes/polygons (Method may be set to “**Manual**” or “**Automatic**”).

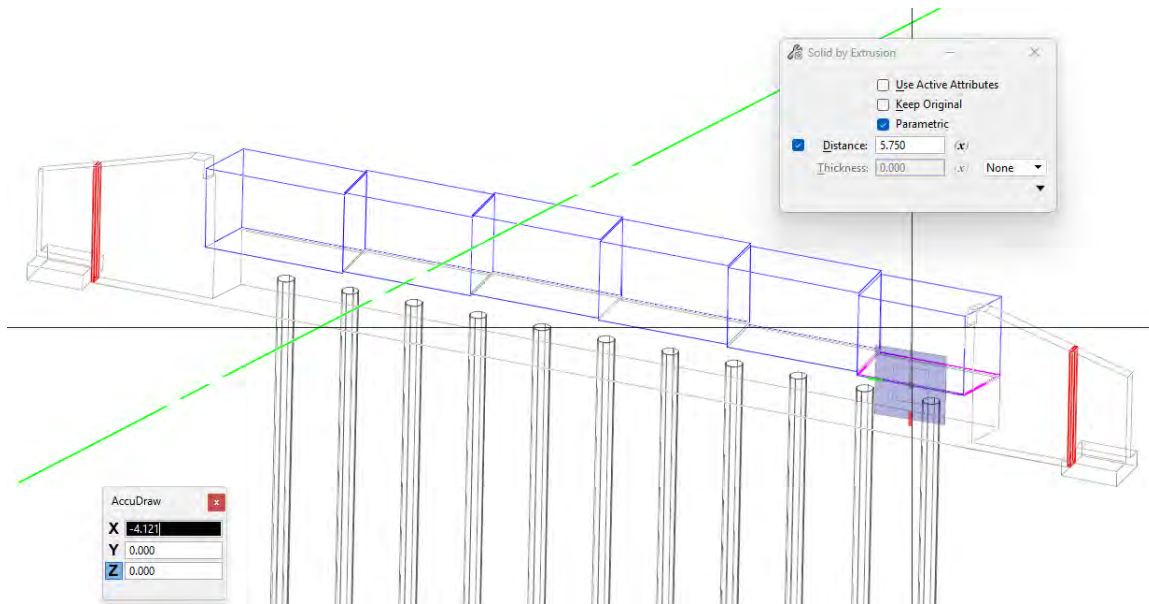


The shapes just created will be extruded such that the solid falls within the limits of the top and bottom of the deck. The excess will be subtracted out in a future step.

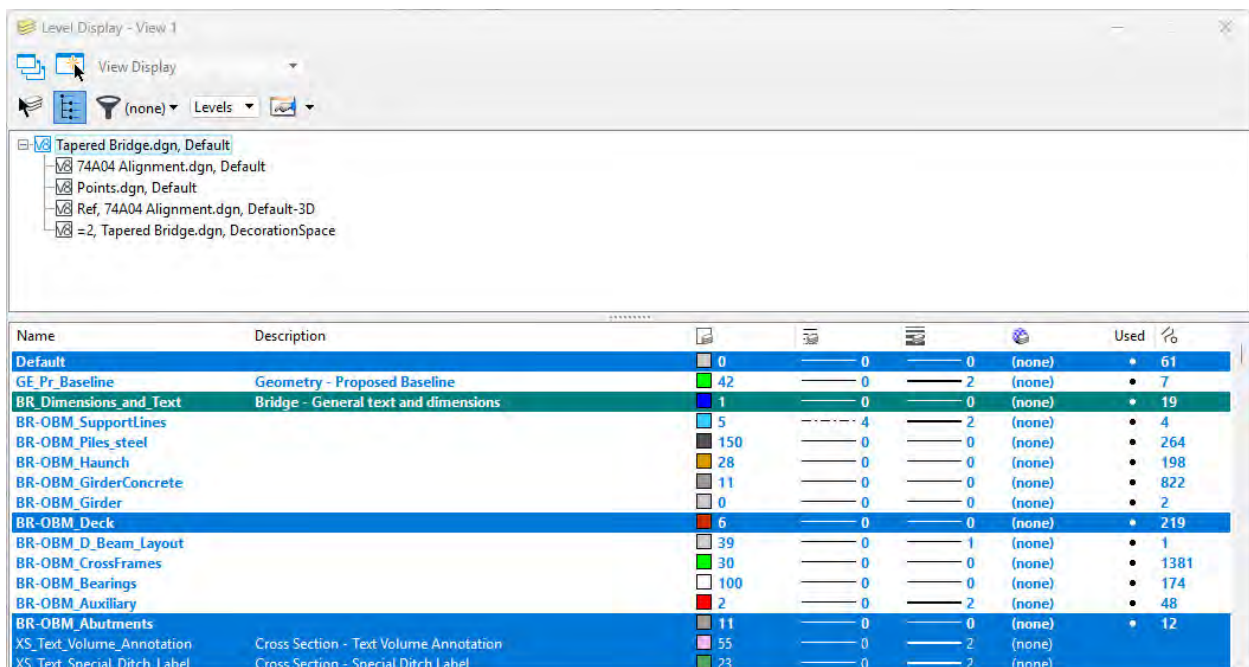
- 16) From within the “**Solids**” tab of the “**Modeling**” workflow, pick the “**Extrude**” command in the “**Create Solids**” group.



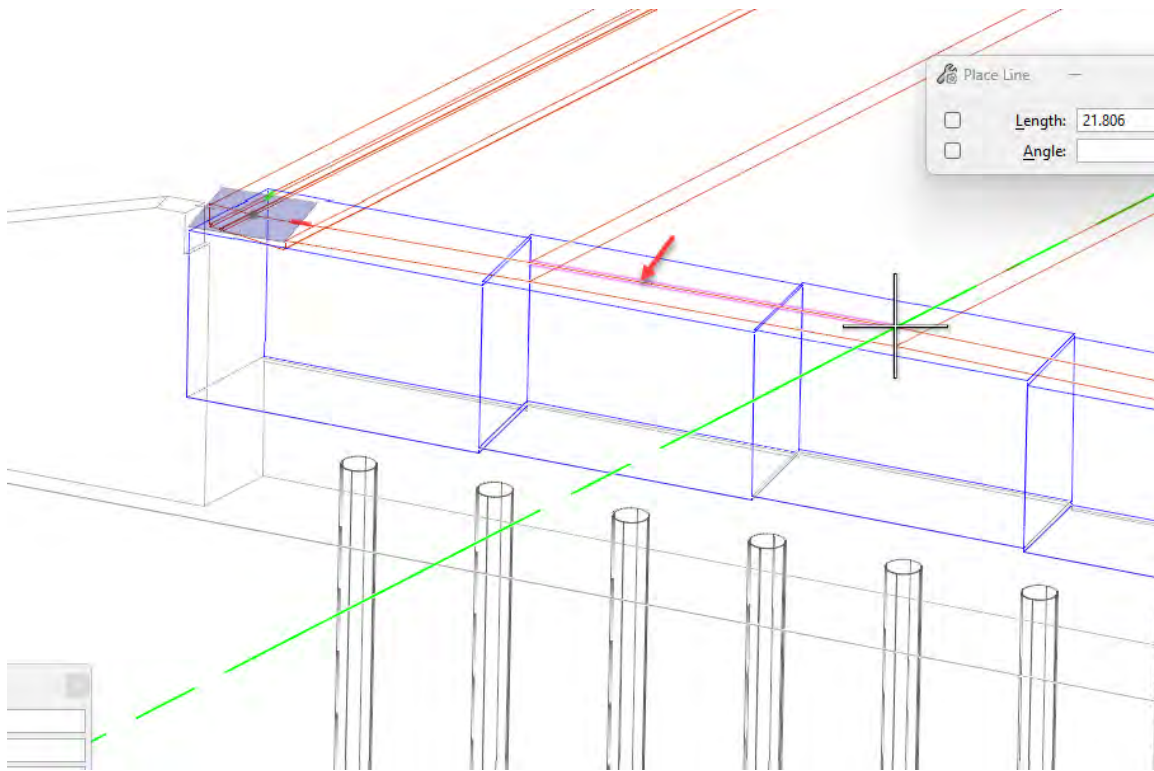
- 17) Select each of the polygons previously created and extrude upwards 5.75 ft.



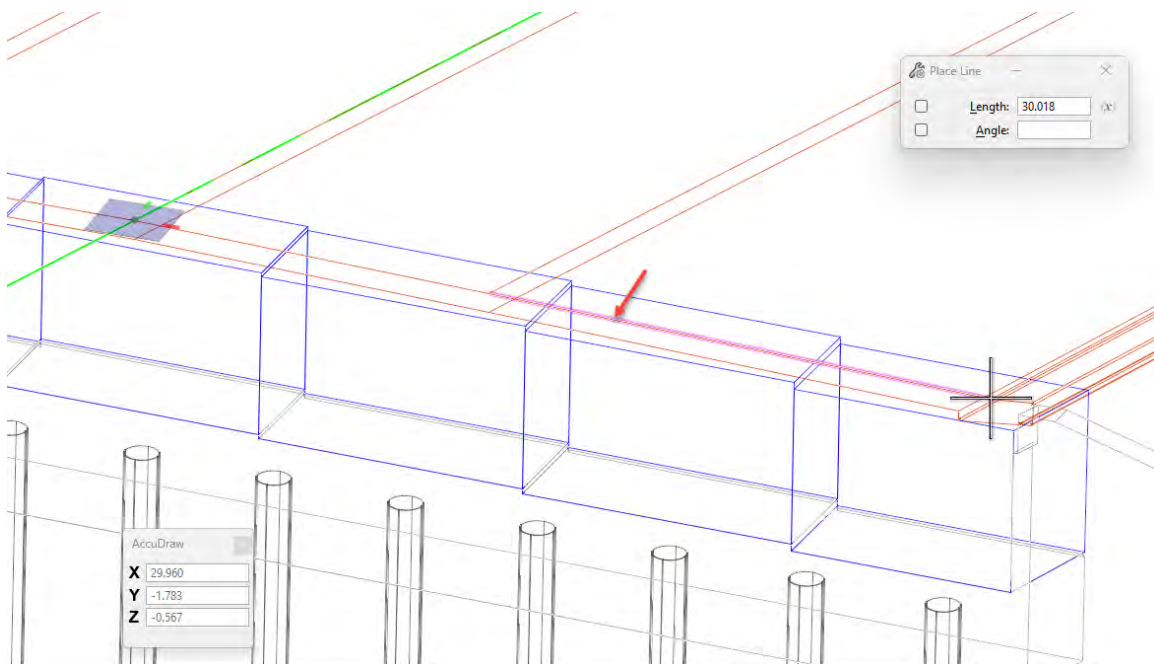
- 18) In the Level Display dialog, turn the level “**BR-OBM_Deck**” on.



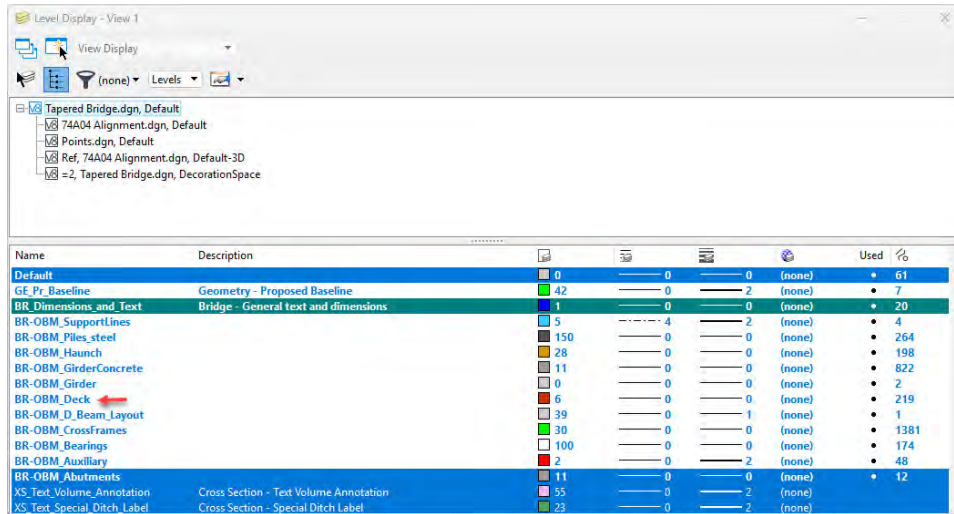
- 19) Using the **“Place Line”** tool, draw a line from the curb line at the Southeast corner of the deck to the crown
(Make sure that the **“Z”** lock is not on in the AccuDraw dialog).



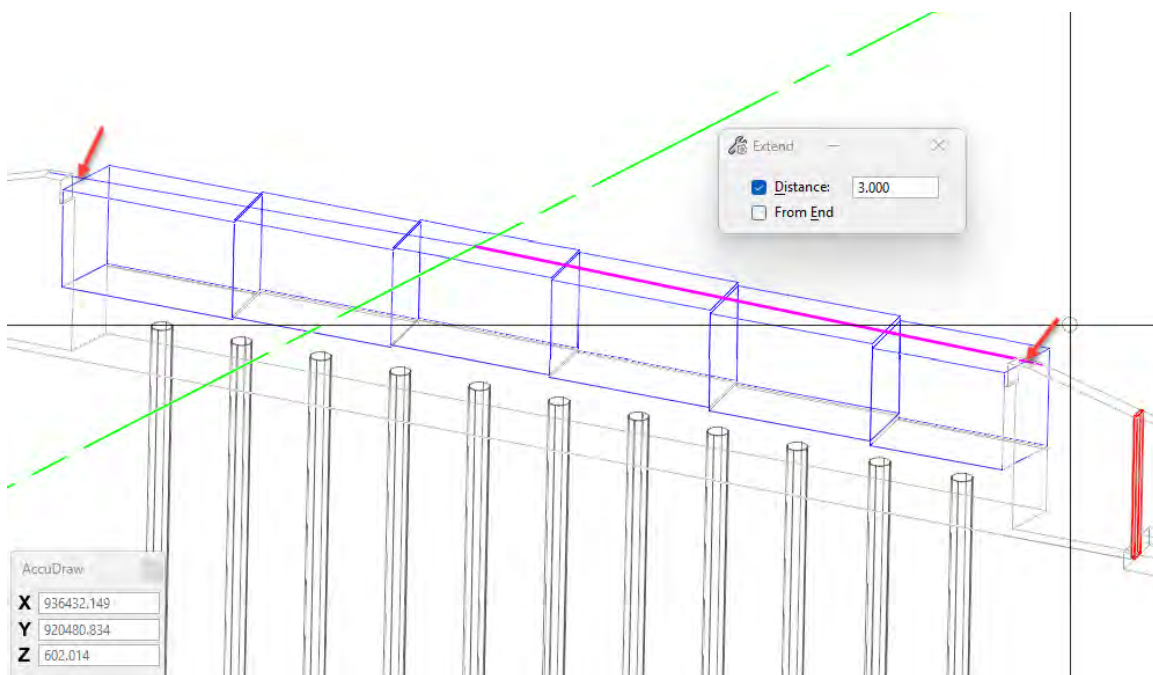
- 20) Continue with another line to the opposite curb line.



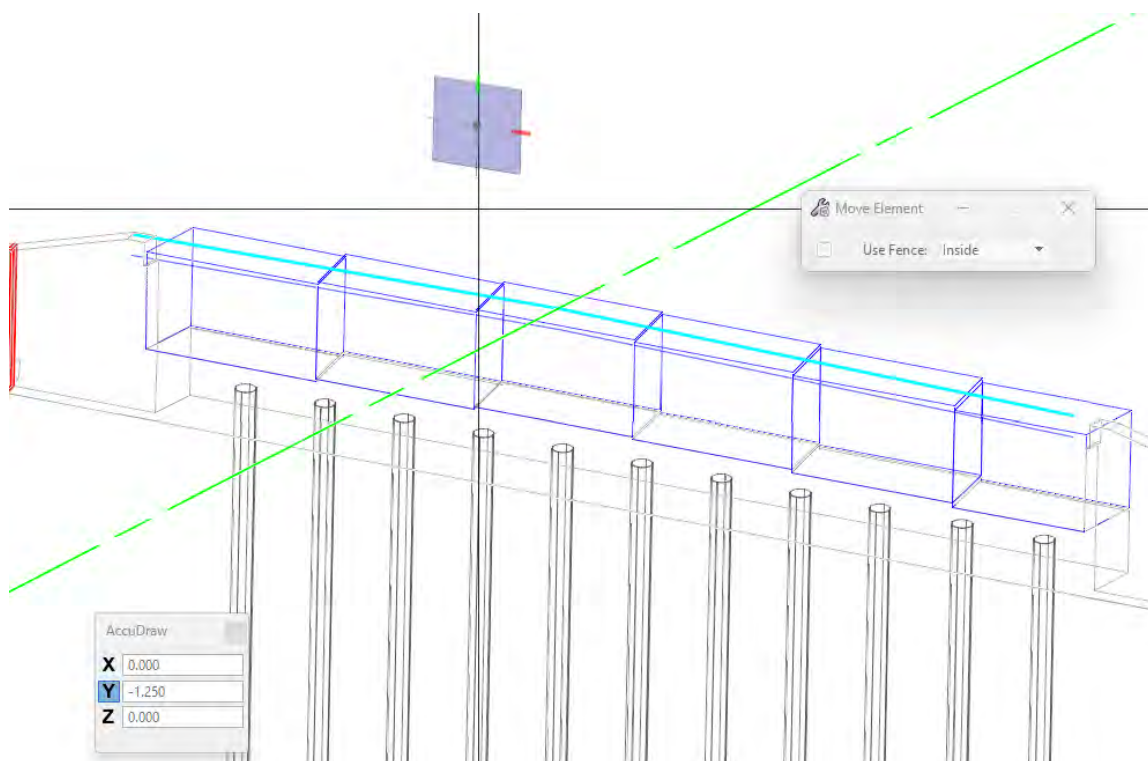
21) Turn off the level “BR-OBM_Deck”.



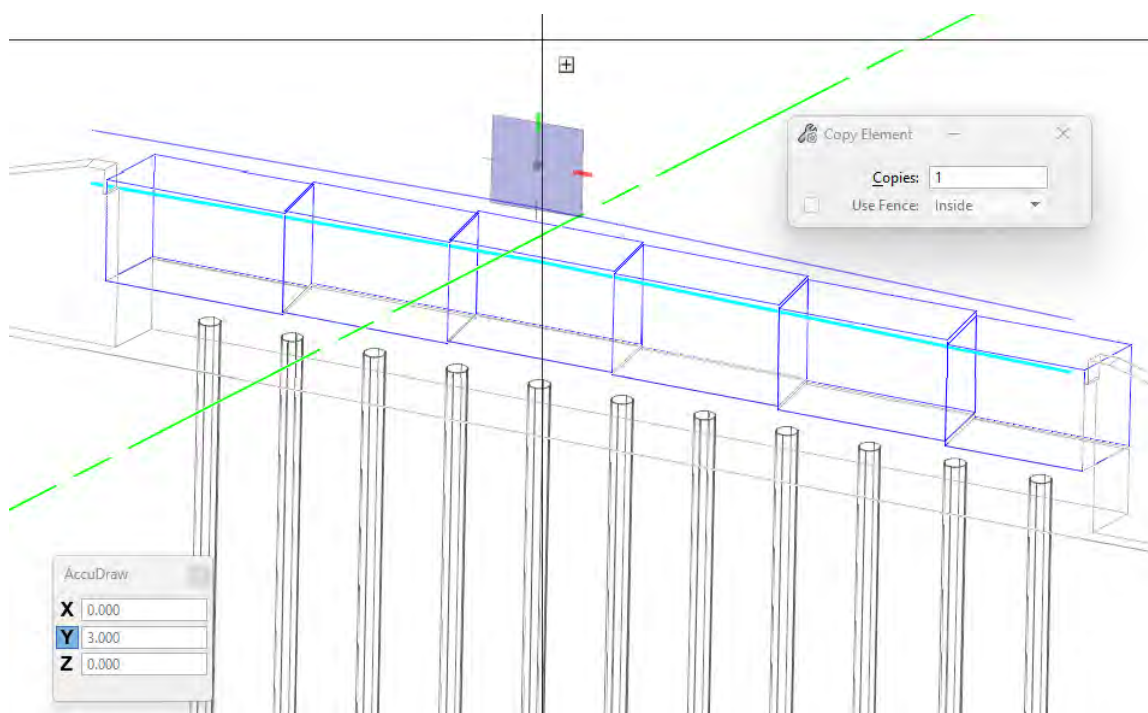
22) From within the “**Drawing**” workflow, select the “**Extend Line**” tool and extend the exterior vertices an arbitrary distance, such as 3.0 ft.



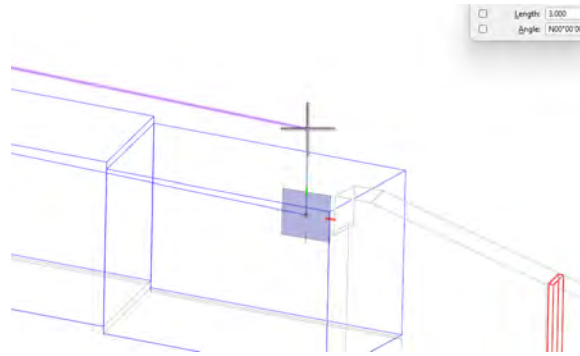
- 23) Select the two lines using the “**Element Selection**” tool and move down vertically “**1’-3”** “. (You can stay in the same view and just use the “F” key to rotate the AccuDraw compass).



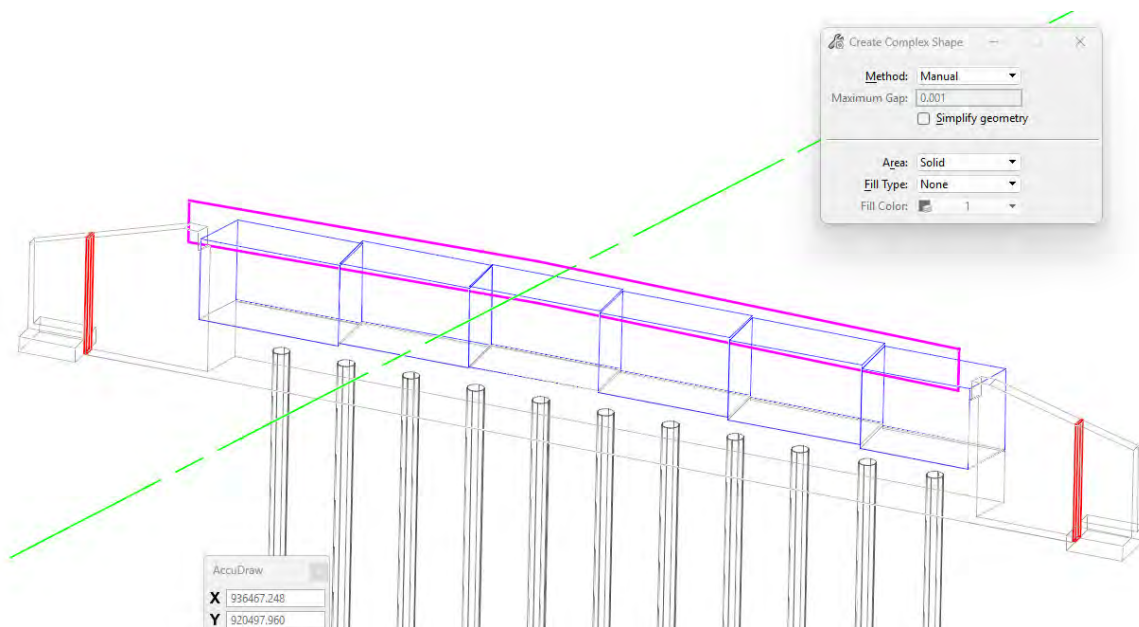
- 24) With the elements still selected, select the “**Copy**” command and copy the lines up vertically an arbitrary distance, such as “**3’-0”** “.



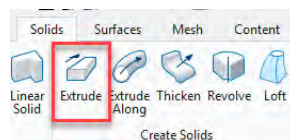
25) Using the **“Place Line”** tool, connect the ends of both sets of lines vertically.



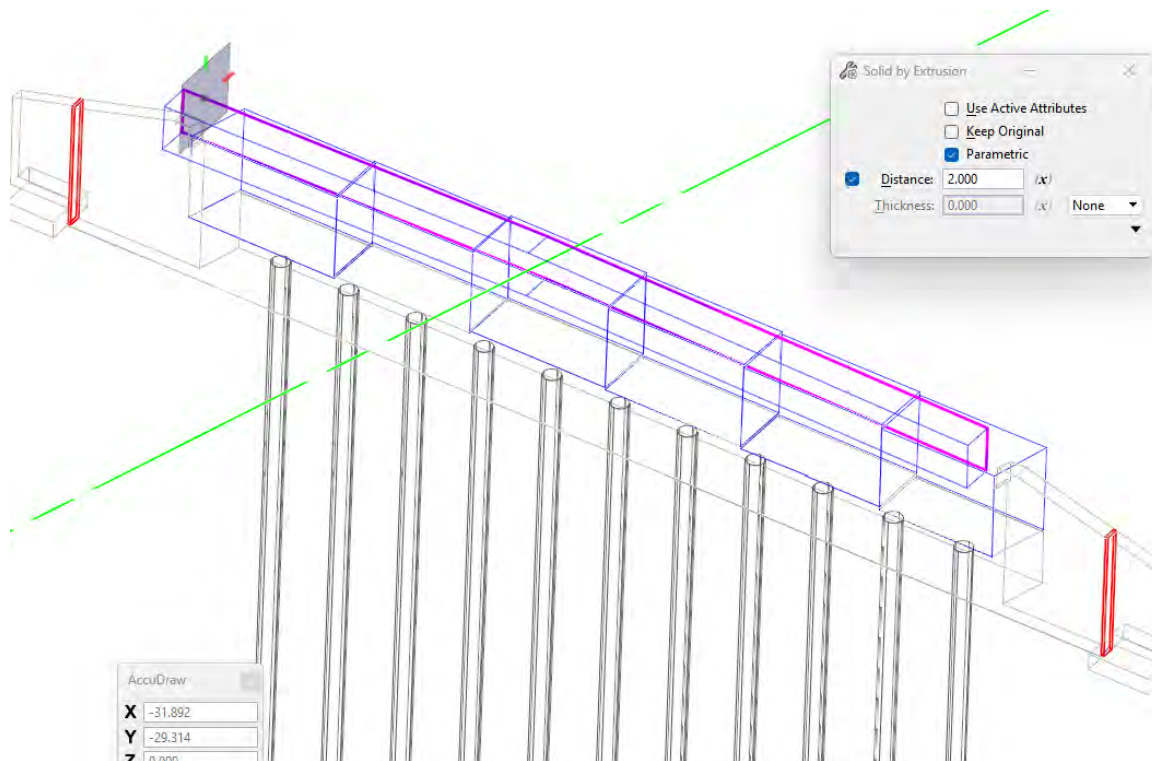
26) Using the **“Create Complex Shape”** command, join the six lines together to create a single element.



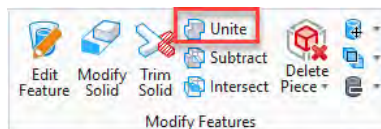
27) Returning to the **“Modeling”** workflow, select the **“Extrude”** command in the **“Solids”** tab.



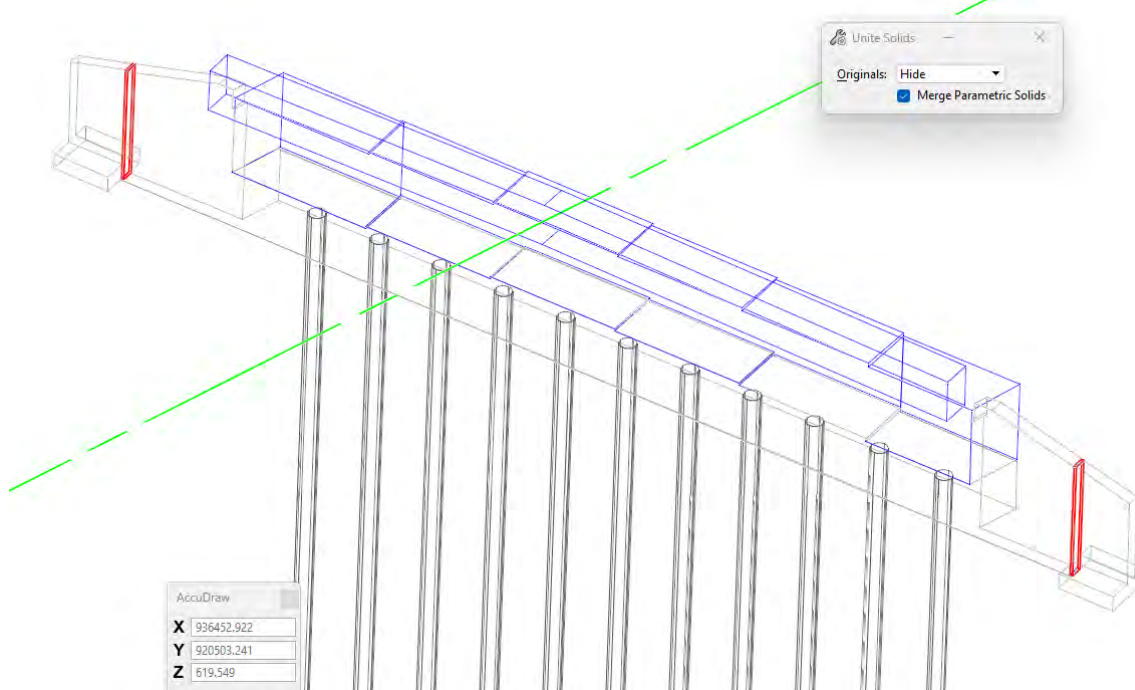
28) Extrude the complex shape to the South (left) an arbitrary distance of “2'-0” “.



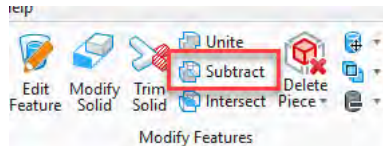
29) In the same workflow, select the “Unite” command in the “Modify Features” group.



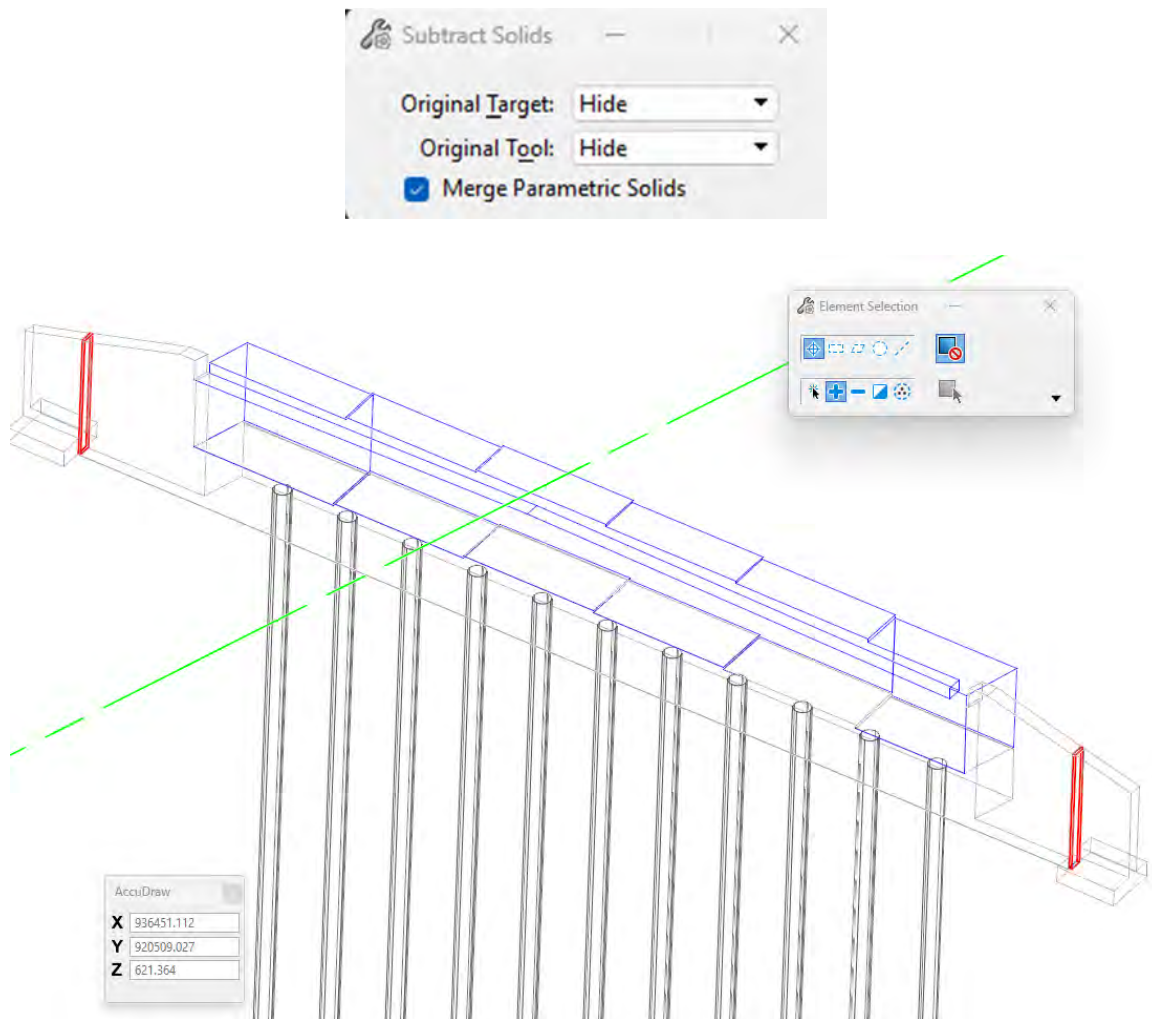
30) Unite the solids comprising the diaphragm from the bearing seat into the deck limits (Hint: After selecting the first two solids, you can hold down the “Ctrl” key on your keyboard and select the remaining solids) and accept.



31) In the same workflow, select the “**Subtract**” command in the “**Modify Features**” group.



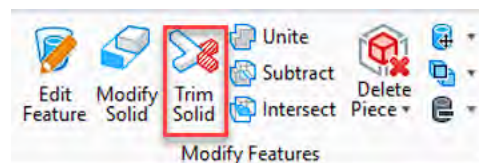
32) Select the diaphragm solid first, then the solid that is to be removed (to create the approach slab ledge), then accept.



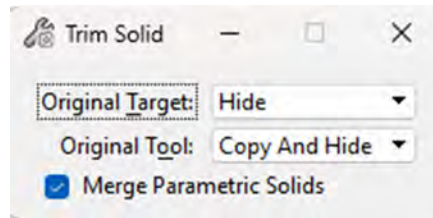
33) Repeat steps 4 through 32 for the North abutment diaphragm.

34) In the Level Display, turn the level, “**BR-OBM_Deck**” on.

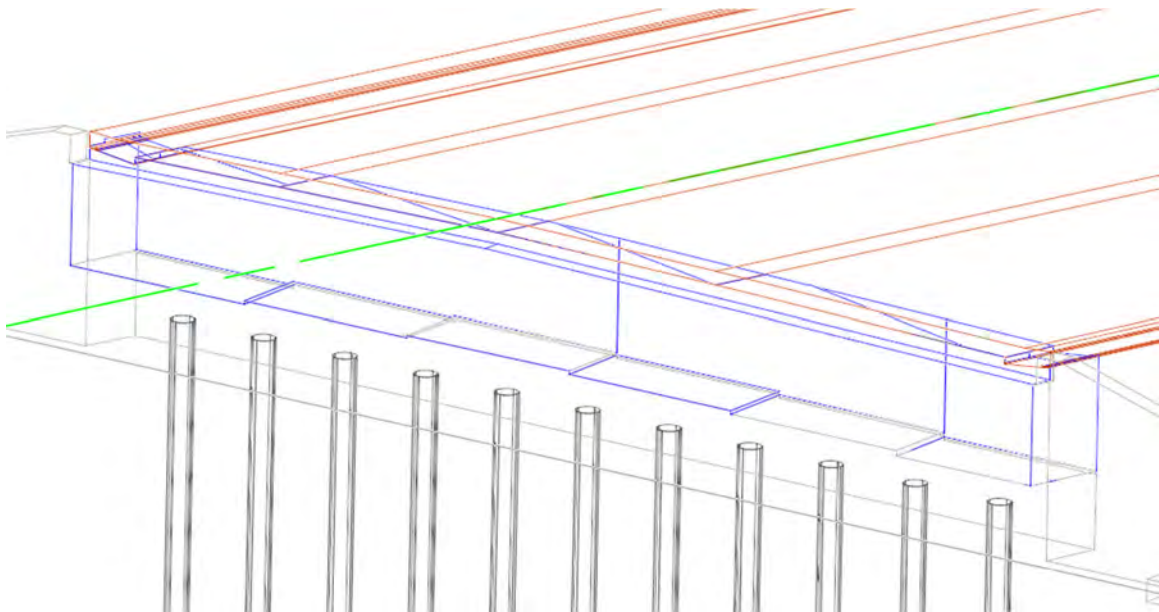
35) From within the “**Modeling**” workflow, select the “**Trim Solid**” command in the “**Modify Features**” group of the “**Solids**” tab.



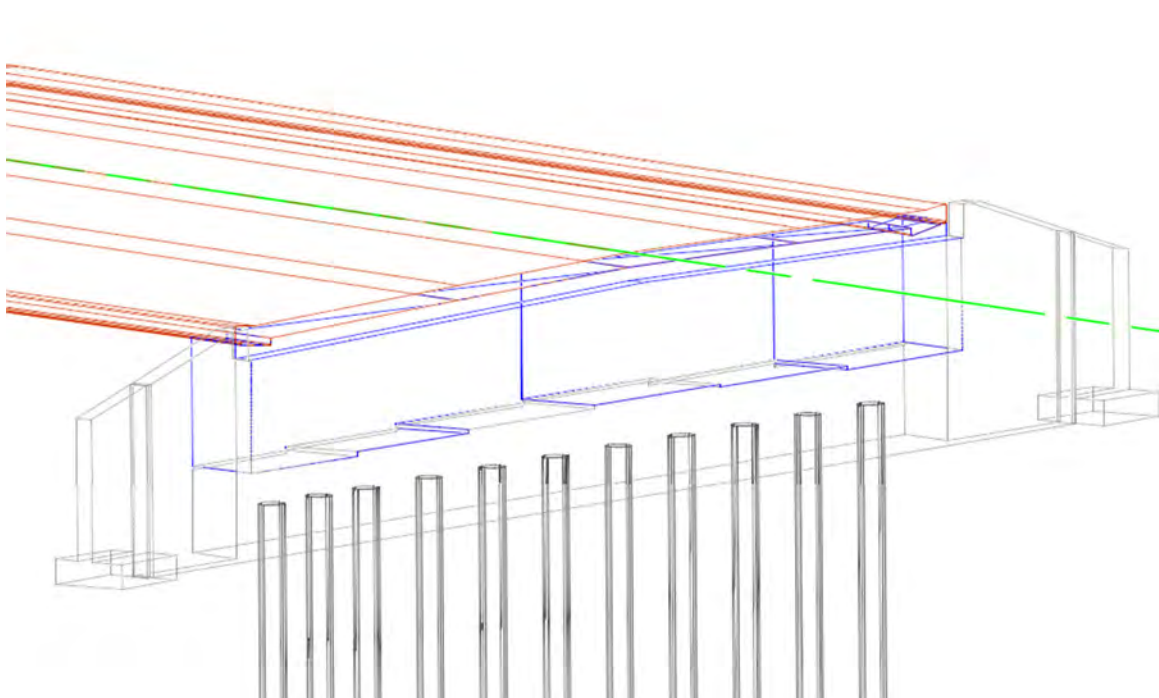
36) Change the tool settings as follows:



37) Select one of the diaphragms and then the deck.



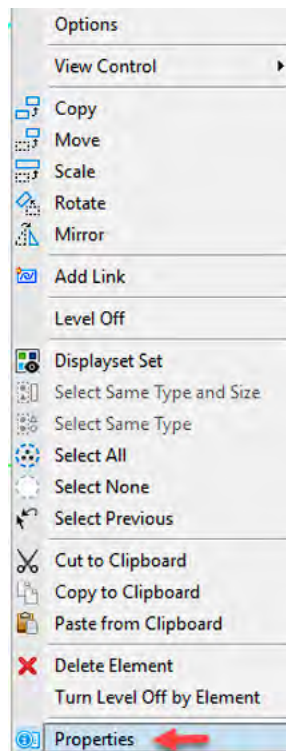
38) With the command still active, select the other diaphragm and then the deck.



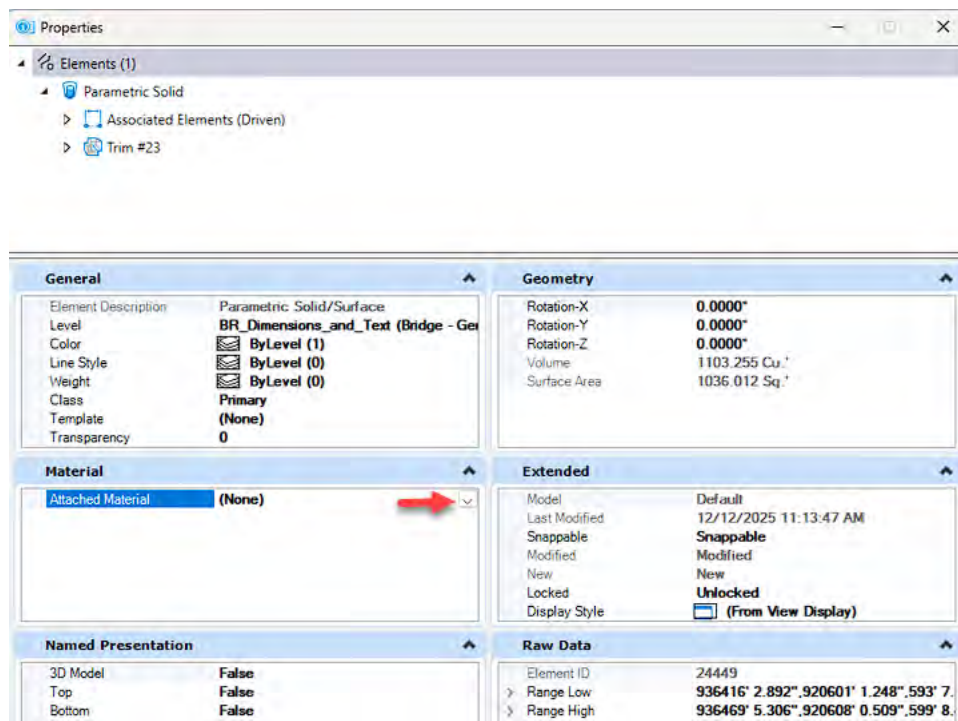
39) Turn on all levels.

40) Using the Selection tool, select one of the diaphragms.

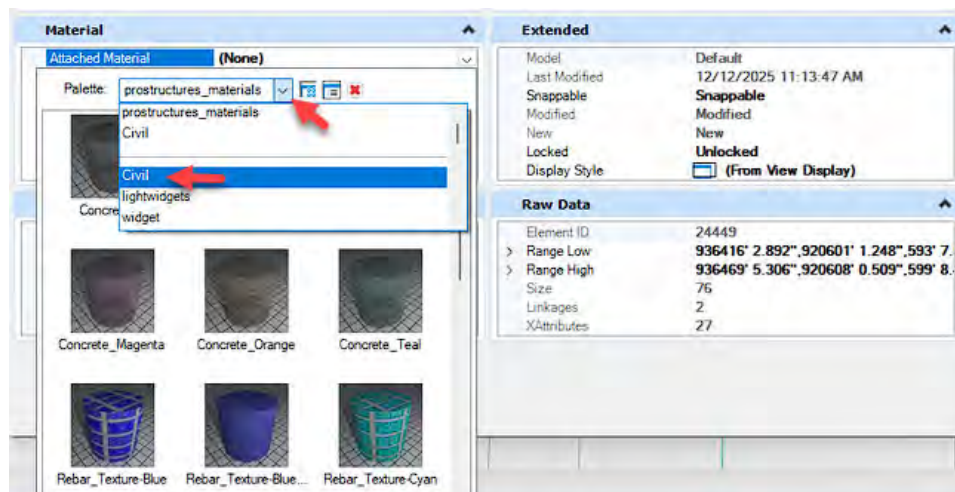
41) Right-click, hold, then select “Properties”.



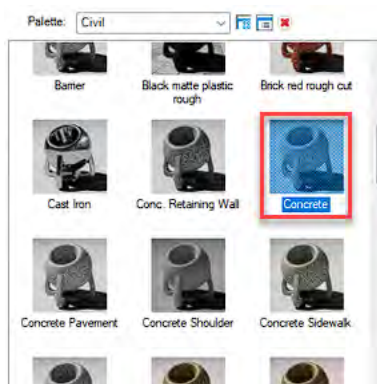
42) In the “Material” group of the properties, pick in the field with “ **(None)** ” shown.



43) Change the Materials Palette to “Civil”.



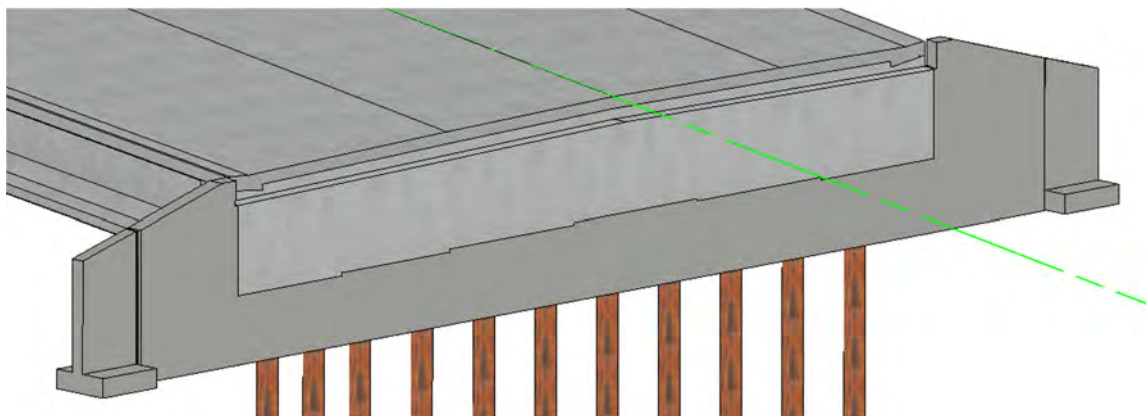
44) Find “Concrete” and select it.



45) Change the level for the concrete diaphragms to “**BR-OBM_Diaphragm_Concrete**”.

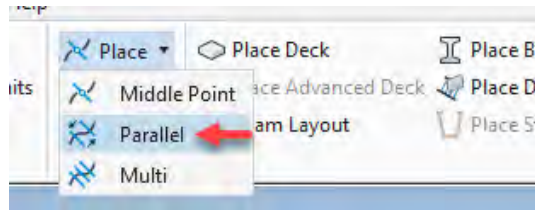
46) Repeat steps 40 through 44 for the other diaphragm.

47) If desired, render with “**Illustration-Ignore Lighting**”.



Chapter 8 – Approach Slabs

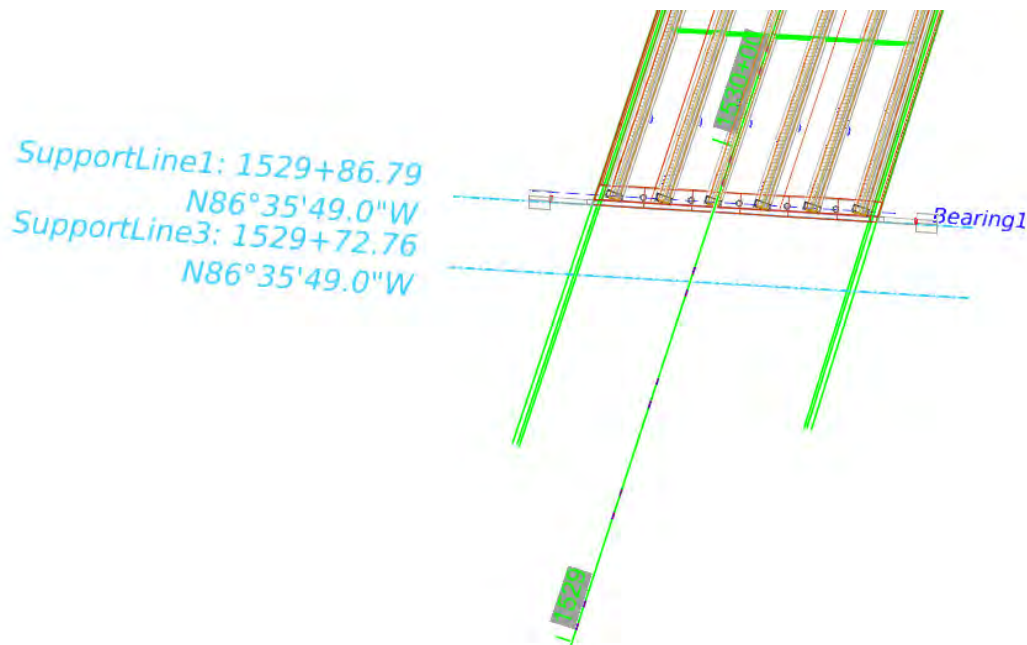
- 1) In the “**OpenBridge Modeler**” workflow, Select “**Place Parallel**” in the “**SupportLine**” group in the “Home” tab.



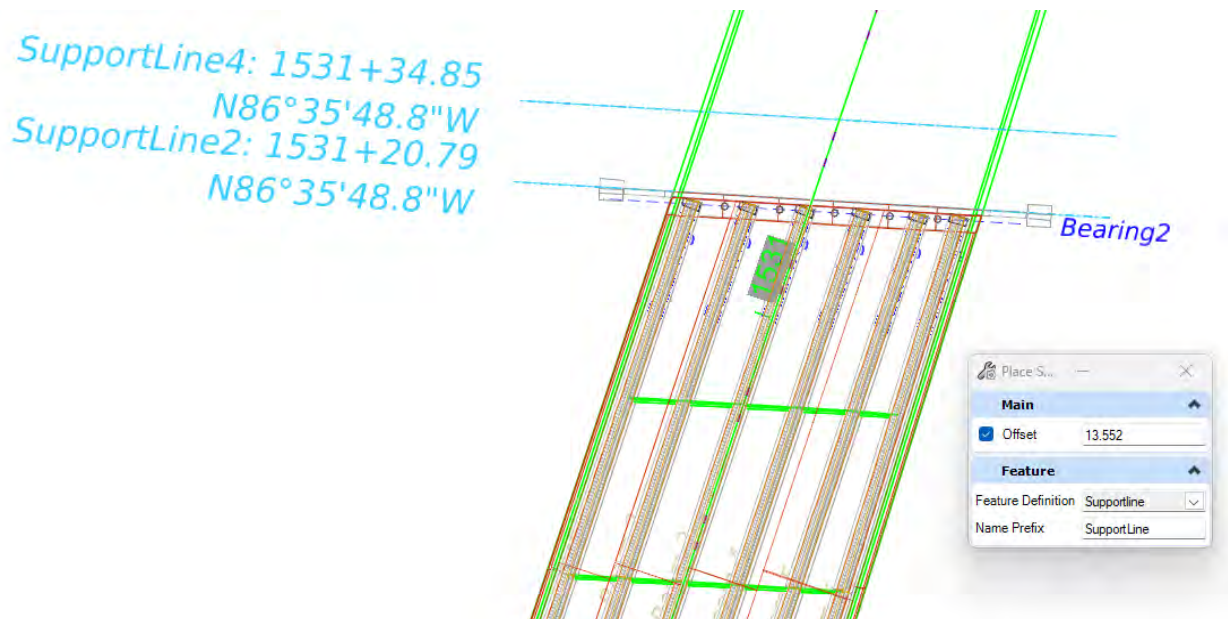
- 2) Toggle the “**Offset**” and set at “**13'-6.624**” ”.



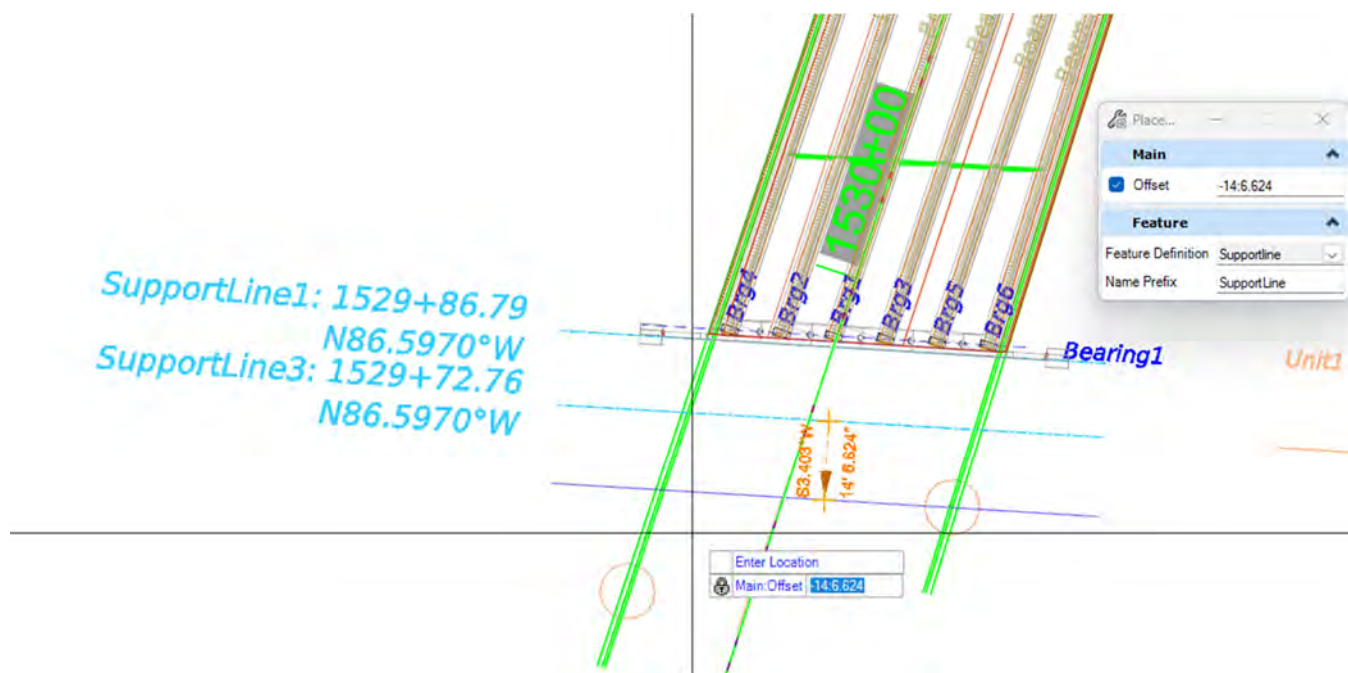
- 3) Select “**SupportLine1**” and data point to the South of it.



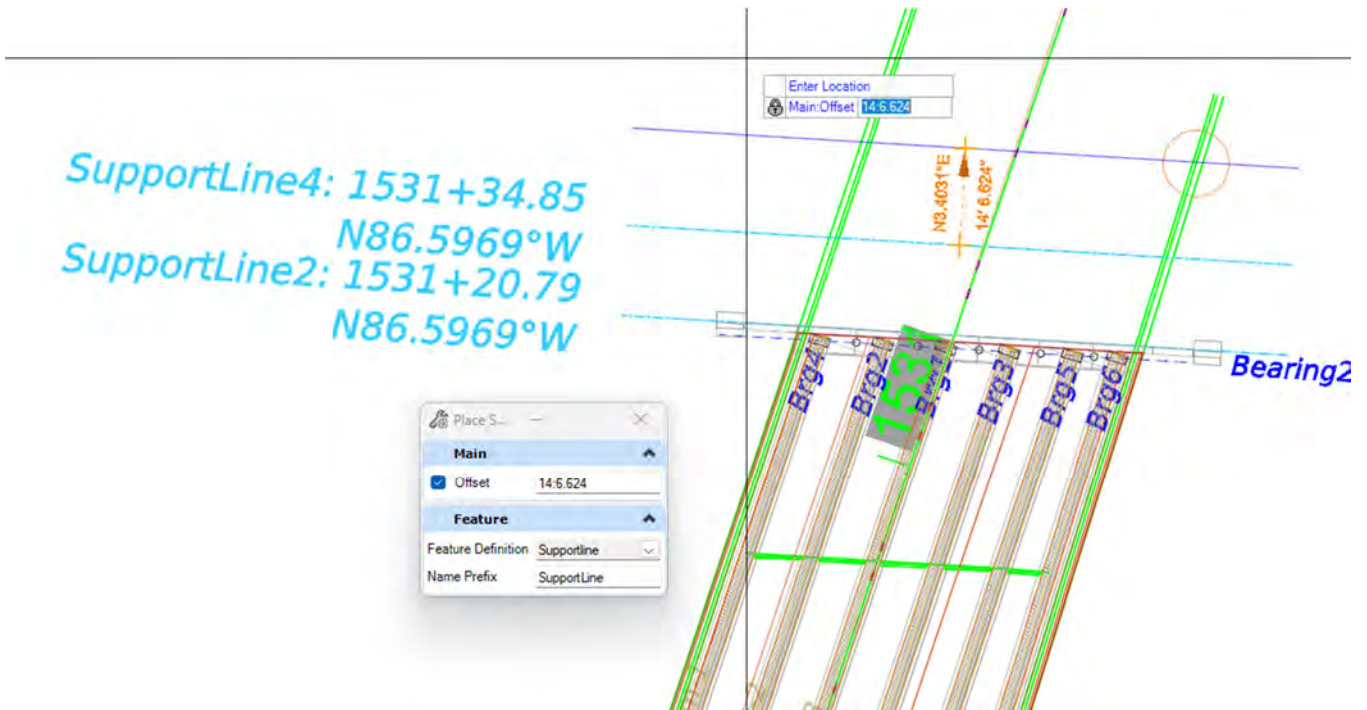
- 4) With the command still active, select “**SupportLine2**” and datapoint to the North of it.



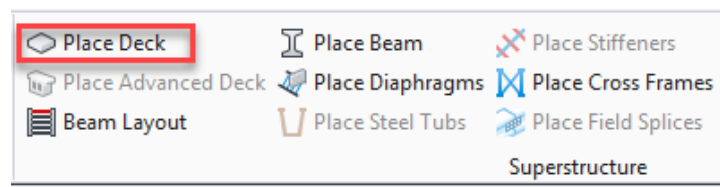
- 5) With the command still active, change the Offset to “**14'-6.624\"**”, select “**SupportLine3**” and datapoint to the South of it.



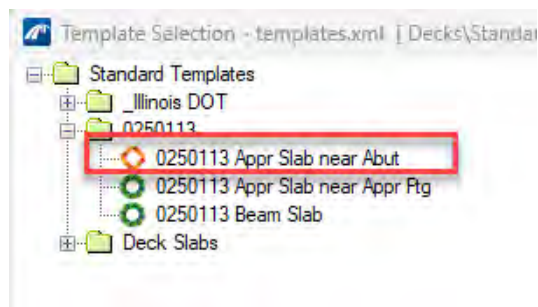
- 6) With the command still active, select “**SupportLine4**” and datapoint to the North of it.



- 7) Select the “**Place Deck**” command in the “**Superstructure**” group.



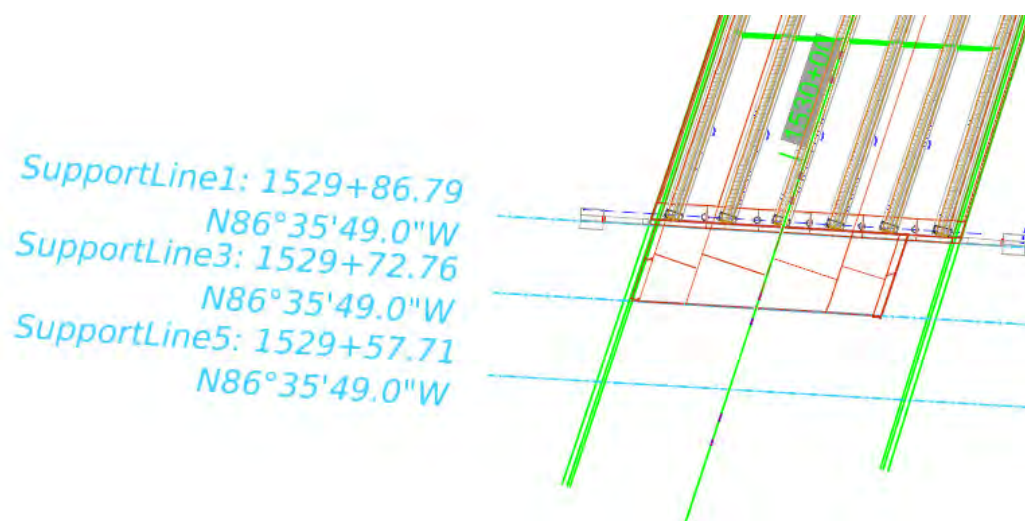
- 8) Change the template to “**0250113 Appr Slab near Abut**”.



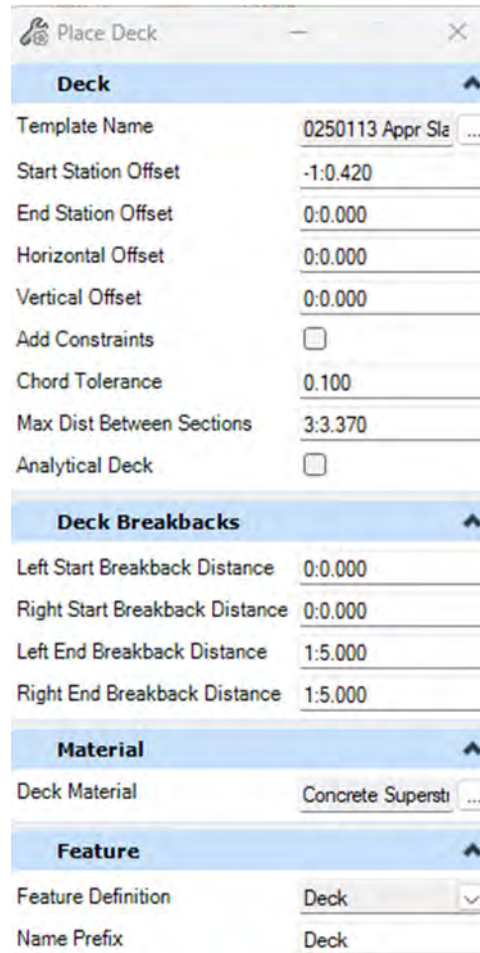
- 9) Complete the “**Place Deck**” dialog as follows: (Note that the Deck Material is “**Concrete Superstructure (Approach Slab)**”).

Place Deck	
Deck	
Template Name	0250113 Appr Sla ...
Start Station Offset	0:0.000
End Station Offset	1:0.420
Horizontal Offset	0:0.000
Vertical Offset	0:0.000
Add Constraints	☐
Chord Tolerance	0.100
Max Dist Between Sections	3:3.370
Analytical Deck	☐
Deck Breakbacks	
Left Start Breakback Distance	1:5.000
Right Start Breakback Distance	1:5.000
Left End Breakback Distance	0:0.000
Right End Breakback Distance	0:0.000
Material	
Deck Material	Concrete Supersti ...
Feature	
Feature Definition	Deck
Name Prefix	Deck

- 10) Select “**SupportLine3**”, then “**SupportLine1**” in that sequence, then accept.



11) With the command still active, change the dialog box values to the following:



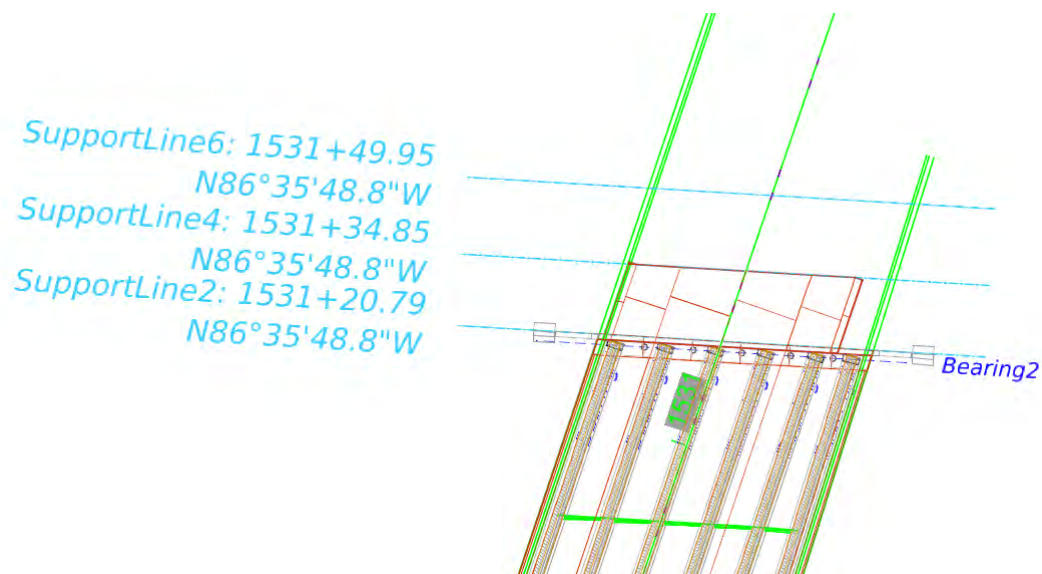
Deck	
Template Name	0250113 Appr Sla
Start Station Offset	-1:0.420
End Station Offset	0:0.000
Horizontal Offset	0:0.000
Vertical Offset	0:0.000
Add Constraints	☐
Chord Tolerance	0.100
Max Dist Between Sections	3:3.370
Analytical Deck	☐

Deck Breakbacks	
Left Start Breakback Distance	0:0.000
Right Start Breakback Distance	0:0.000
Left End Breakback Distance	1:5.000
Right End Breakback Distance	1:5.000

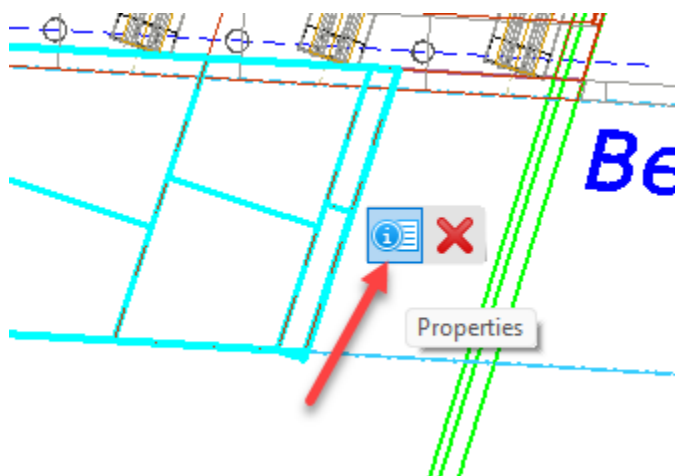
Material	
Deck Material	Concrete Supersti

Feature	
Feature Definition	Deck
Name Prefix	Deck

12) Select **“SupportLine2”**, then **“SupportLine4”** in that sequence, then accept.



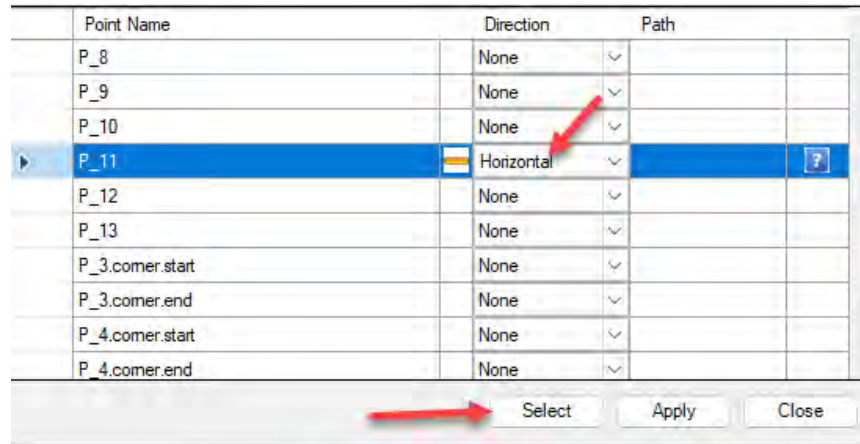
- 13) Using the “**Element Selection**” tool, select the South approach section that was just placed and “bump” the mouse (move away after selecting and then move back) , then click the “**Properties**” button.



- 14) Pick the three dots next to “**SELECT to Edit**” for the Point Control.

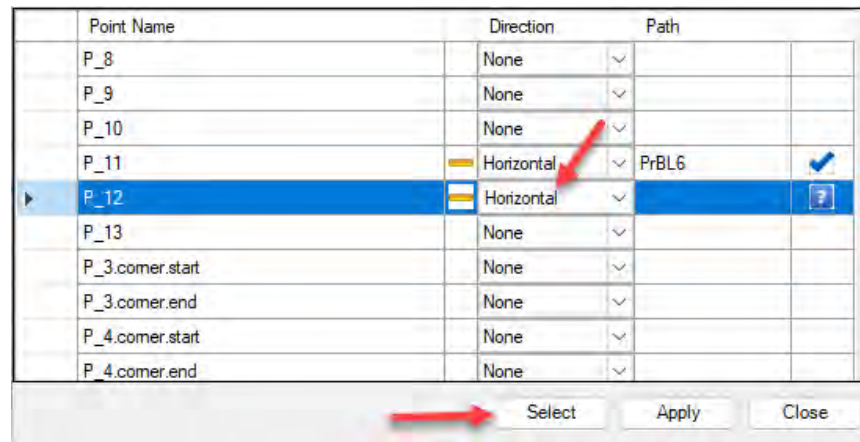
Bridge Structure #	025-0113
State Element Number	12
NBI Element Number	12
Name	Deck1
Description	
Template	0250113 Appr Slab near A
Analytical Deck	False
Start Station	1529+72.79
End Station	1529+86.79
Start Station Offset	0.000'
End Station Offset	1.035'
Horizontal Offset	0.000'
Vertical Offset	0.000'
Chord Tolerance	0.328'
Max Dist Between Sec	3.281'
Variable Constraint	SELECT to Edit
Point Control	SELECT to Edit
Top Surface Area	644.064 Sq.'
Left Start Breakback C	1.417'
Right Start Breakback	1.417'
Left End Breakback Di	0.000'
Right End Breakback I	0.000'
Volume	807.915 Cu.'
Surface Area	1438.952 Sq.'
Feature Definition	Deck
Deck Material	Concrete Superstructure (

15) Pick point “**P_11**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.



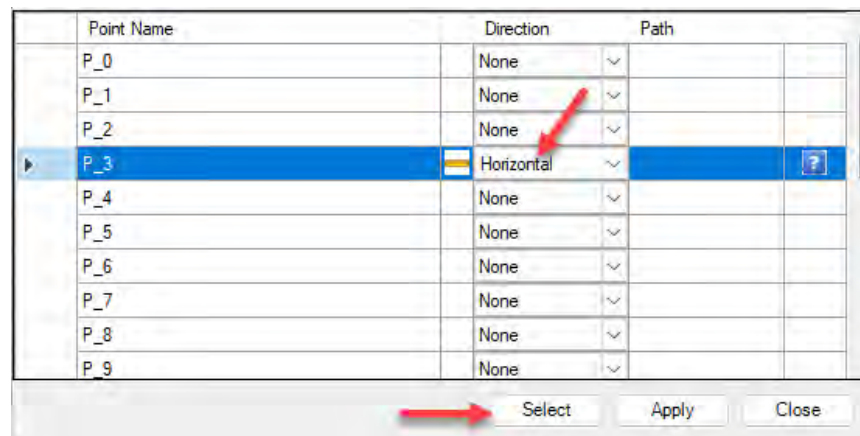
16) Pick the outer construction line that we created and used for the left side of the bridge deck.

17) Pick point “**P_12**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.



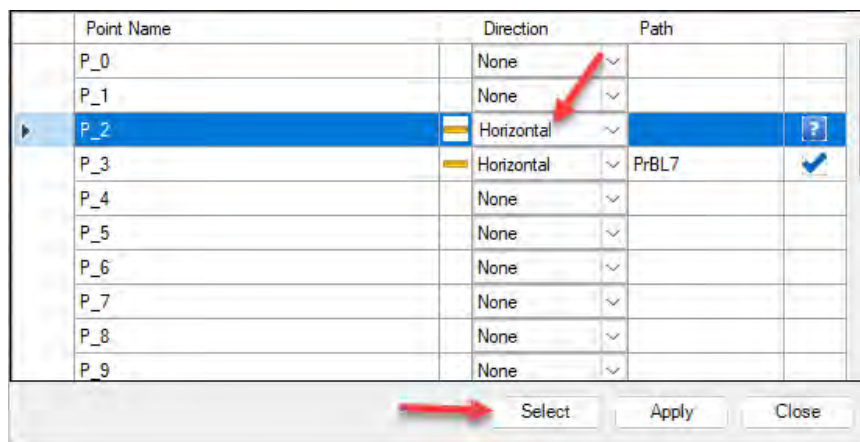
18) Pick the inner construction line that we created for the left side of the bridge deck.

19) Pick point “**P_3**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.



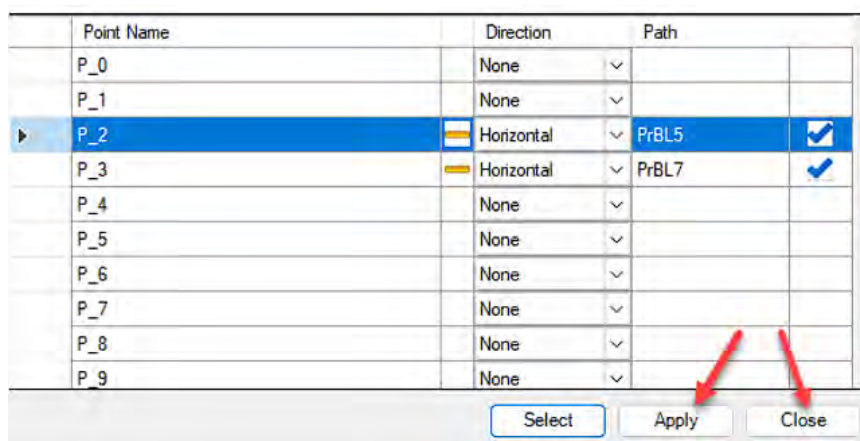
20) Pick the outside construction line that we created for the right side of the bridge deck.

21) Pick point “**P_2**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.

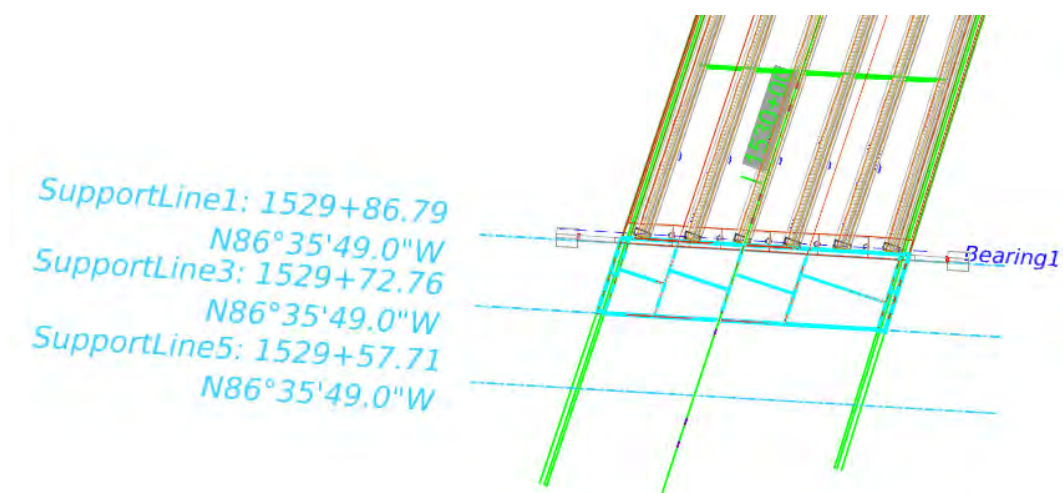


22) Pick the inner construction line that we created for the right side of the bridge deck.

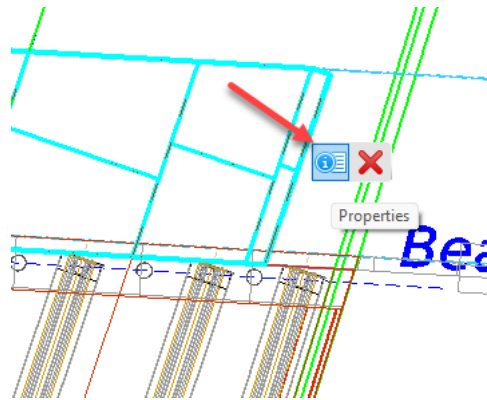
23) Select “**Apply**”, then “**Close**”.



24) That part of the South approach should appear as follows:



- 25) Using the “**Element Selection**” tool, select the North approach section that was just placed and “bump” the mouse (move away after selecting and then move back) , then click the “**Properties**” button.



- 26) Pick the three dots next to “**SELECT to Edit**” for the Point Control.

Bridge Structure #	025-0113
State Element Number	12
NBI Element Number	12
Name	Deck2
Description	
Template	0250113 Appr Slab near A
Analytical Deck	False
Start Station	1531+20.79
End Station	1531+34.82
Start Station Offset	-1.035'
End Station Offset	0.000'
Horizontal Offset	0.000'
Vertical Offset	0.000'
Chord Tolerance	0.328'
Max Dist Between Sec	3.281'
Variable Constraint	SELECT to Edit
Point Control	SELECT to Edit
Top Surface Area	645.460 Sq.'
Left Start Breakback C	0.000'
Right Start Breakback	0.000'
Left End Breakback Di	1.417'
Right End Breakback I	1.417'
Volume	809.676 Cu.'
Surface Area	1442.084 Sq.'
Feature Definition	Deck
Deck Material	Concrete Superstructure

27) Pick point “**P_11**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.

Point Name	Direction	Path
P_8	None	
P_9	None	
P_10	None	
P_11	Horizontal	
P_12	None	
P_13	None	
P_3.comer.start	None	
P_3.comer.end	None	
P_4.comer.start	None	
P_4.comer.end	None	

Select Apply Close

28) Pick the outer construction line that we created for the left side of the bridge deck.

29) Pick point “**P_12**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.

Point Name	Direction	Path
P_8	None	
P_9	None	
P_10	None	
P_11	Horizontal	PrBL6
P_12	Horizontal	
P_13	None	
P_3.comer.start	None	
P_3.comer.end	None	
P_4.comer.start	None	
P_4.comer.end	None	

Select Apply Close

30) Pick the inner construction line that we created for the left side of the bridge deck.

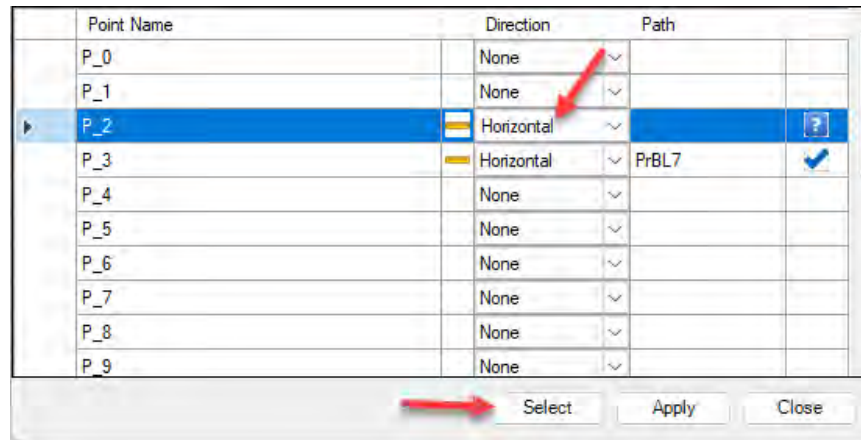
31) Pick point “**P_3**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.

Point Name	Direction	Path
P_0	None	
P_1	None	
P_2	None	
P_3	Horizontal	
P_4	None	
P_5	None	
P_6	None	
P_7	None	
P_8	None	
P_9	None	

Select Apply Close

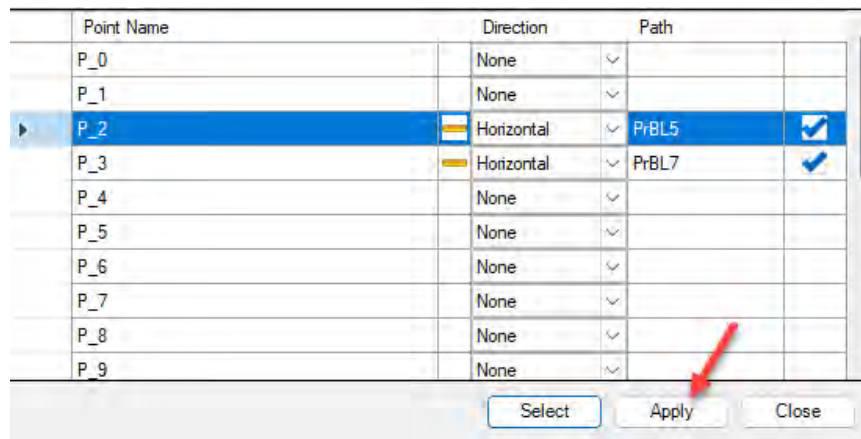
32) Pick the outside construction line that we created for the right side of the bridge deck.

33) Pick point “**P_2**”, then change the “**Direction**” to “**Horizontal**”, then pick “**Select**” at the bottom of the dialog.

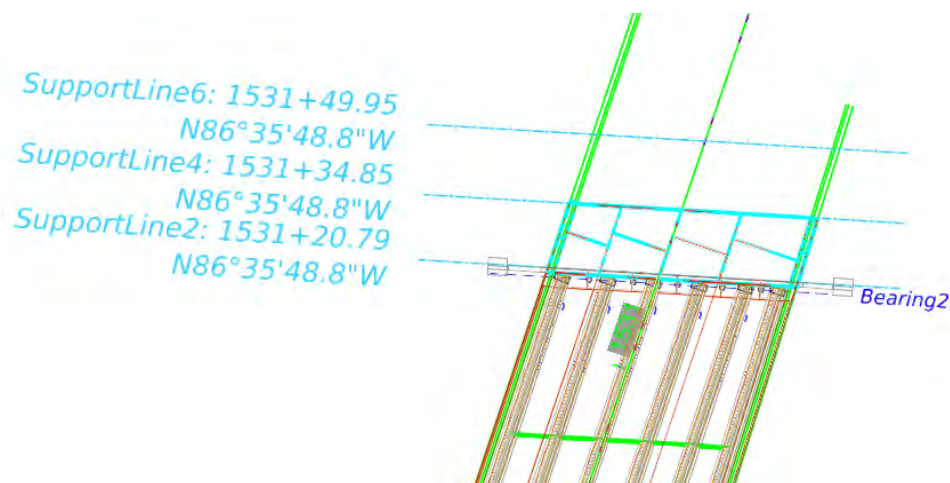


34) Pick the inner construction line that we created for the right side of the bridge deck.

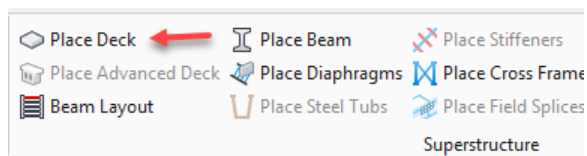
35) Select “**Apply**”.



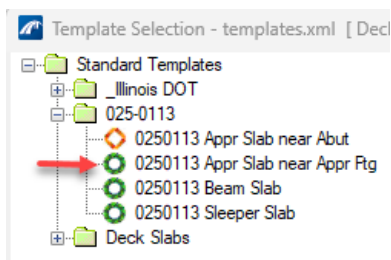
36) That part of the North approach should appear as follows:



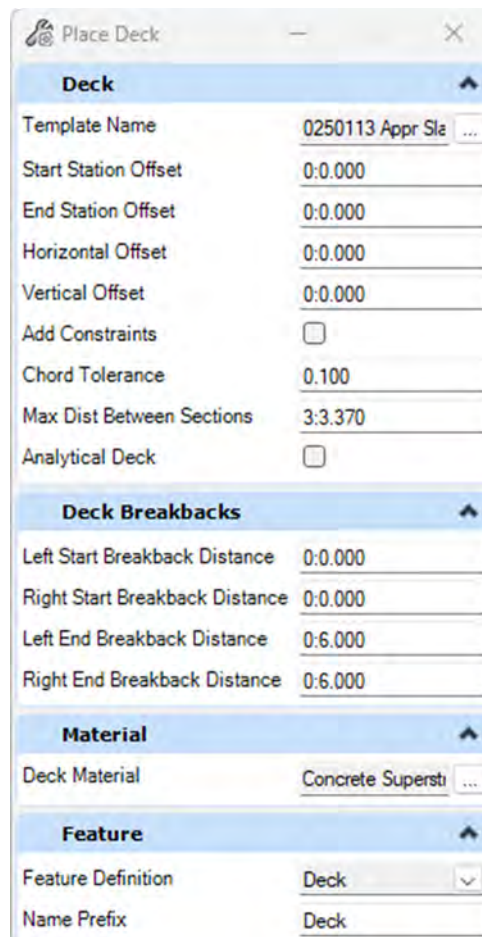
37) Select ***“Place Deck”*** in the ***“Superstructure”*** group.



38) Change the template to ***“0250113 Appr Slab near Appr Ftg”***.

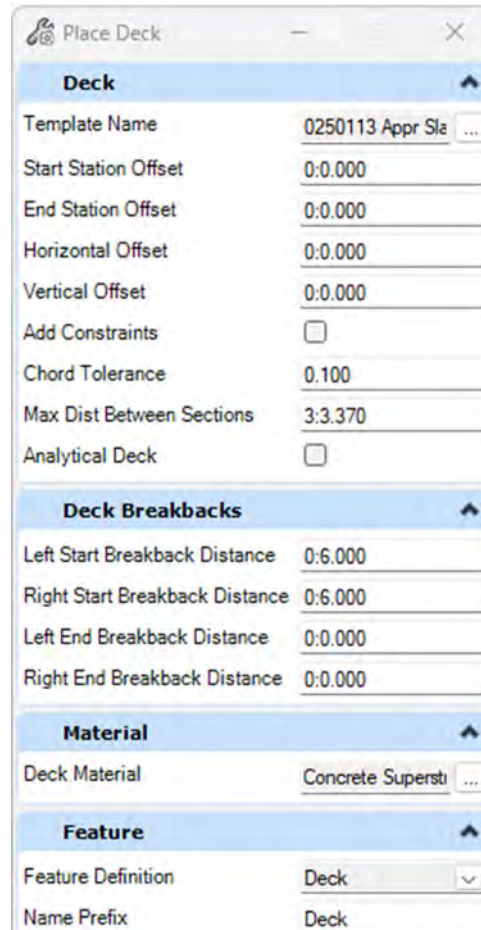


39) Change the settings in the dialog as show:



40) Select ***“SupportLine5”*** first, ***“SupportLine3”*** second, then accept.

41) With the **“Place Deck”** command still active, change the settings in the dialog as show:



Deck	
Template Name	0250113 Appr Sla
Start Station Offset	0:0.000
End Station Offset	0:0.000
Horizontal Offset	0:0.000
Vertical Offset	0:0.000
Add Constraints	☐
Chord Tolerance	0.100
Max Dist Between Sections	3:3.370
Analytical Deck	☐

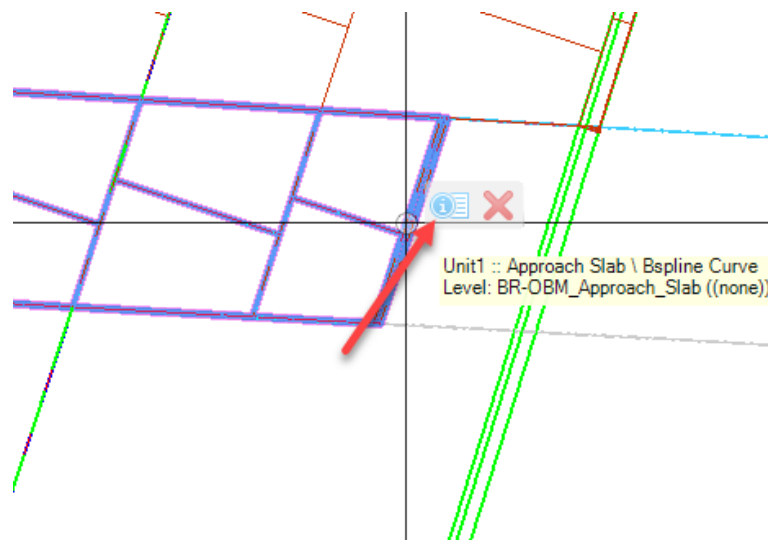
Deck Breakbacks	
Left Start Breakback Distance	0:6.000
Right Start Breakback Distance	0:6.000
Left End Breakback Distance	0:0.000
Right End Breakback Distance	0:0.000

Material	
Deck Material	Concrete Supersti

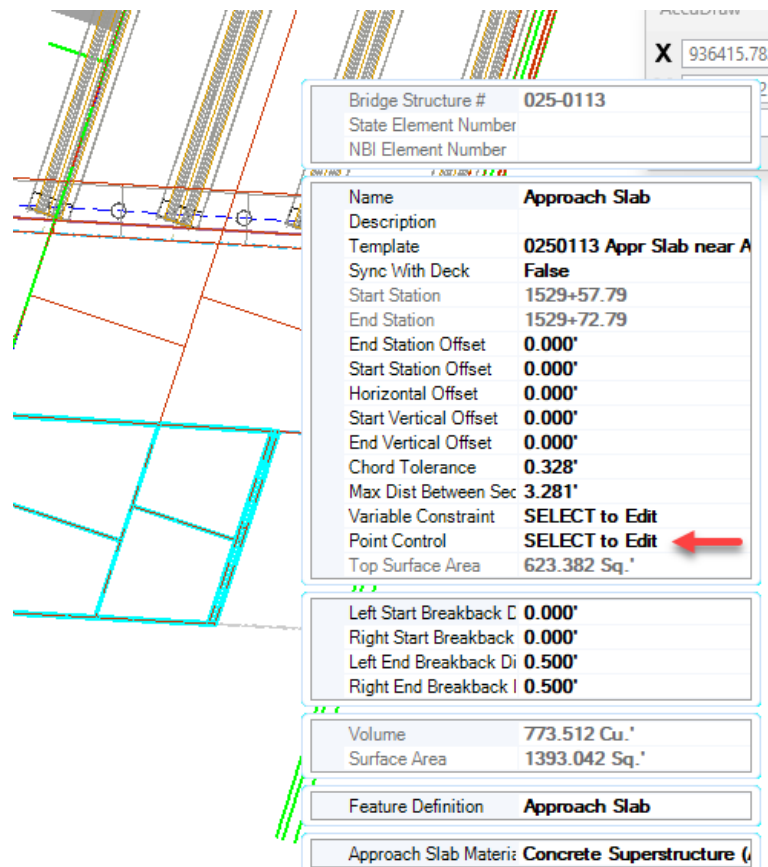
Feature	
Feature Definition	Deck
Name Prefix	Deck

42) Select **“SupportLine4”** first, **“SupportLine6”** second, then accept.

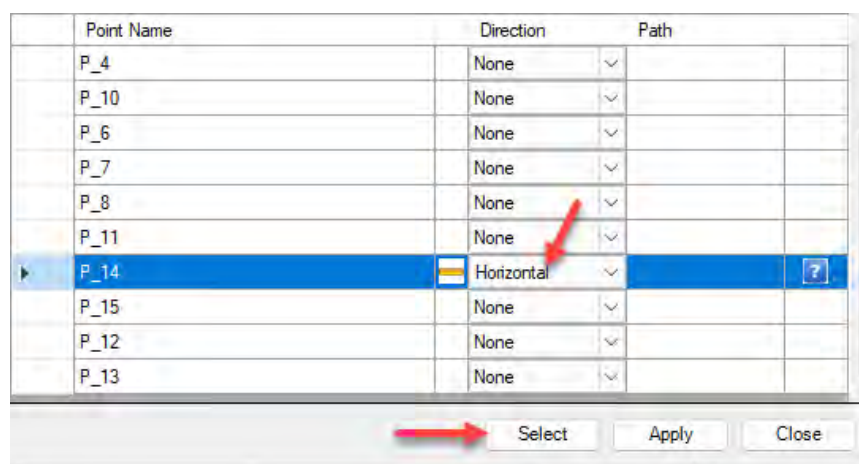
43) Using the **“Element Selection”** tool, select the South approach section that was just placed and “bump” the mouse (move away after selecting and then move back) , then click the **“Properties”** button.



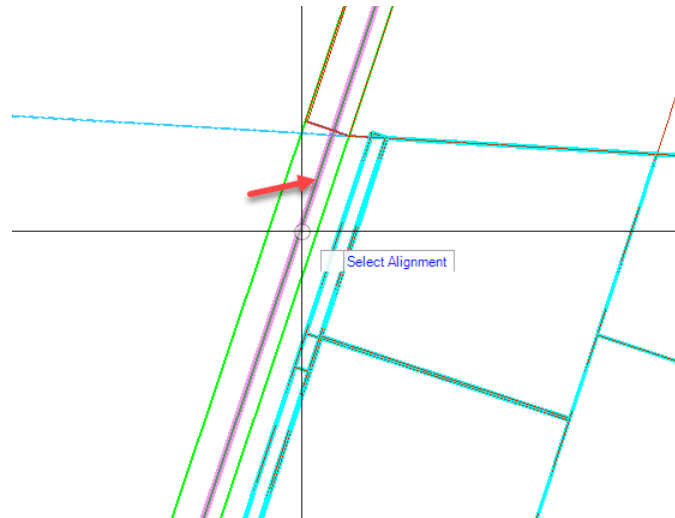
44) Pick the three dots next to ***“SELECT to Edit”*** for the Point Control.



45) Select ***“P_14”***, select ***“Horizontal”*** under the ***“Direction”*** column, then pick the ***“Select”*** button.



46) Pick the line that represents the outer edge of the curb of the approach slab on the left side.

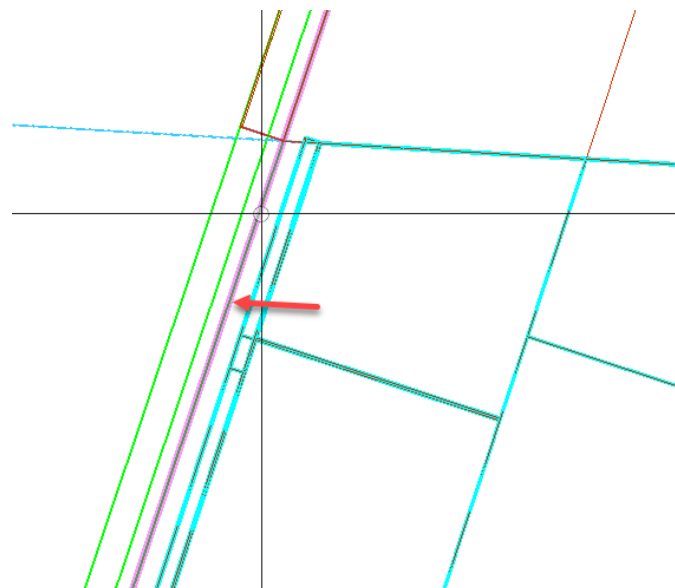


47) Select “P_12”, select “Horizontal” under the “Direction” column, then pick the “Select” button.

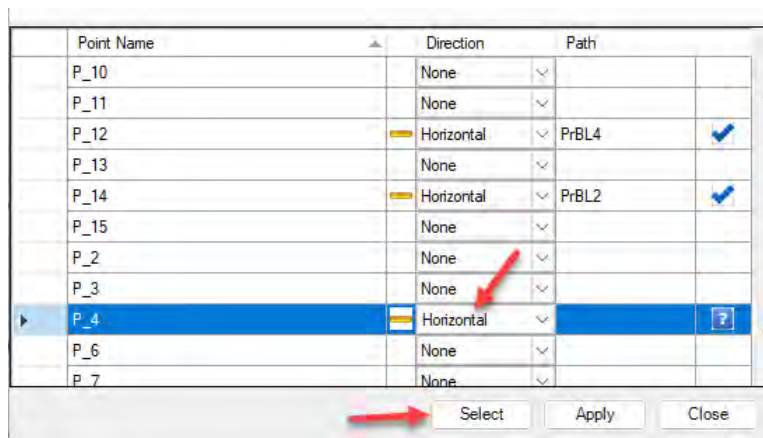
Point Name	Direction	Path
P_0	None	
P_1	None	
P_10	None	
P_11	None	
P_12	Horizontal	
P_13	None	
P_14	Horizontal	PrBL2
P_15	None	
P_2	None	
P_3	None	

Buttons: Select, Apply, Close

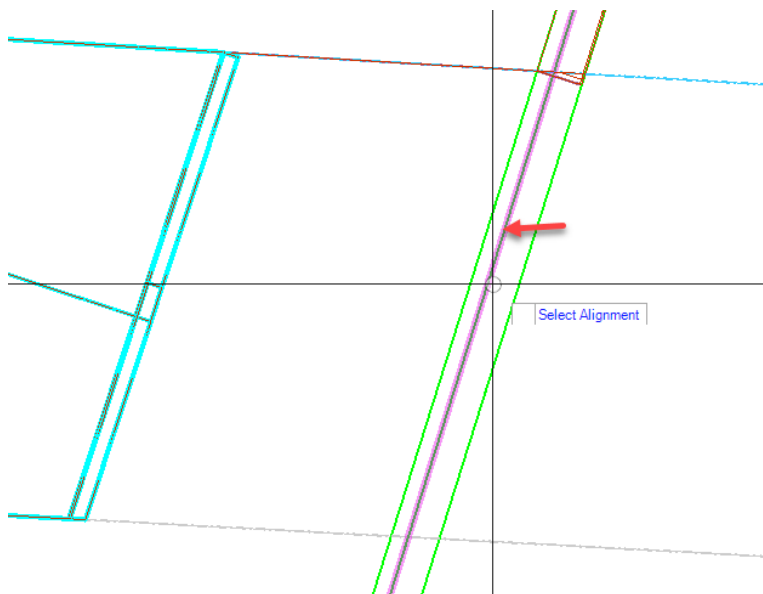
48) Pick the line that represents the inner edge of the curb of the approach slab on the left side.



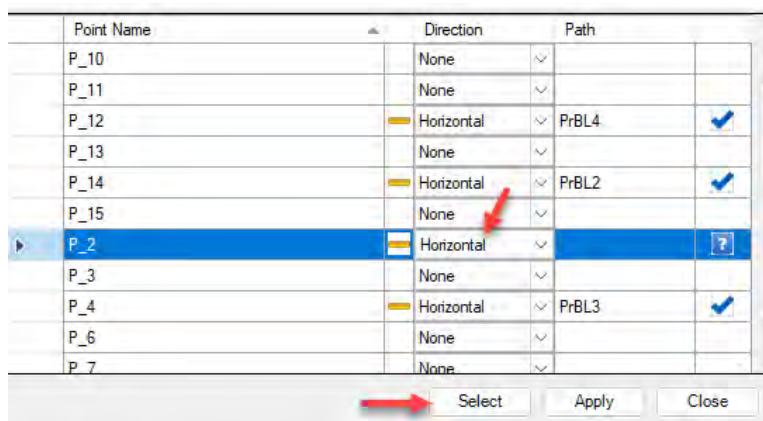
49) Select **"P_4"**, select **"Horizontal"** under the **"Direction"** column, then pick the **"Select"** button.



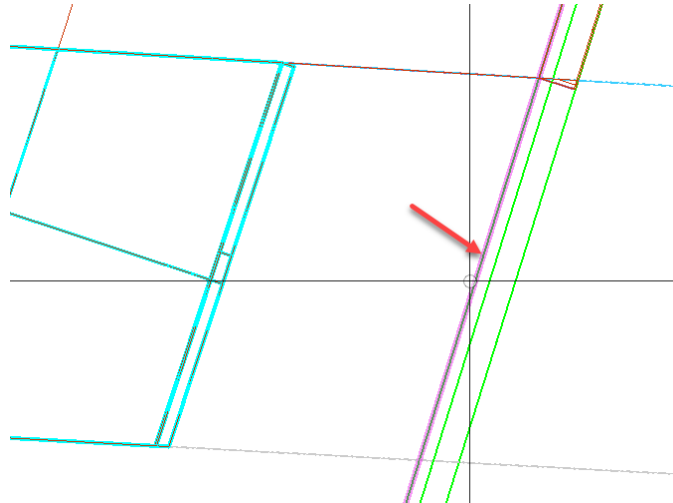
50) Pick the line that represents the outside edge of the curb of the approach slab on the right side.



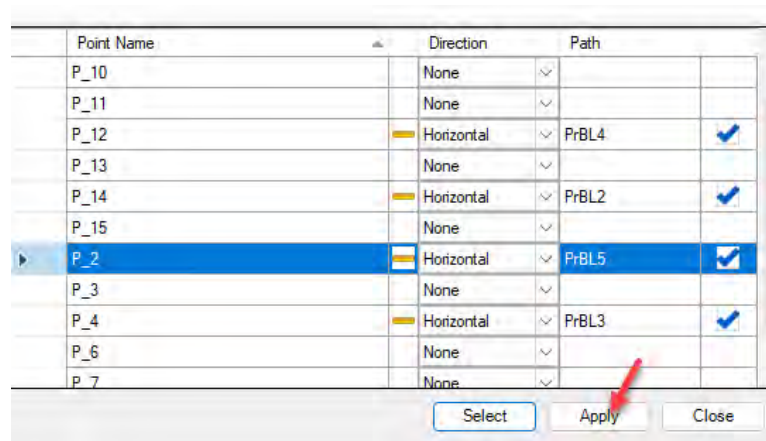
51) Select **"P_2"**, select **"Horizontal"** under the **"Direction"** column, then pick the **"Select"** button.



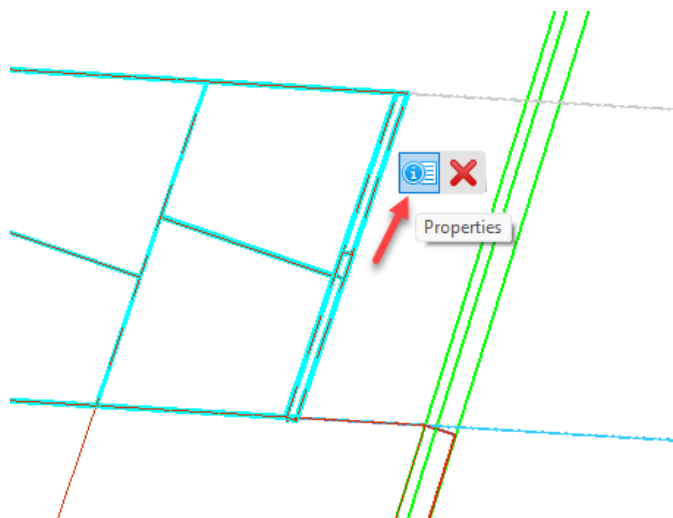
52) Pick the line that represents the inside edge of the curb of the approach slab on the right side.



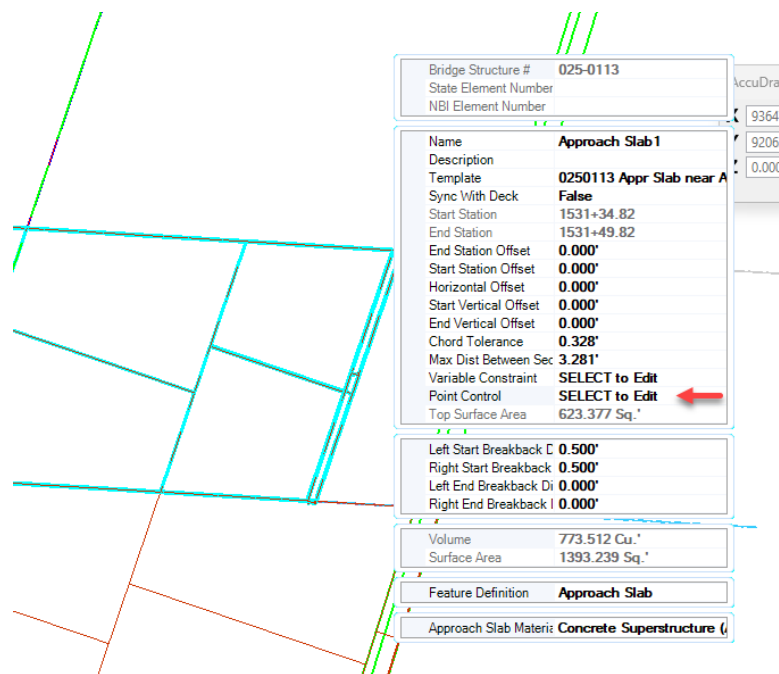
53) Select “**Apply**”, then close the dialog.



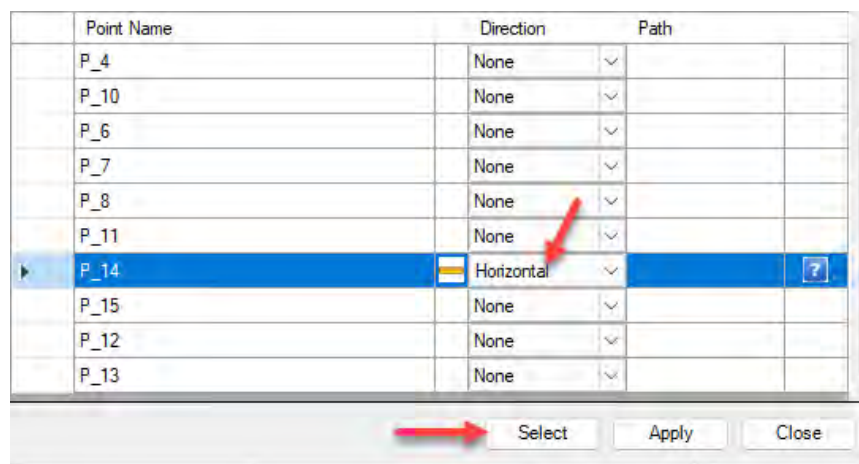
54) Using the “**Element Selection**” tool, select the North approach section that was just placed and “bump” the mouse (move away after selecting and then move back), then click the “**Properties**” button.



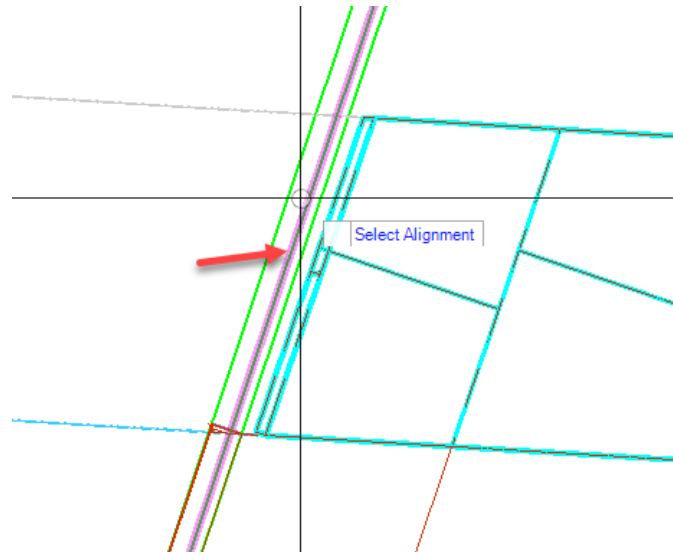
55) Pick the three dots next to **“SELECT to Edit”** for the Point Control.



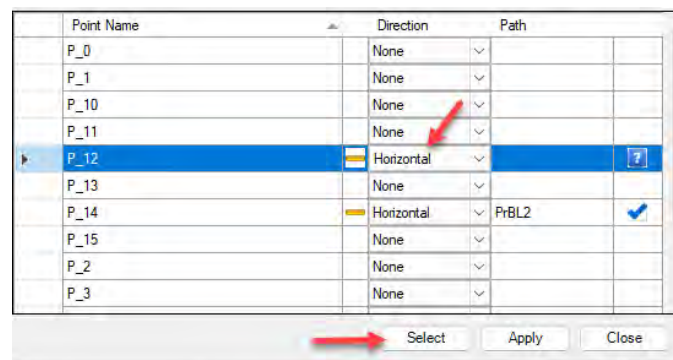
56) Select **“P_14”**, select **“Horizontal”** under the **“Direction”** column, then pick the **“Select”** button.



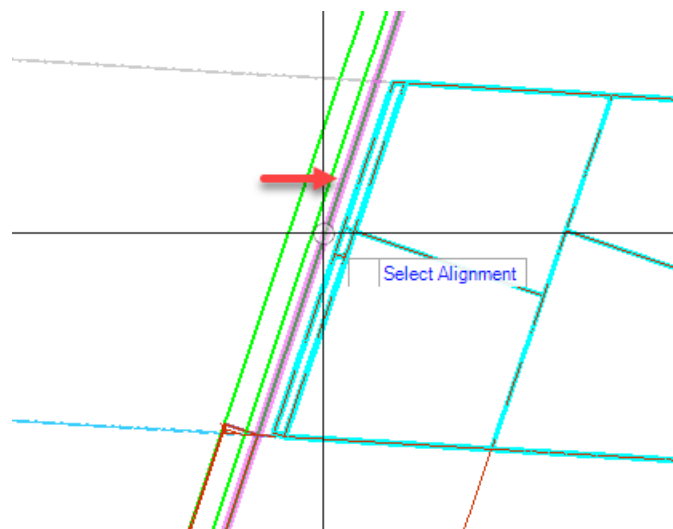
57) Pick the line that represents the outside edge of the curb of the approach slab on the left side.



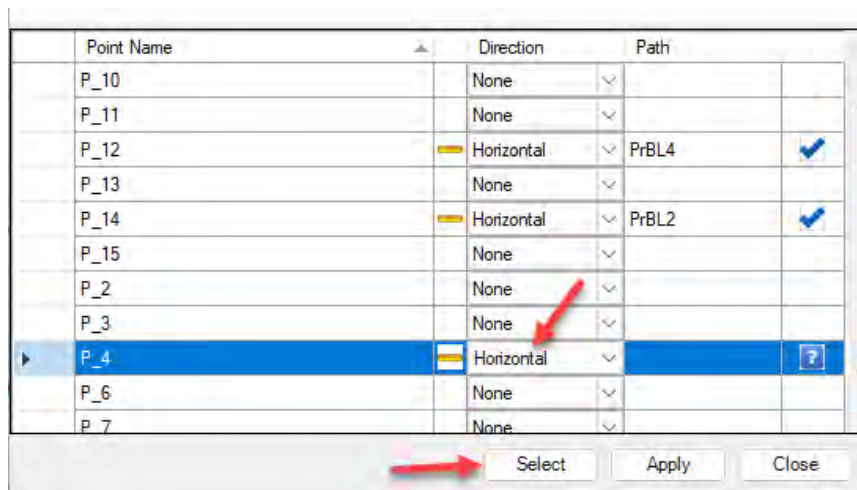
58) Select "**P_12**", select "**Horizontal**" under the "**Direction**" column, then pick the "**Select**" button.



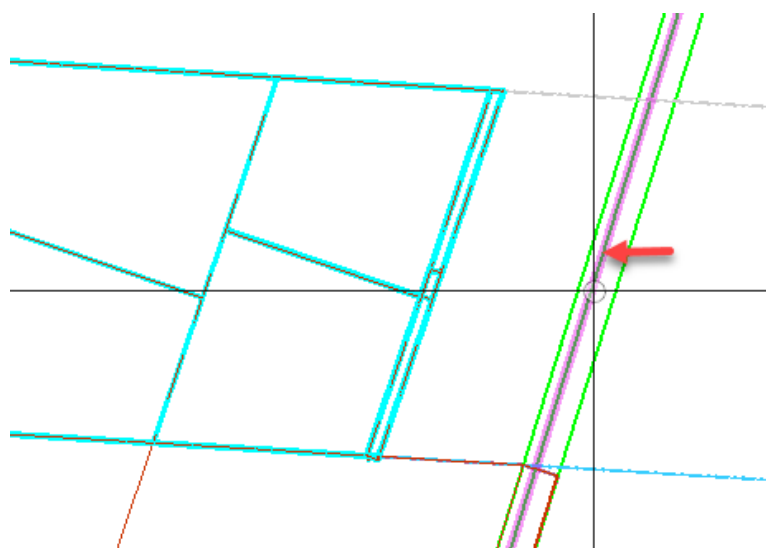
59) Pick the line that represents the inside edge of the curb of the approach slab on the left side.



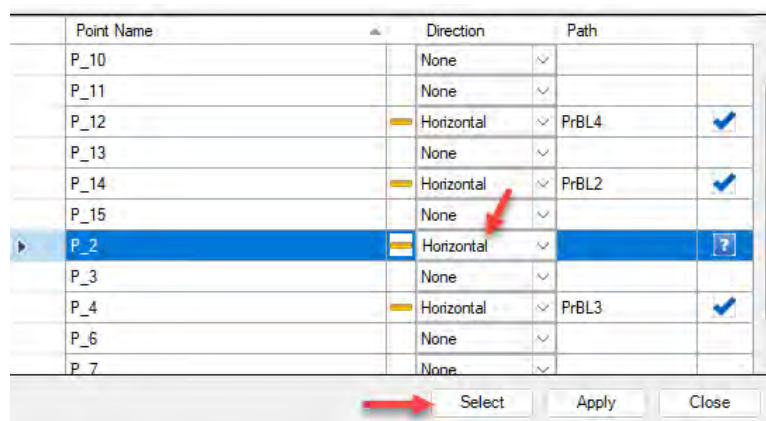
60) Select “**P_4**”, select “**Horizontal**” under the “**Direction**” column, then pick the “**Select**” button.



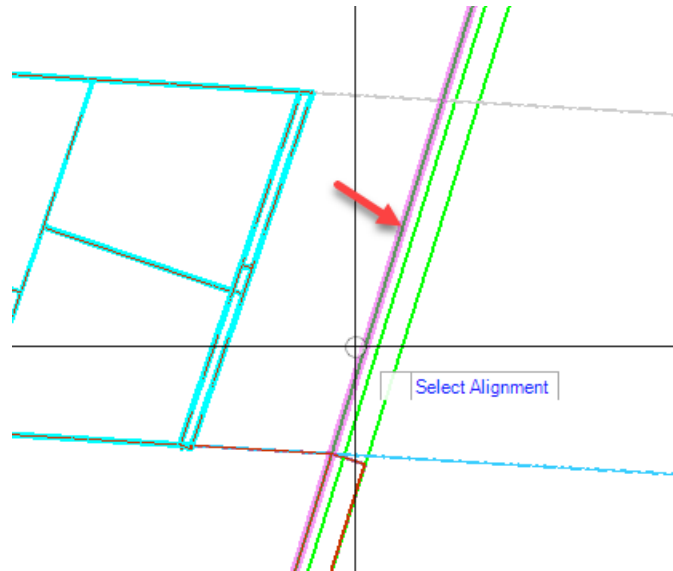
61) Pick the line that represents the outside edge of the curb of the approach slab on the right side.



62) Select “**P_2**”, select “**Horizontal**” under the “**Direction**” column, then pick the “**Select**” button.



63) Pick the line that represents the inside edge of the curb of the approach slab on the right side.

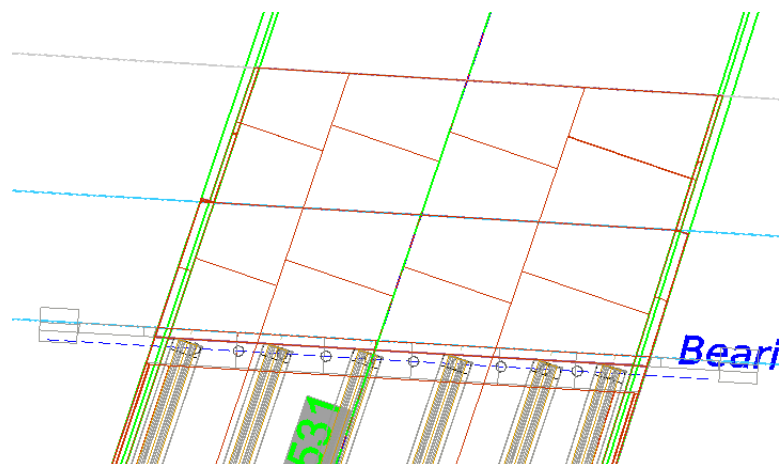


64) Select “**Apply**”, then “**Close**”.

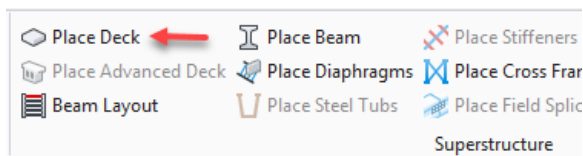
Point Name	Direction	Path	
P_10	None		
P_11	None		
P_12	Horizontal	PrBL4	✓
P_13	None		
P_14	Horizontal	PrBL2	✓
P_15	None		
P_2	Horizontal	PrBL5	✓
P_3	None		
P_4	Horizontal	PrBL3	✓
P_6	None		
P_7	None		

Buttons: Select, Apply, Close

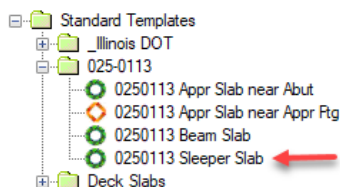
Both approach slabs should now appear correctly.



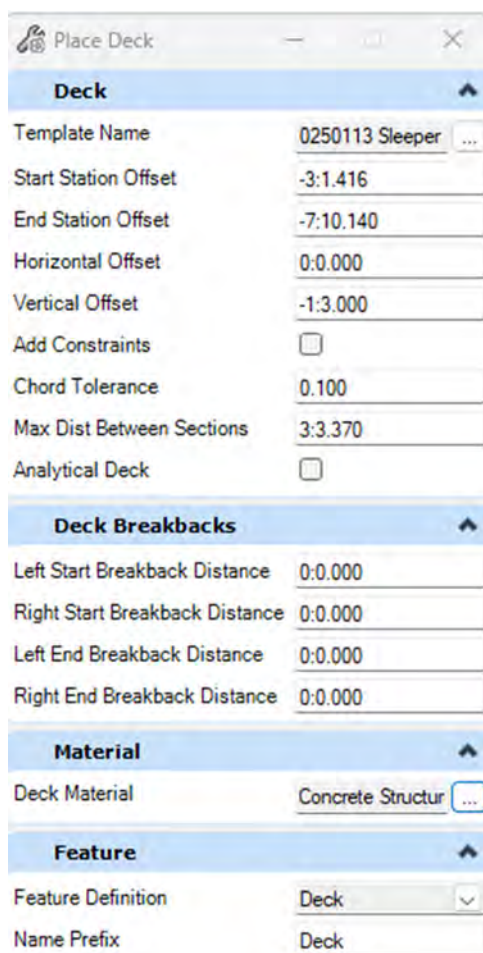
65) Select **“Place Deck”** in the **“Superstructure”** group.



66) Select the **“...”** and select the template **“0250113 Sleeper Slab”**.



67) Change the dialog values as shown:



68) Select **“SupportLine 5”**, **“SupportLine3”**, then accept.

69) With the **“Place Deck”** command still active, change the dialog values as shown:

Deck	
Template Name	0250113 Sleeper
Start Station Offset	7:10.044
End Station Offset	3:1.368
Horizontal Offset	0:0.000
Vertical Offset	-1:3.000
Add Constraints	☐
Chord Tolerance	0.100
Max Dist Between Sections	3:3.370
Analytical Deck	☐

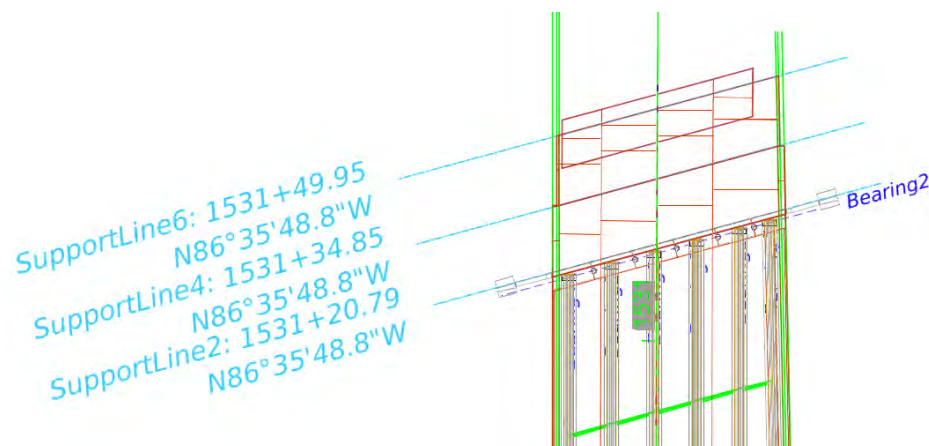
Deck Breakbacks	
Left Start Breakback Distance	0:0.000
Right Start Breakback Distance	0:0.000
Left End Breakback Distance	0:0.000
Right End Breakback Distance	0:0.000

Material	
Deck Material	Concrete Structur...

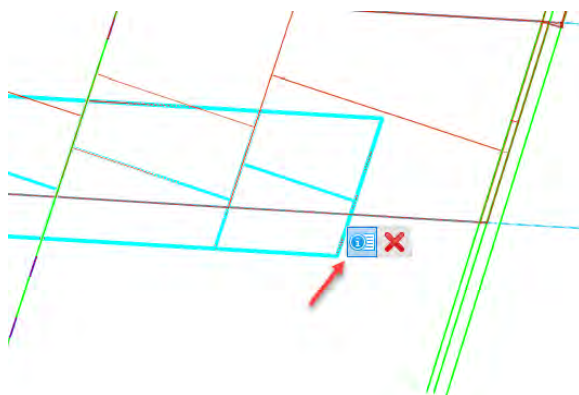
Feature	
Feature Definition	Deck
Name Prefix	Deck

70) Select **“SupportLine4”**, **“SupportLine6”**, then accept.

71) The sleeper slabs should appear as below:



- 72) Using the “**Element Selection**” tool, select the South sleeper slab that was just placed and “bump” the mouse (move away after selecting and then move back), then select “**Properties**”.



- 73) Pick the three dots next to “**SELECT to Edit**” for the Point Control.

Bridge Name	Bridge
Bridge Description	Tapered Bridge
Bridge Structure #	025-0113
State Element Number	12
NBI Element Number	12

Name	Deck5
Description	
Template	0250113 Sleeper Slab
Analytical Deck	False
Start Station	1529+54.59
End Station	1529+64.92
Start Station Offset	-3.118'
End Station Offset	-7.845'
Horizontal Offset	0.000'
Vertical Offset	-1.250'
Chord Tolerance	0.328'
Max Dist Between Sec	3.281'
Variable Constraint	SELECT to Edit
Point Control	SELECT to Edit
Top Surface Area	423.604 Sq.'

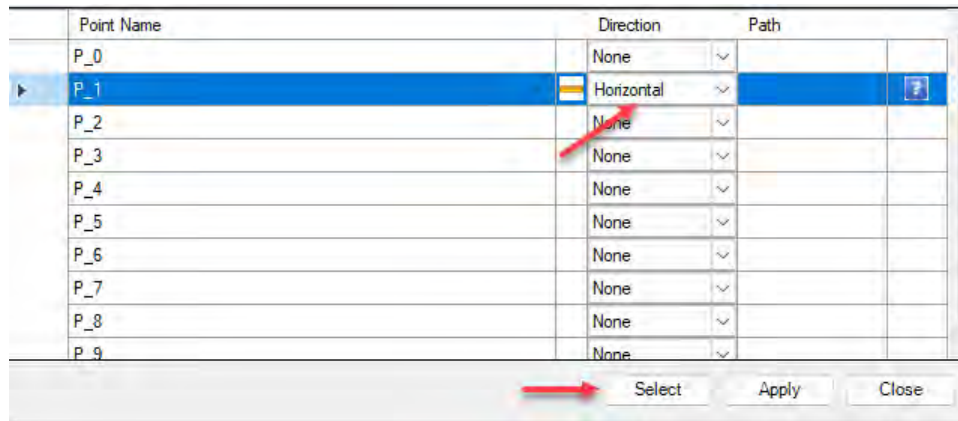
Left Start Breakback C	0.000'
Right Start Breakback	0.000'
Left End Breakback Di	0.000'
Right End Breakback I	0.000'

Volume	352.948 Cu.'
Surface Area	935.140 Sq.'

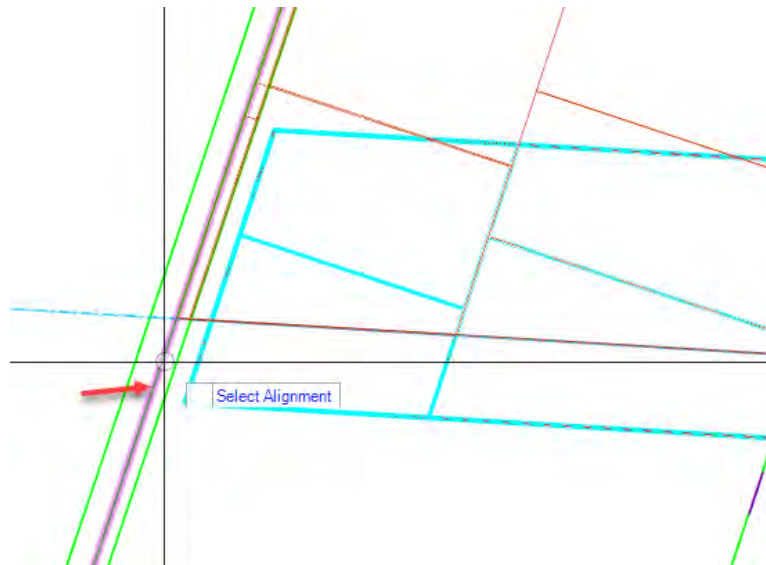
Feature Definition	Deck
--------------------	------

Deck Material	Concrete Structures
---------------	---------------------

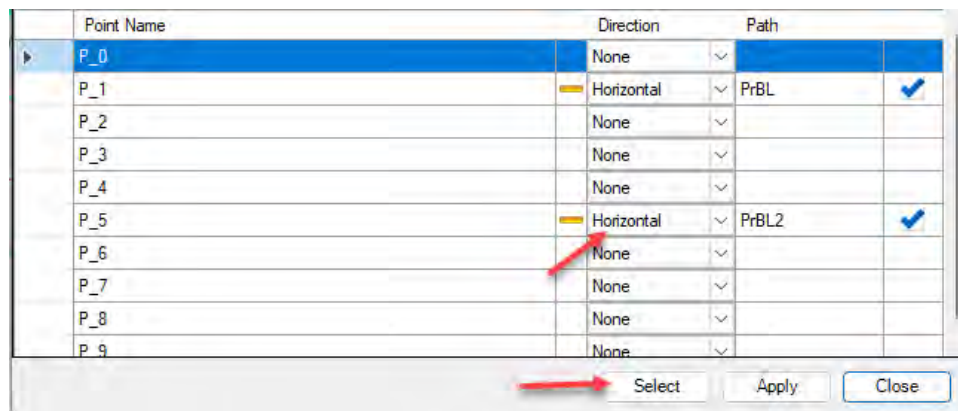
74) Select point “P_1”, change the direction to “**Horizontal**”, then “**Select**”.



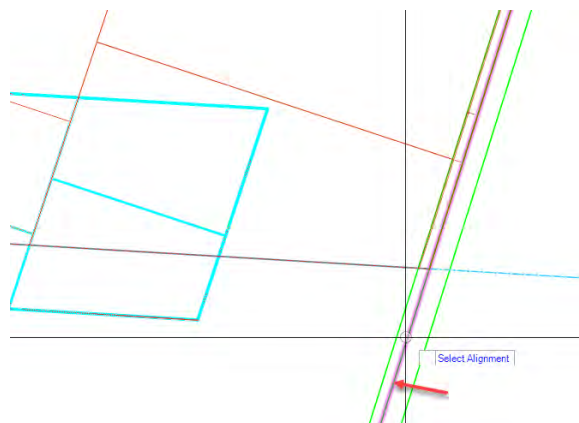
75) Pick the line representing the desired outside left edge of approach curb.



76) Select point “P_5”, change the direction to “**Horizontal**”, then “**Select**”.

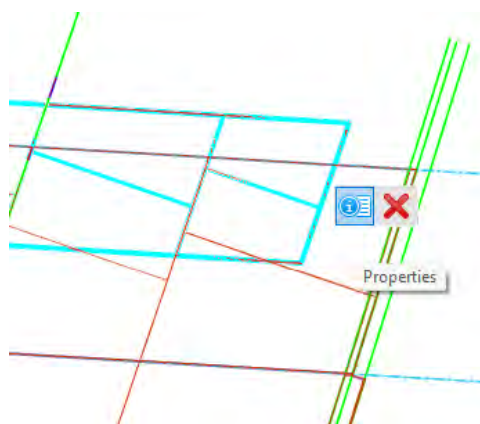


77) Pick the line representing the desired outside right edge of approach curb, then **“Apply”**.

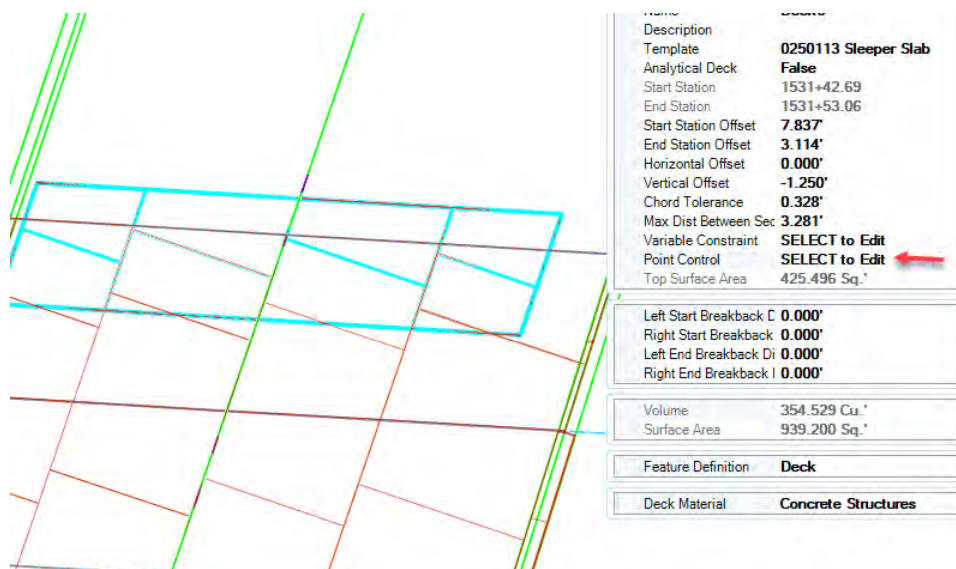


78) Close the **“Edit Point Control”** dialog.

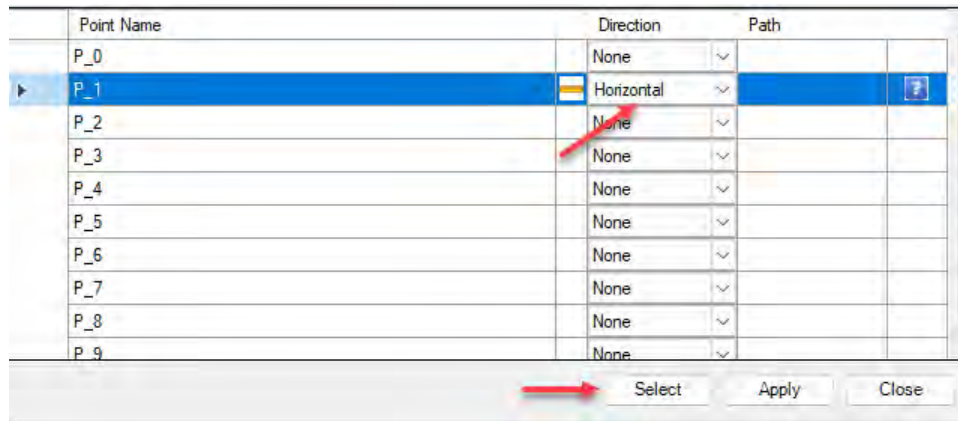
79) Using the **“Element Selection”** tool, select the North sleeper slab that was just placed and **“bump”** the mouse (move away after selecting and then move back), then select **“Properties”**.



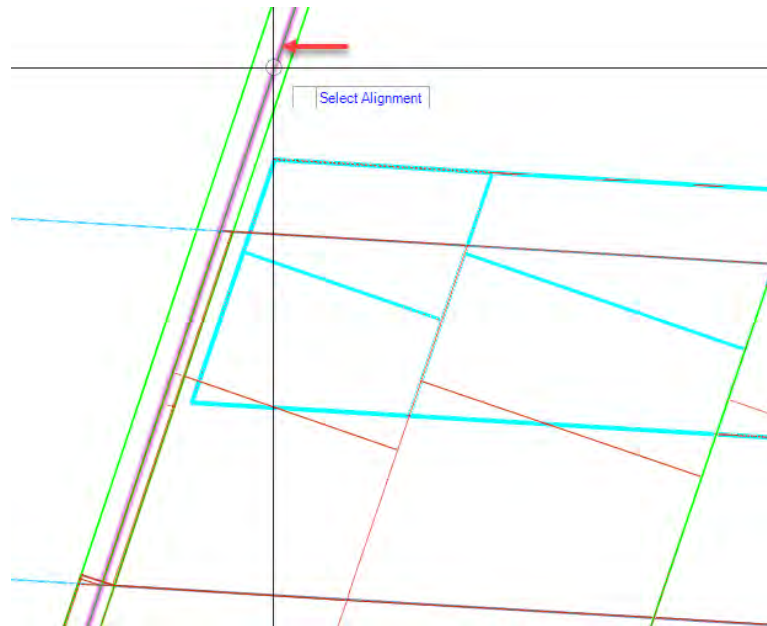
80) Pick the three dots next to **“SELECT to Edit”** for the Point Control.



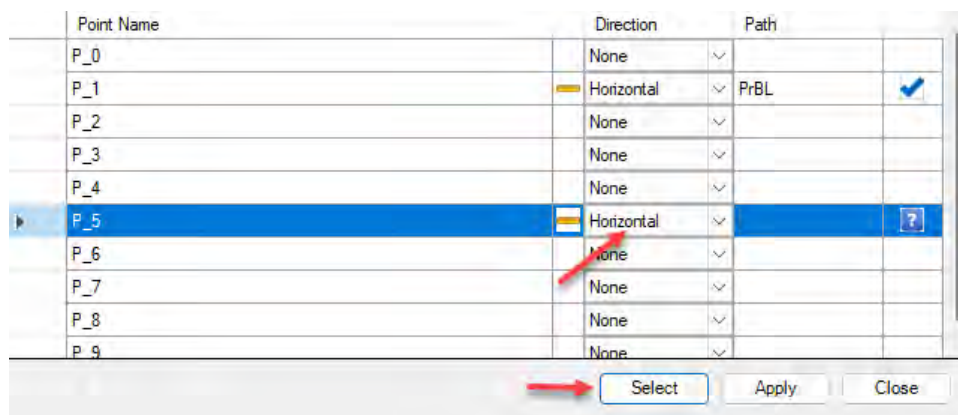
81) Select point “**P_1**”, change the direction to “**Horizontal**”, then “**Select**”.



82) Pick the line representing the desired outside left edge of approach curb.



83) Select point “**P_5**”, change the direction to “**Horizontal**”, then “**Select**”.

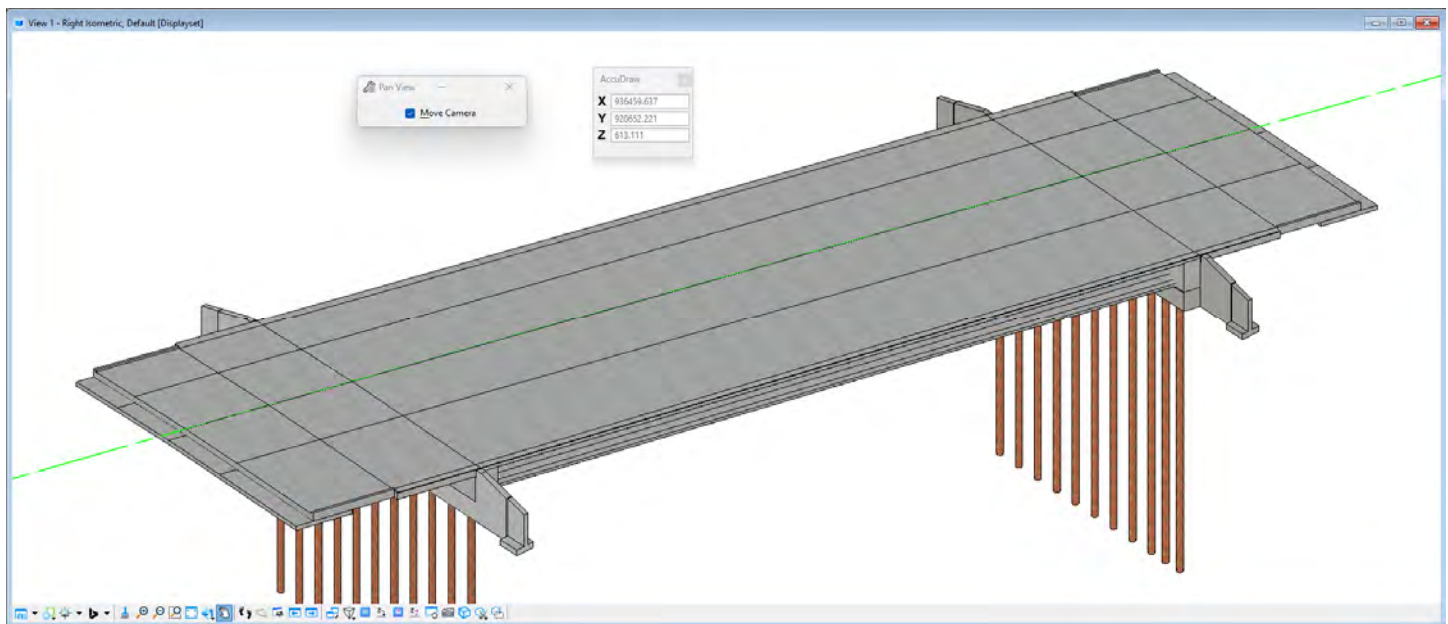


84) Pick the line representing the desired outside right edge of approach curb, then ***“Apply”***.



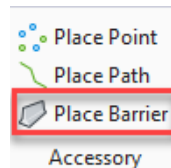
85) Close the ***“Edit Point Control”*** dialog.

86) Render and review model.

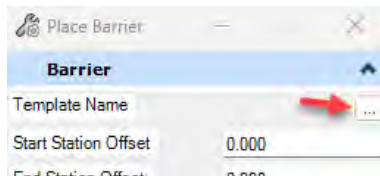


Chapter 9 – Constant Slope Parapets

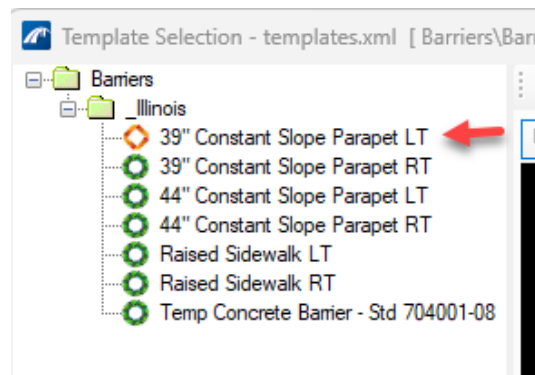
- 1) In the “**OpenBridge Modeler**” workflow, Select “**Place Barrier**” in the “**Accessory**” group in the “**Home**” tab.



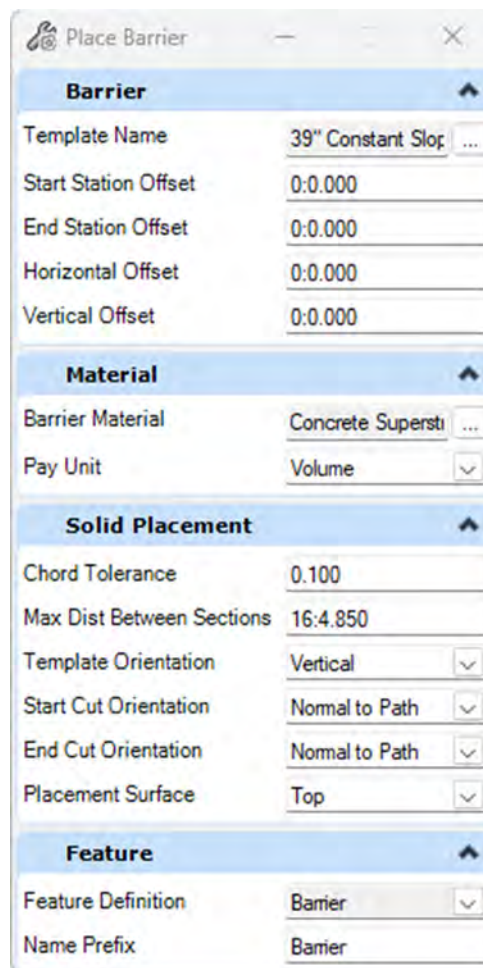
- 2) In the “**Place Barrier**” dialog, select “...” in the “**Template Name**” row.



- 3) In the “**Template Selection**” dialog, select the “**39” Constant Slope Parapet LT**”, then click “**Select**” in the lower right corner.



- 4) Change the values in the dialog as shown:



The 'Place Barrier' dialog box is shown with the following settings:

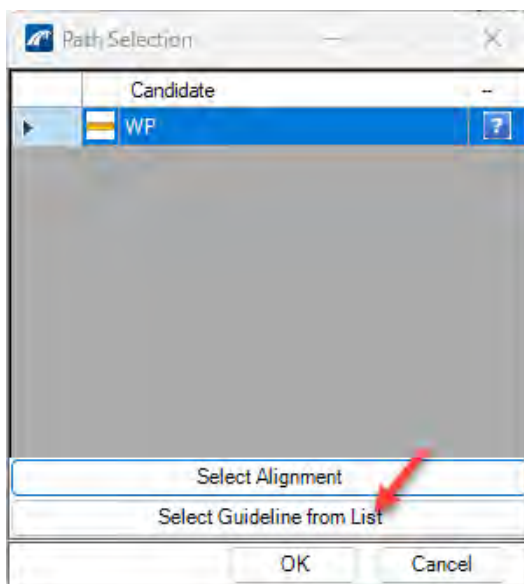
Barrier	
Template Name	39" Constant Slop ...
Start Station Offset	0:0.000
End Station Offset	0:0.000
Horizontal Offset	0:0.000
Vertical Offset	0:0.000

Material	
Barrier Material	Concrete Supersti ...
Pay Unit	Volume

Solid Placement	
Chord Tolerance	0.100
Max Dist Between Sections	16:4.850
Template Orientation	Vertical
Start Cut Orientation	Normal to Path
End Cut Orientation	Normal to Path
Placement Surface	Top

Feature	
Feature Definition	Barrier
Name Prefix	Barrier

- 5) Select the bridge deck, reset, then left-click to accept.
- 6) Pick **"Select Guideline from List"** from within the **"Path Selection"** dialog.



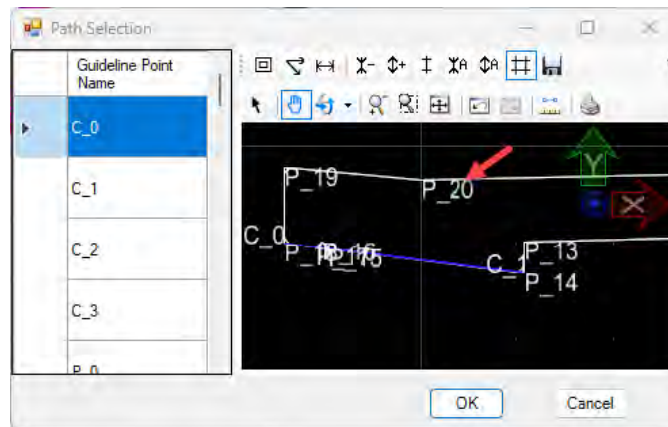
The 'Path Selection' dialog box is shown with the following settings:

Candidate	
WP	?

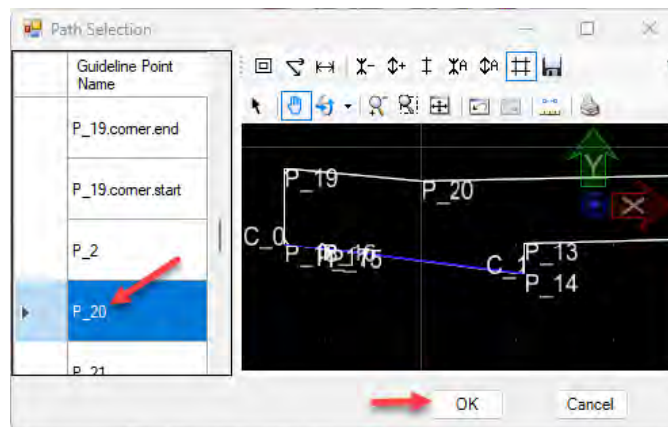
Buttons: Select Alignment, Select Guideline from List, OK, Cancel

A red arrow points to the 'Select Guideline from List' button.

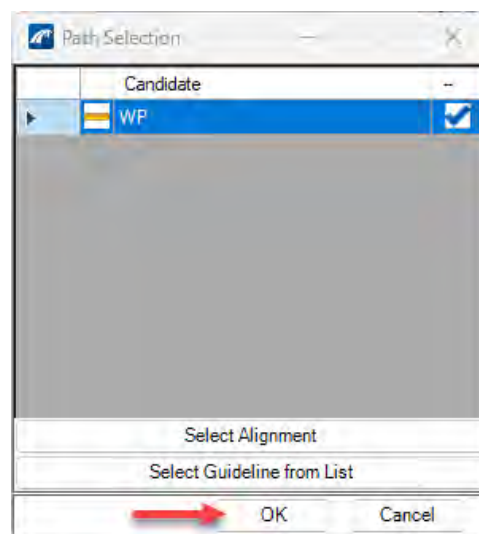
- 7) Zoom into the location for the left parapet in the deck template view to determine the point for the curb line (in this case it is “**P_20**”).

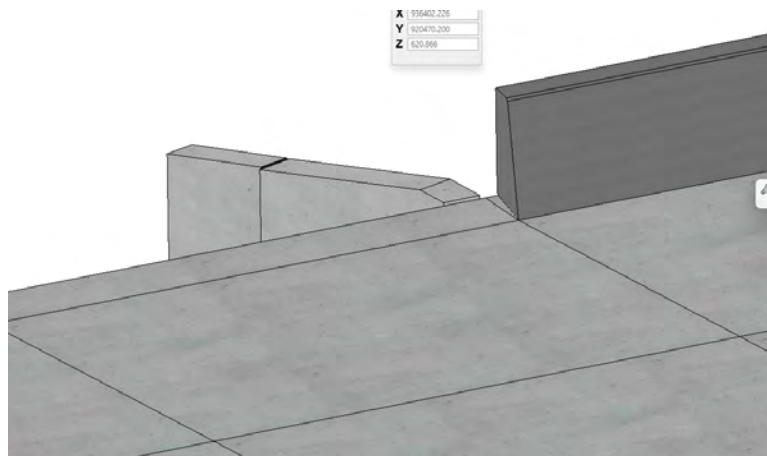


- 8) Scroll down the “Guideline Point Name” list until you find “**P_20**”, select it, then click on “**OK**”.

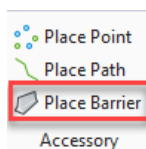


- 9) Select “**OK**” in the remaining “**Path Selection**” dialog.





10) Select **“Place Barrier”** command again.



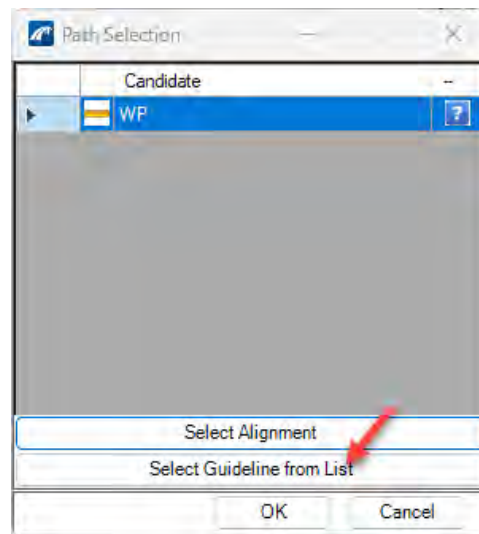
11) The template name is already set to **“39” Constant Slope Parapet LT”**.

12) Verify that the dialog values are as shown below:

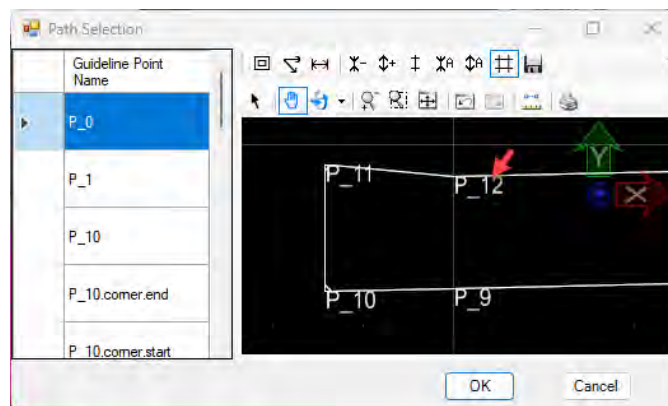
Barrier	
Template Name	39" Constant Slope Parapet LT
Start Station Offset	0+0.000
End Station Offset	0+0.000
Horizontal Offset	0+0.000
Vertical Offset	0+0.000
Material	
Barrier Material	Concrete Superstitching
Pay Unit	Volume
Solid Placement	
Chord Tolerance	0.100
Max Dist Between Sections	16+4.850
Template Orientation	Vertical
Start Cut Orientation	Normal to Path
End Cut Orientation	Normal to Path
Placement Surface	Top
Feature	
Feature Definition	Barrier
Name Prefix	Barrier

13) Select the South approach section, nearest to the bridge deck, reset, then left-click to accept.

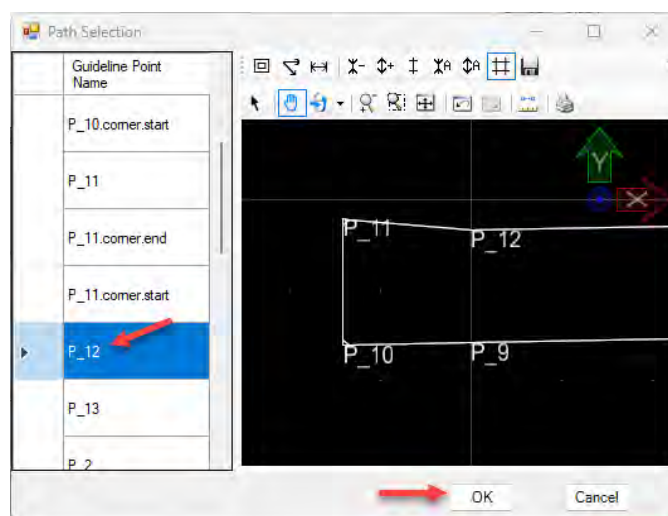
14) Pick **“Select Guideline from List”** from within the **“Path Selection”** dialog.



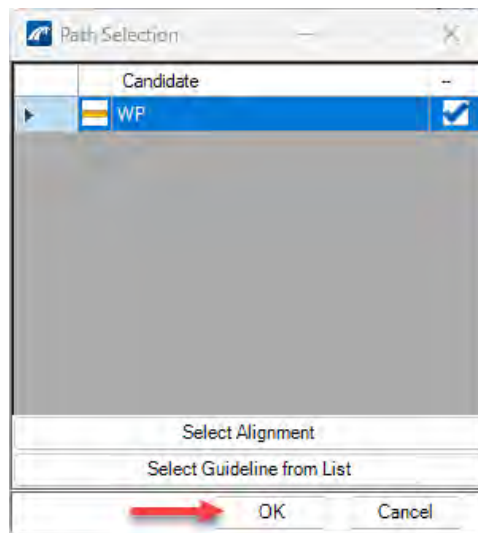
15) Zoom into the location for the left parapet in the deck template view to determine the point for the curb line (in this case it is **“P_12”**).



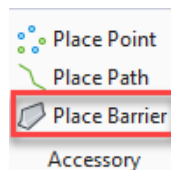
16) Scroll down the **“Guideline Point Name”** list until you find **“P_12”**, select it, then click on **“OK”**.



17) Select **“OK”** in the remaining **“Path Selection”** dialog.

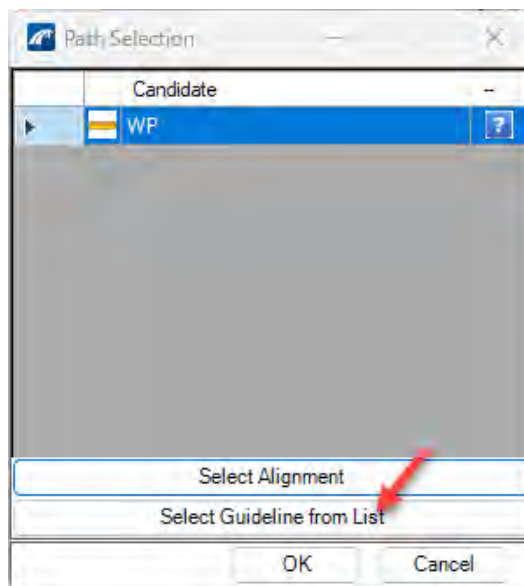


18) Select **“Place Barrier”** command again.

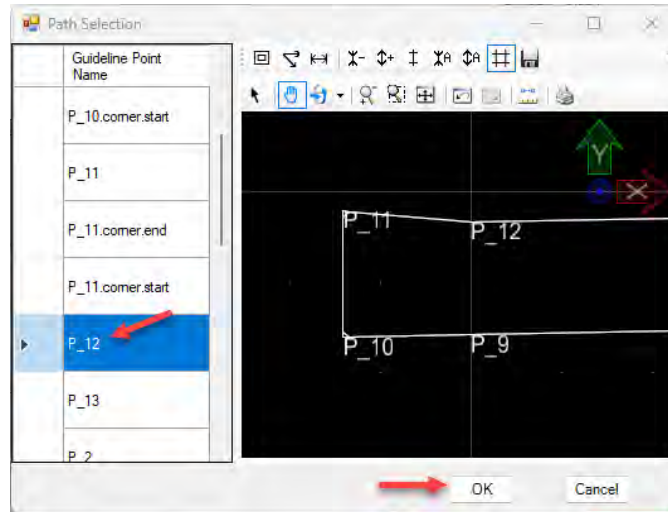


19) Select the North approach section, nearest to the bridge deck, reset, then left-click to accept.

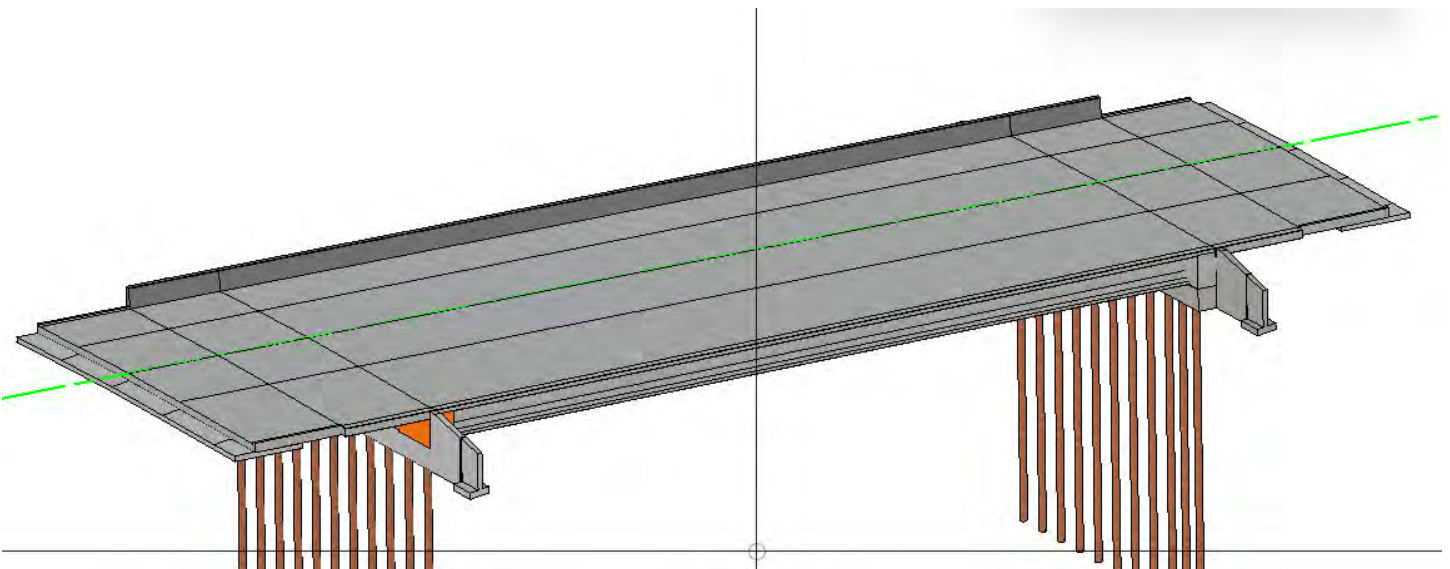
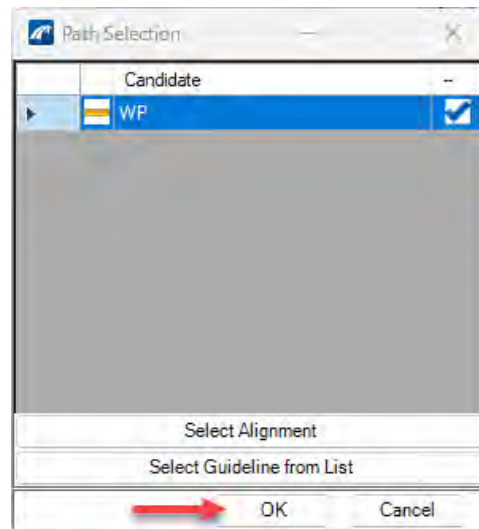
20) Pick **“Select Guideline from List”** from within the **“Path Selection”** dialog.



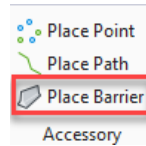
21) Scroll down the “**Guideline Point Name**” list until you find “**P_12**”, select it, then click on “**OK**”.



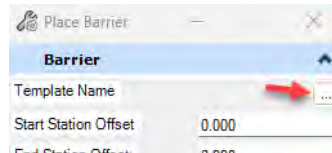
22) Select “**OK**” in the remaining “**Path Selection**” dialog.



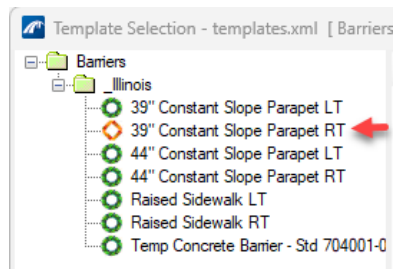
23) Select the **“Place Barrier”** command again.



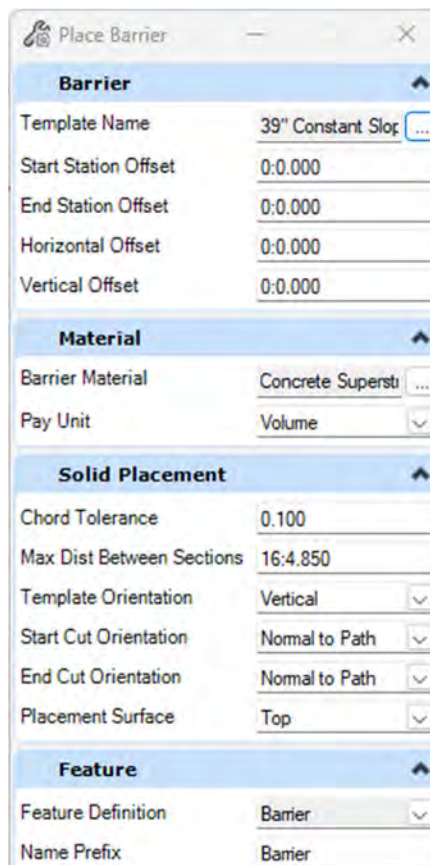
24) In the **“Place Barrier”** dialog, select **“...”** in the **“Template Name”** row.



25) In the **“Template Selection”** dialog, select the **“39” Constant Slope Parapet RT”**, then click **“Select”** in the lower right corner.

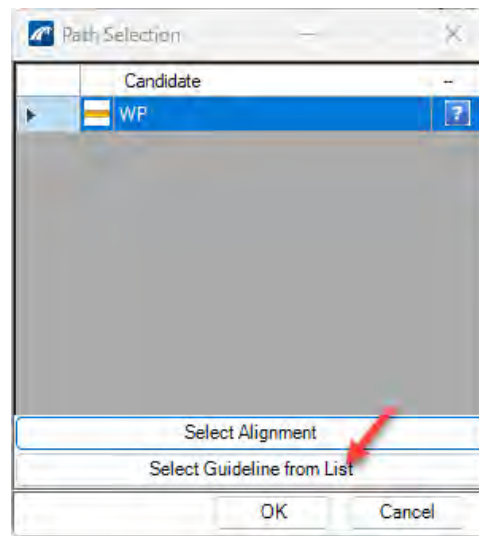


26) Change the values in the dialog as shown:

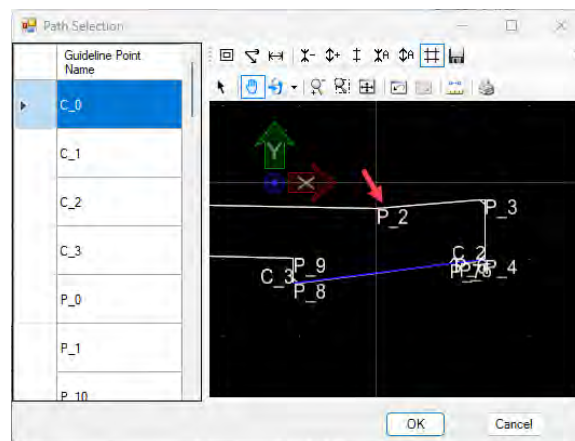


27) Select the bridge deck, reset, then left-click to accept.

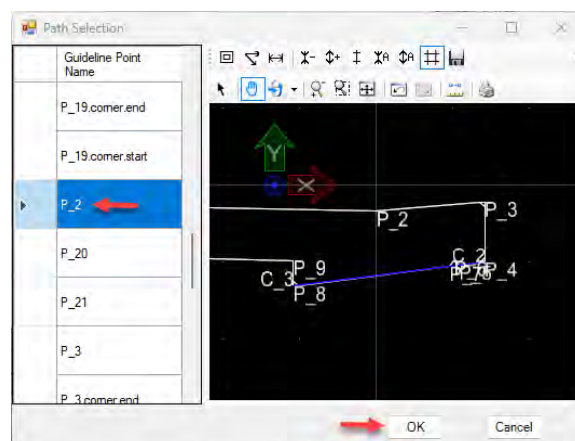
28) Pick **“Select Guideline from List”** from within the **“Path Selection”** dialog.



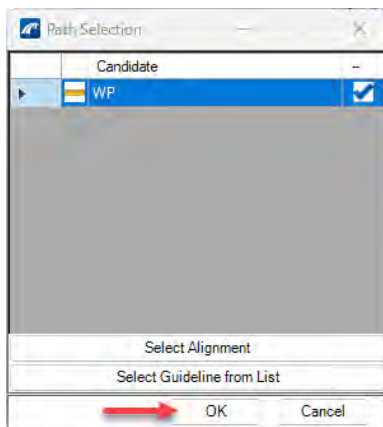
29) Zoom into the location for the right parapet in the deck template view to determine the point for the curb line (in this case it is **“P_2”**).



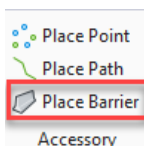
30) Scroll down the **“Guideline Point Name”** list until you find **“P_2”**, select it, then click on **“OK”**.



31) Select **“OK”** in the remaining **“Path Selection”** dialog.

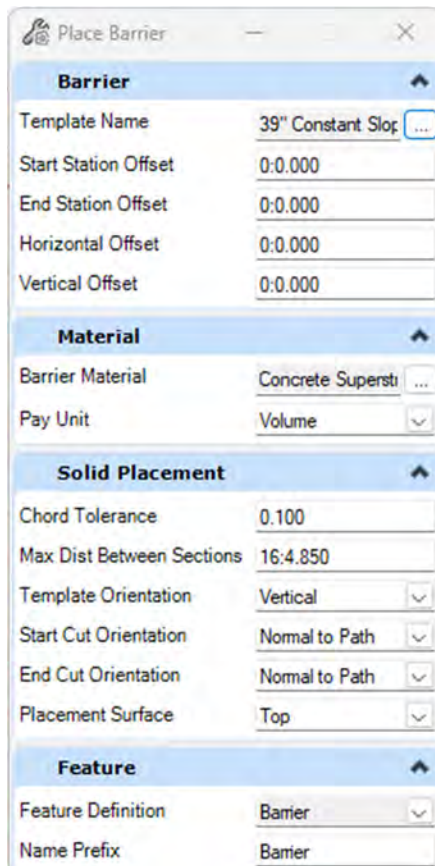


32) Select **“Place Barrier”** command again.



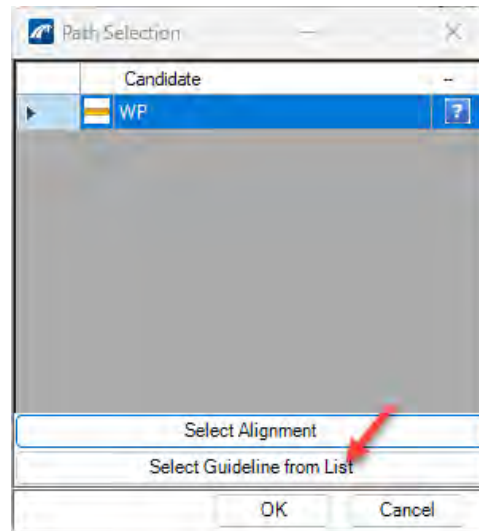
33) The template name is already set to **“39” Constant Slope Parapet RT”**.

34) Verify that the dialog values are as shown below:

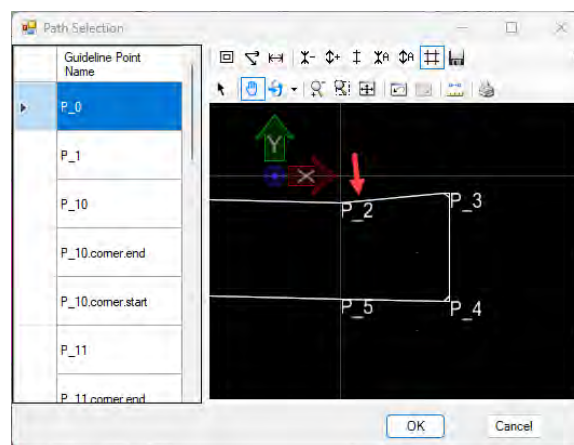


35) Select the South approach section, nearest to the bridge deck, reset, then left-click to accept.

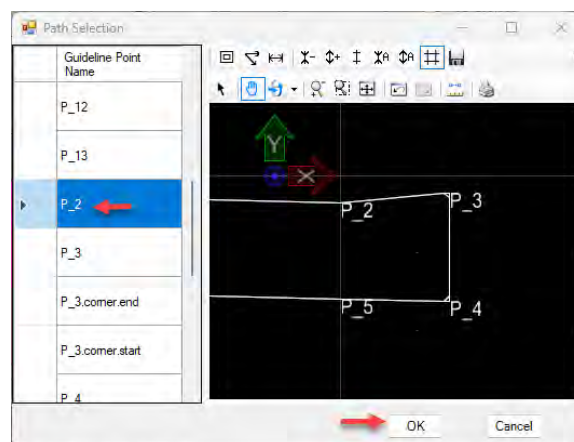
36) Pick ***“Select Guideline from List”*** from within the **“Path Selection”** dialog.



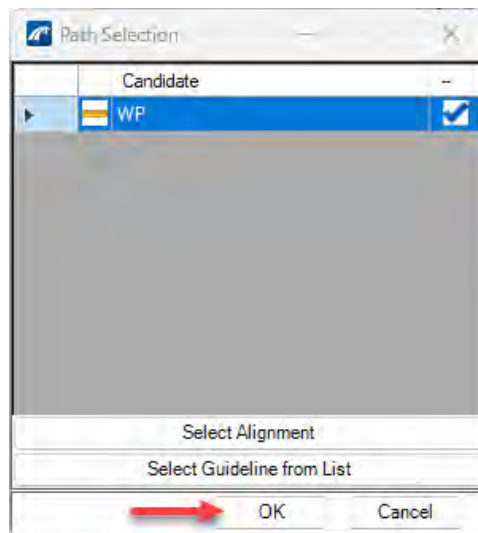
37) Zoom into the location for the right parapet in the deck template view to determine the point for the curb line (in this case it is ***“P_2”***).



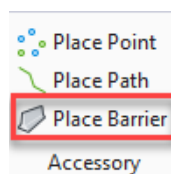
38) Scroll down the ***“Guideline Point Name”*** list until you find ***“P_2”***, select it, then click on ***“OK”***.



39) Select **“OK”** in the remaining **“Path Selection”** dialog.

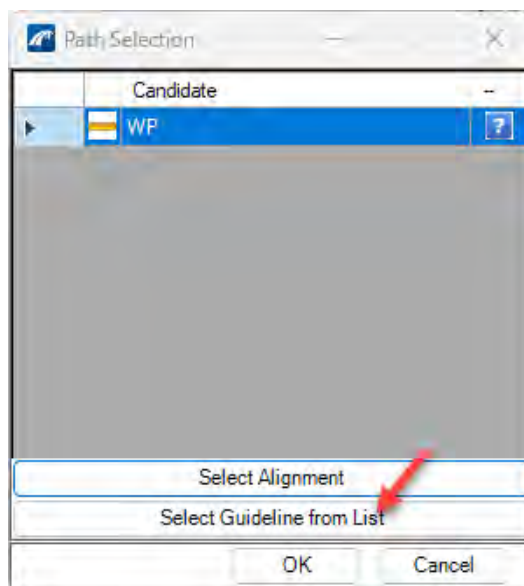


40) Select **“Place Barrier”** command again.

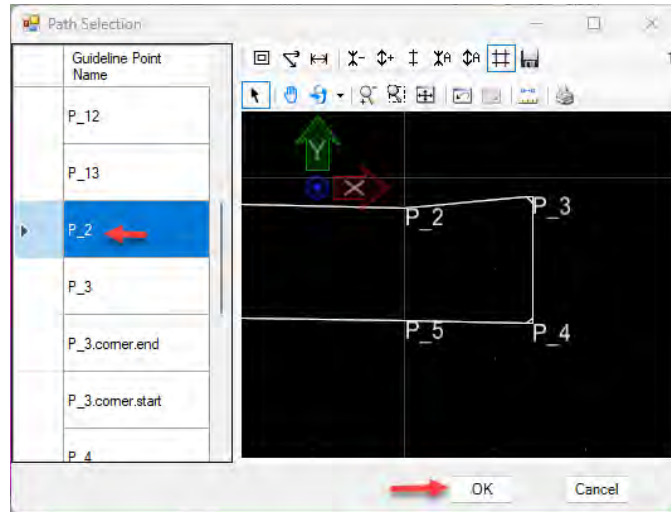


41) Select the North approach section, nearest to the bridge deck, reset, then left-click to accept.

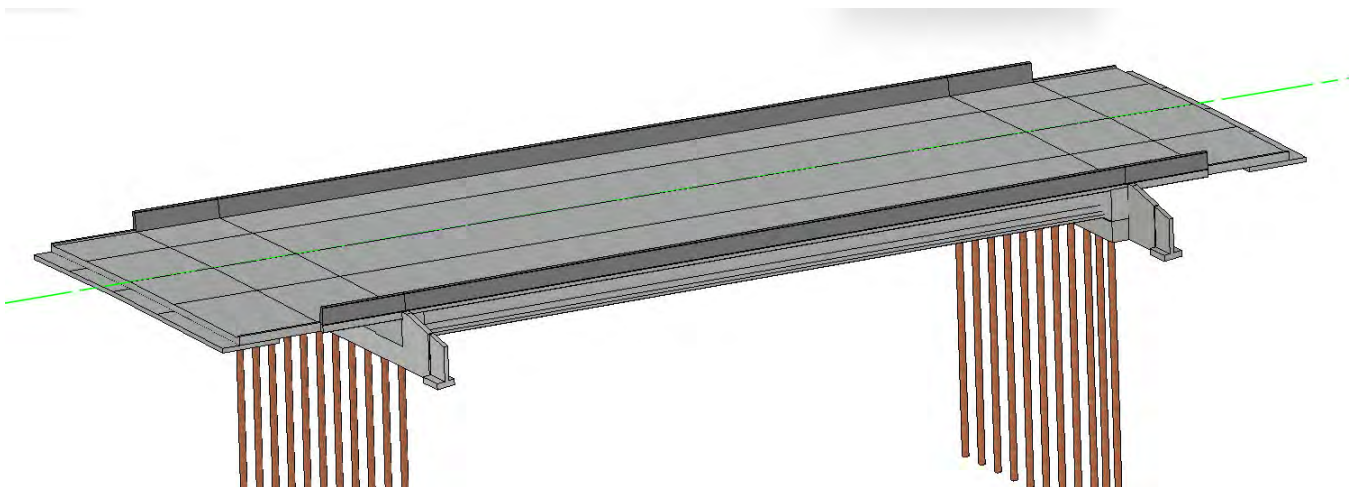
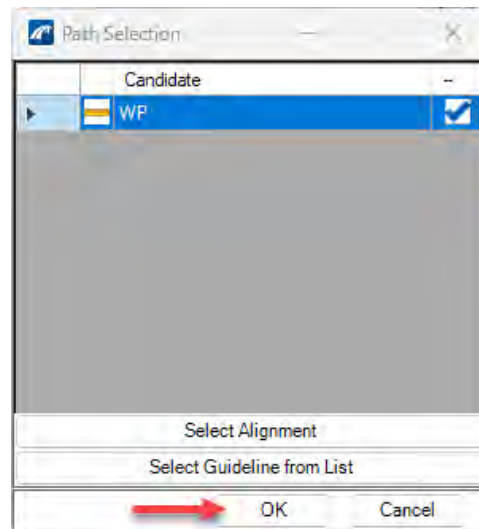
42) Pick **“Select Guideline from List”** from within the **“Path Selection”** dialog.



43) Scroll down the “**Guideline Point Name**” list until you find “**P_2**”, select it, then click on “**OK**”.



44) Select “**OK**” in the remaining “**Path Selection**” dialog.

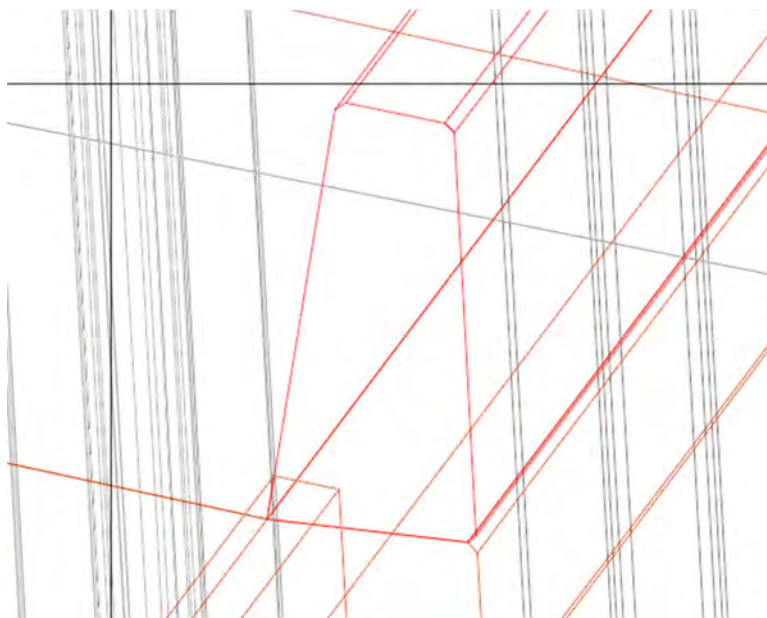


Chapter 10 – Parapet & Curb Tapers

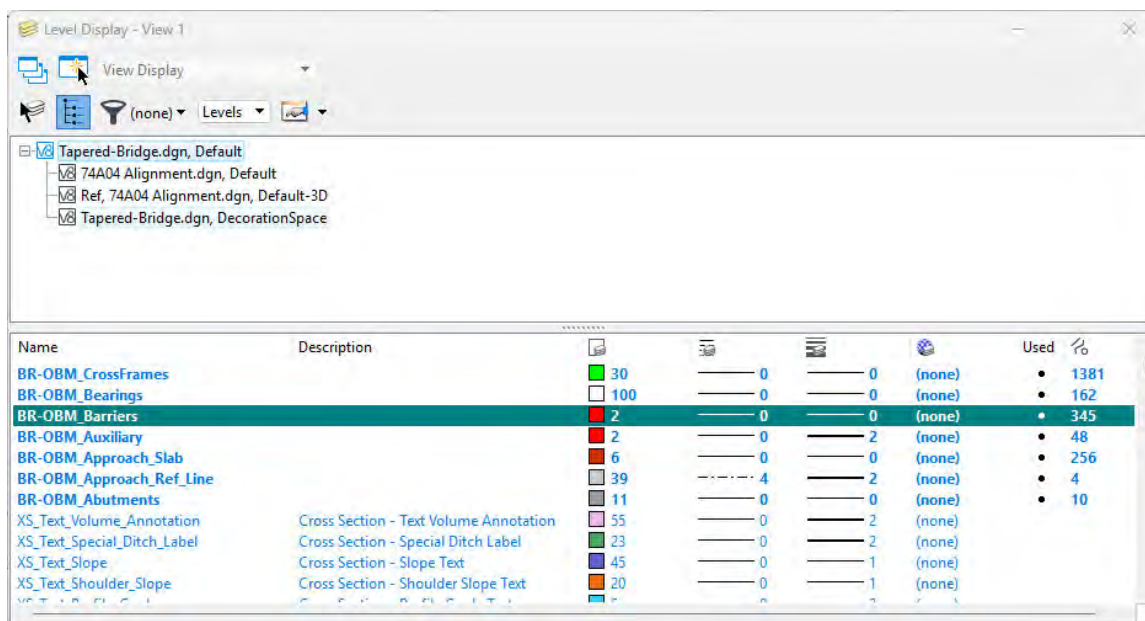
Parapet Tapers

To create the tapers at the ends of the parapets, we will be creating solids at each taper location and subtracting them out from the OBM barrier solid.

- 1) Using the dynamic rotation tool, rotate the view so that you can see the top and end of the Southeast parapet.

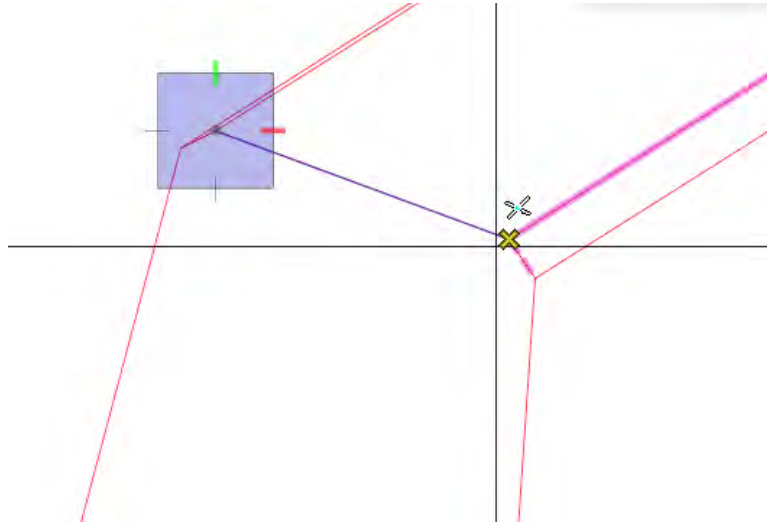


- 2) In the “**Level Display**” dialog, turn off all levels except for “**BR-OBM_Barriers**”.

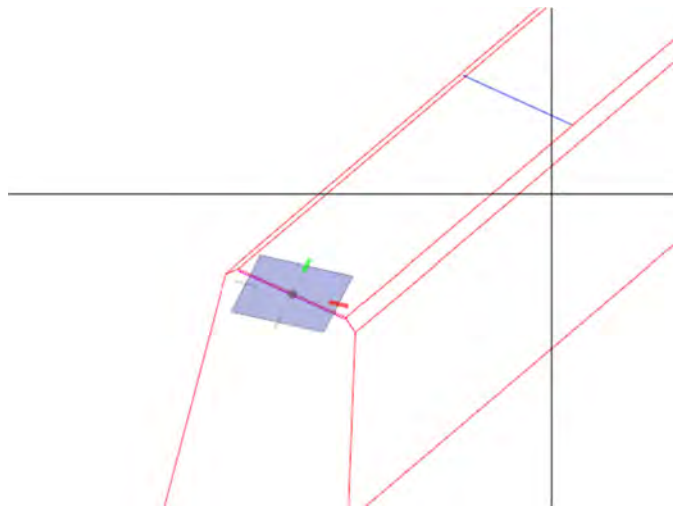


- 3) Make an unused level active, such as “**BR-OBM_FC_ConstructionLines**”.

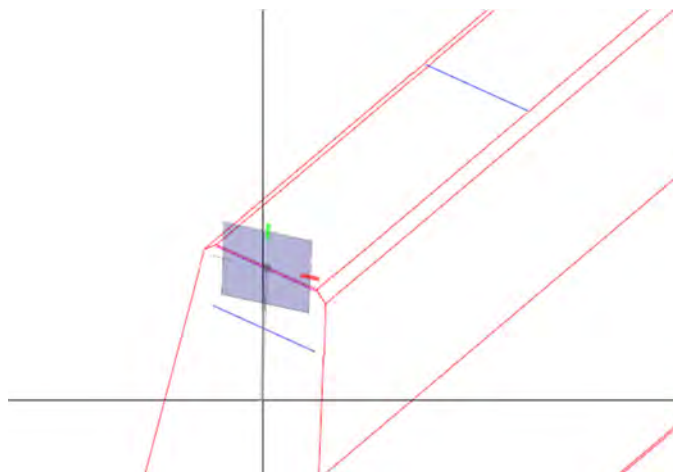
- 4) In the Southeast corner of the bridge, draw a line along the top of the Southeast parapet end.



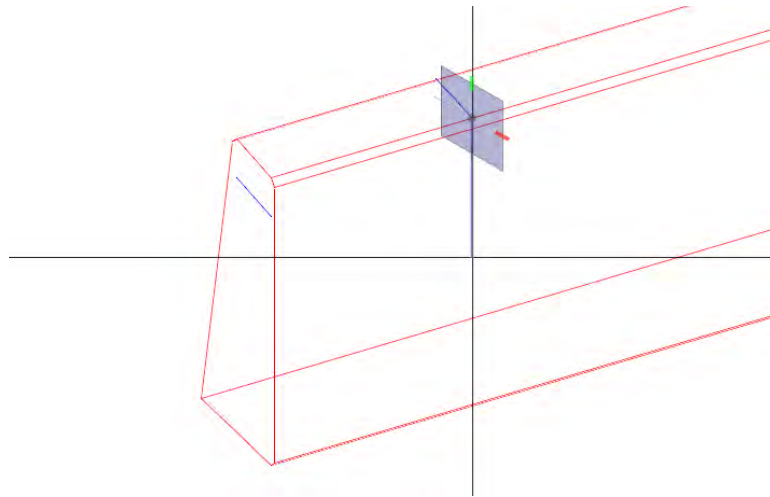
- 5) Select the ***“Move/Copy Parallel”*** command and copy the line 2.0 ft over (Type ***“T”*** after picking the line to be copied to change the AccuDraw compass to a Top View orientation) and accept.



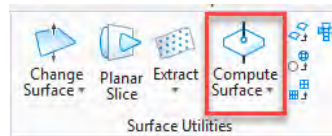
- 6) Select the ***“Move/Copy Parallel”*** command and move the first line you drew 5" down (Type ***“F”*** after picking the line to be moved to change the AccuDraw compass to a Front View orientation) and accept.



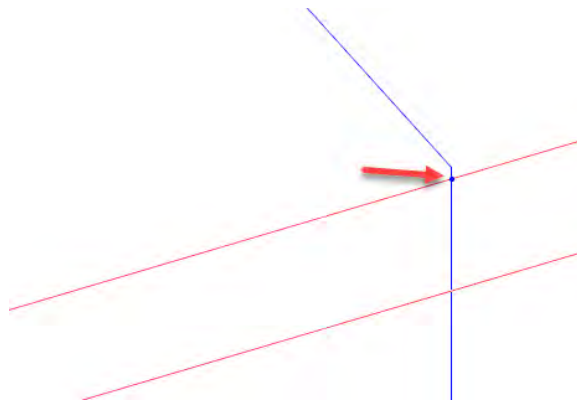
- 7) Using the **“Place Line”** command, draw a vertical line from the endpoint of the transverse line at the top of the parapet (type “f” to rotate the compass to a front view setting).



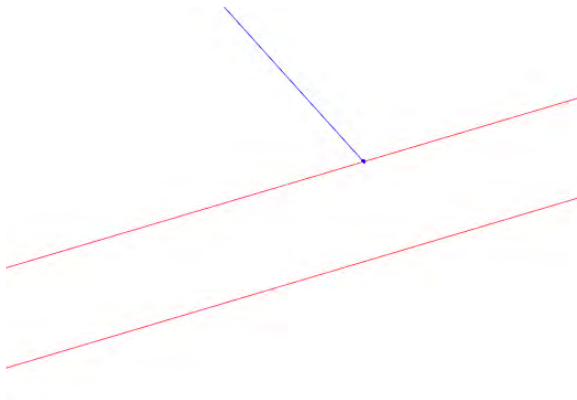
- 8) From the **“Modeling”** workflow and under the **“Surfaces”** tab, select the **“Compute Surface Intersections”** tool.



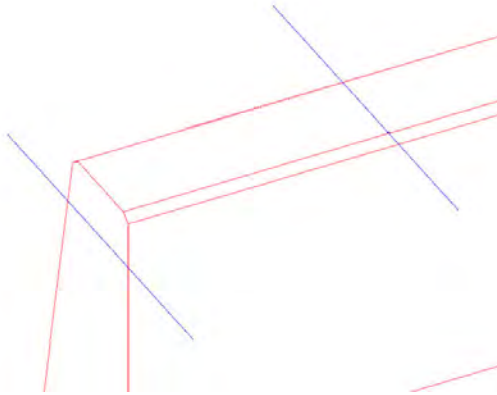
- 9) Select the vertical line just drawn and the parapet, then accept (This places a node where the vertical line intersects the top surface of the parapet).



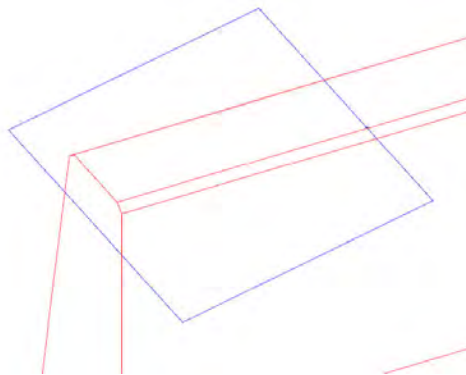
- 10) Move the horizontal line down to node and delete the vertical line.



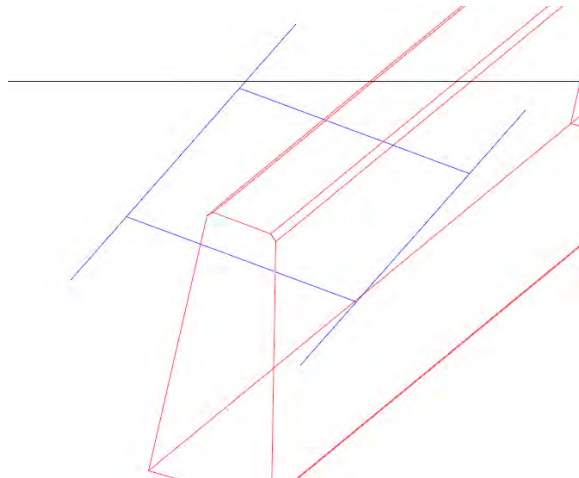
11) Using the “**Extend Line**” tool, extend both lines an arbitrary distance such as 1’-0”.



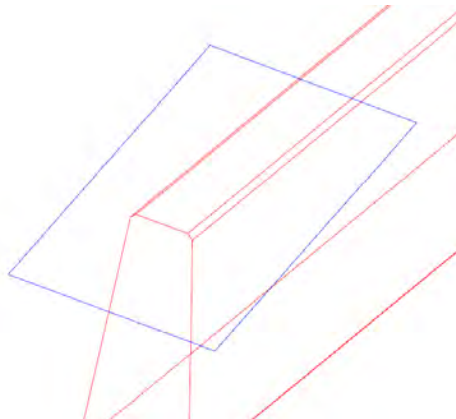
12) Using the “**Place Line**” tool, draw two lines connecting these two lines together.



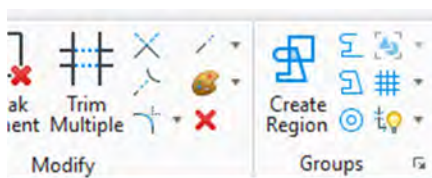
13) Extend the two newly created lines an arbitrary distance, such as 1’-0”.



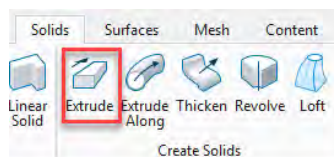
14) Move the original two lines such that it becomes a closed shape.



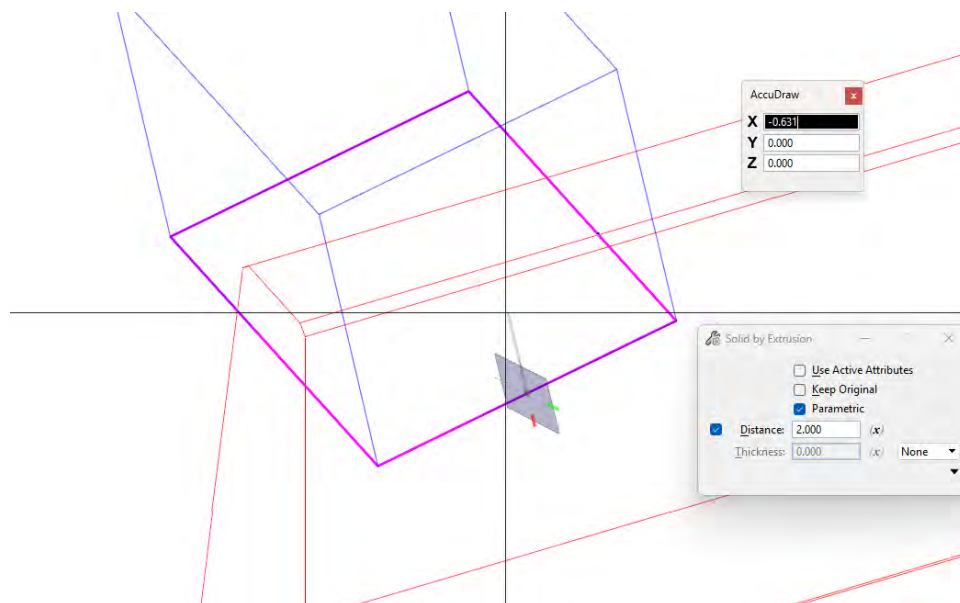
15) Using the “**Create Complex Shape**” command, connect these four lines together.



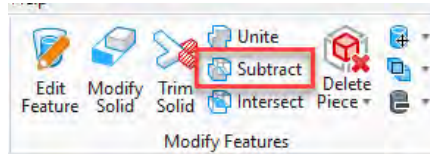
16) From the “**Modeling**” workflow and the “**Solids**” tab, select the “**Extrude**” tool.



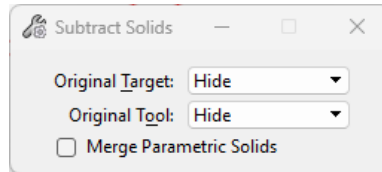
17) Using an arbitrary distance, such as 2'-0", extrude the solid up.



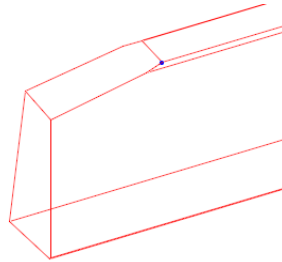
18) Select the “**Subtract**” command in the “**Modify Features**” group of commands.



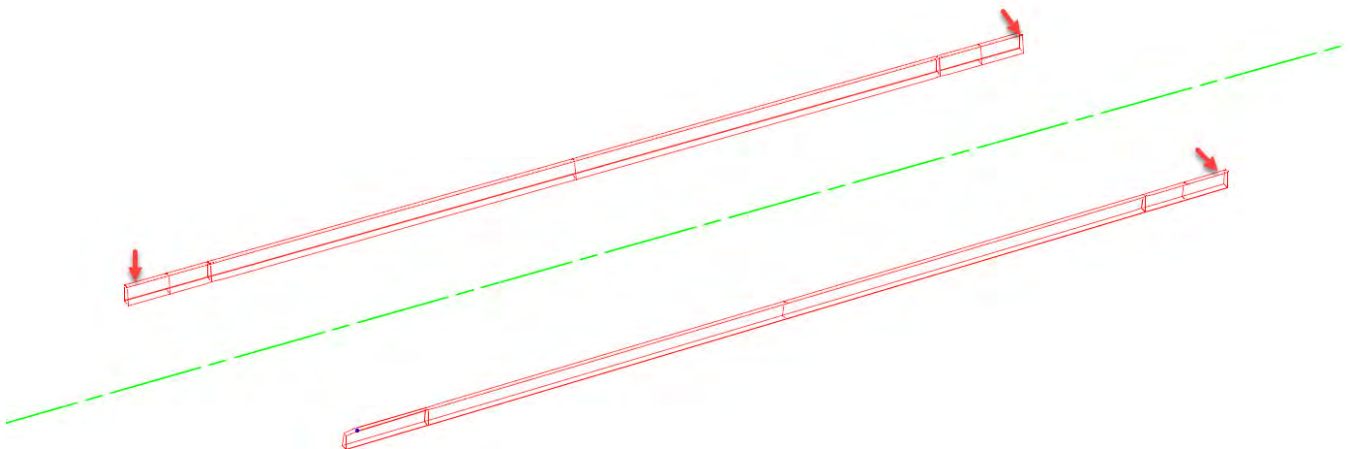
19) Ensure that the dialog has the following values set:



20) Select the parapet, then the solid to subtract.



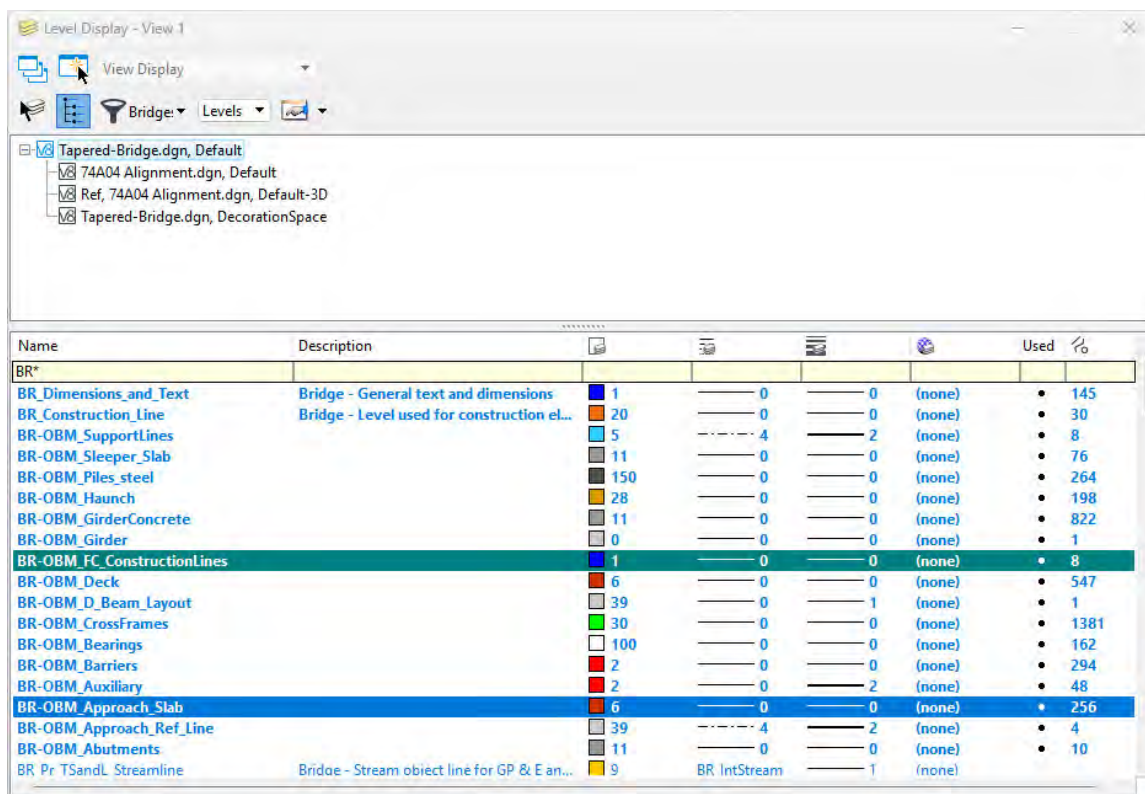
21) Repeat steps 1 through 20 for the other three locations.



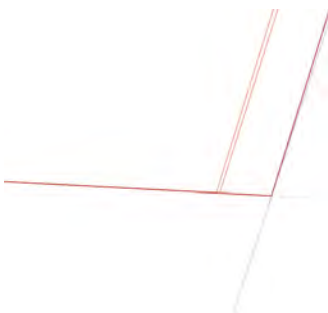
Curb Tapers

In a similar manner, the tapers for the curbs will be created.

22) In the “**Level Display**” dialog, turn off the “**BR-OBM_Barriers**” level and turn on “**BR-OBM_Deck**”.

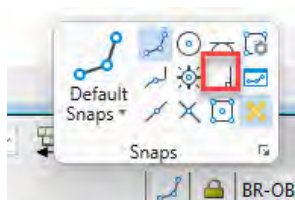


23) Rotate to a top view and zoom to the Southeast curb.

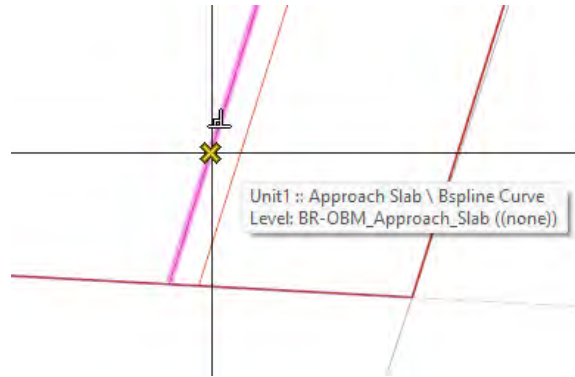


24) Pick the “**Place Line**” command.

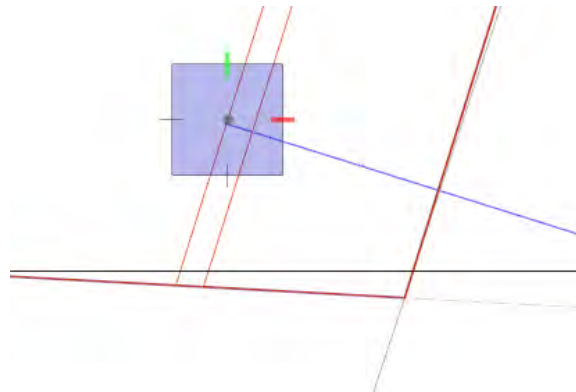
25) Set the active snap to “**Perpendicular**”



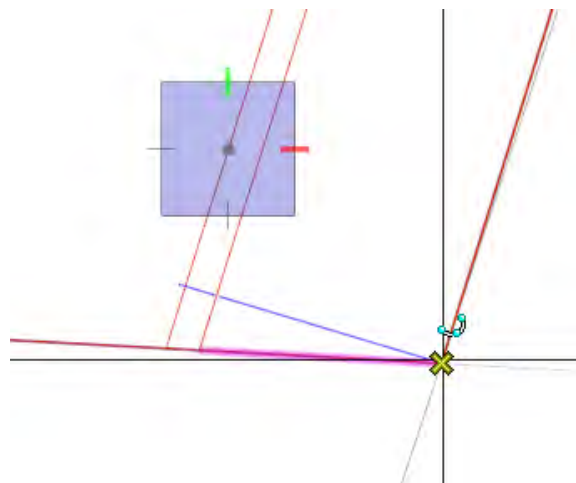
26) Start the line somewhere along the curb line.



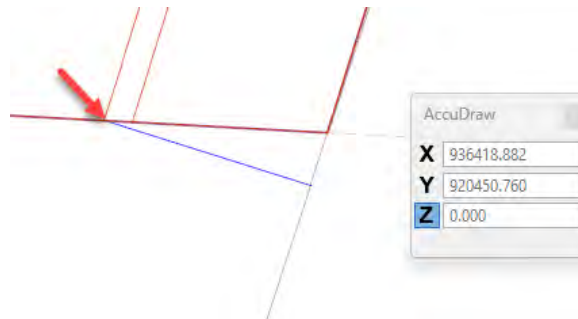
27) Type “T” to rotate AccuDraw to top view settings.



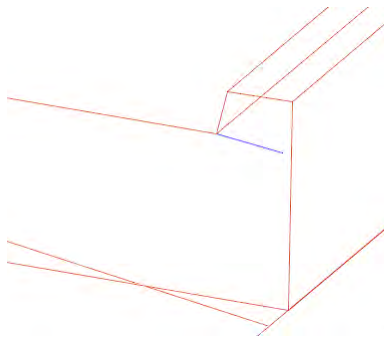
28) Snap the end of the line to the corner of the approach slab.



29) Move the line so that it starts at the flowline of the curb.



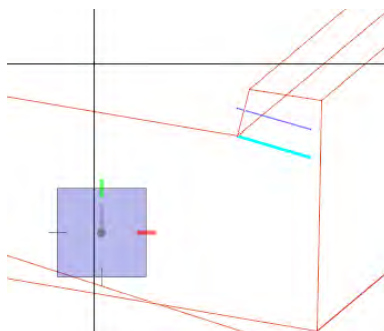
30) Rotate the view dynamically and verify that the line is at the base of the curb and is level (If it does not work as expected, you can change the end point elevation in the Properties).



31) Select the line and pick the **“Move”** command.

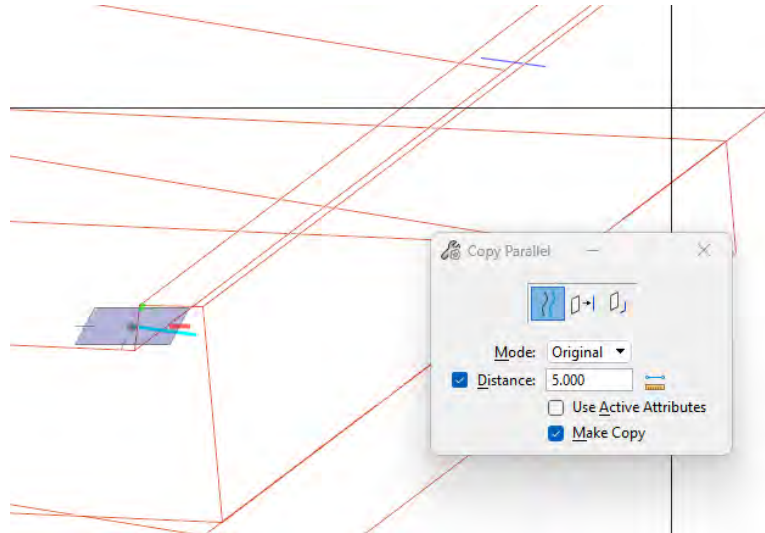
32) Click a data point on the screen, then type **“f”**.

33) Key in **“0..2”** and move the line up.

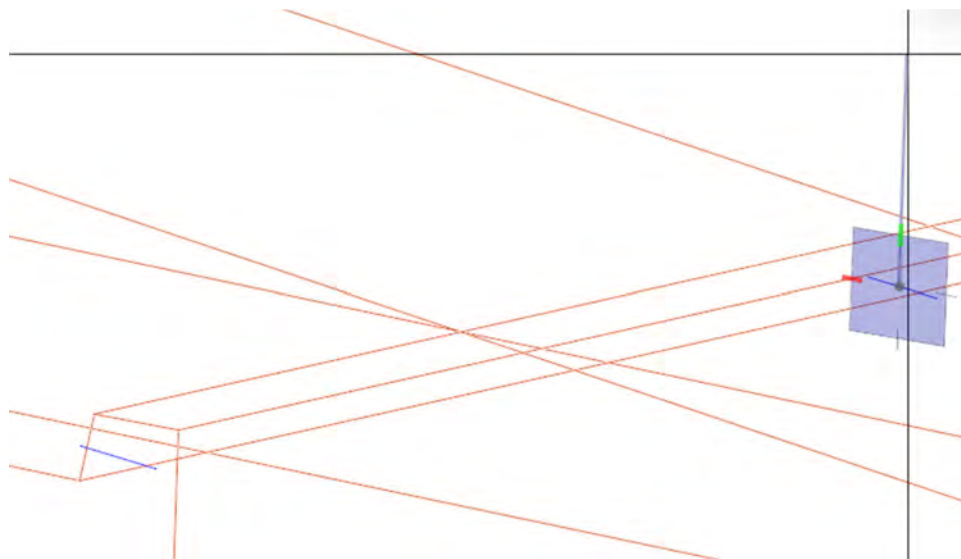


34) Select the element, then **“Move/Copy Parallel”** with a value of 5'-0" set.

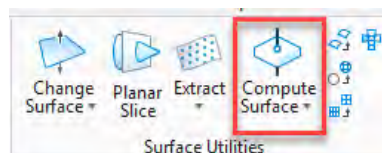
35) Select a data point on the screen, type “**T**”, then data point somewhere towards the bridge.



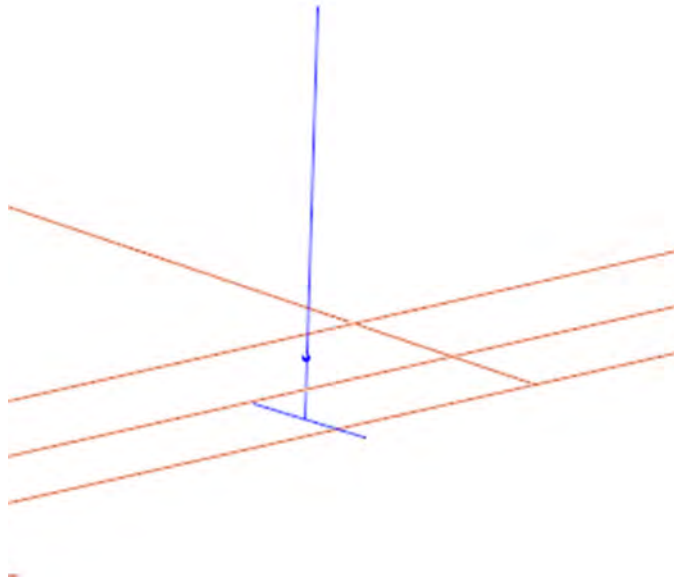
36) Using the “**Place Line**” command, draw a vertical line from the midpoint of the transverse line that was previously copied 5’-0” in from the end so that it goes above the top of the curb.



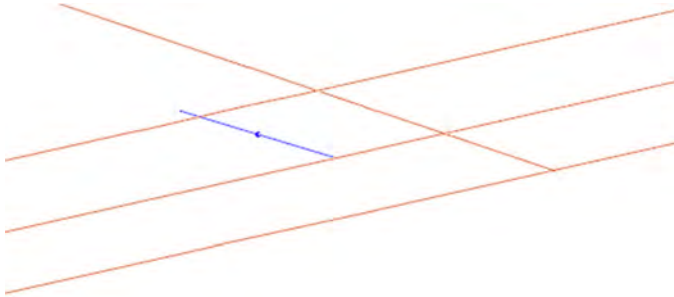
37) From the “**Modeling**” workflow and under the “**Surfaces**” tab, select the “**Compute Surface Intersections**” tool.



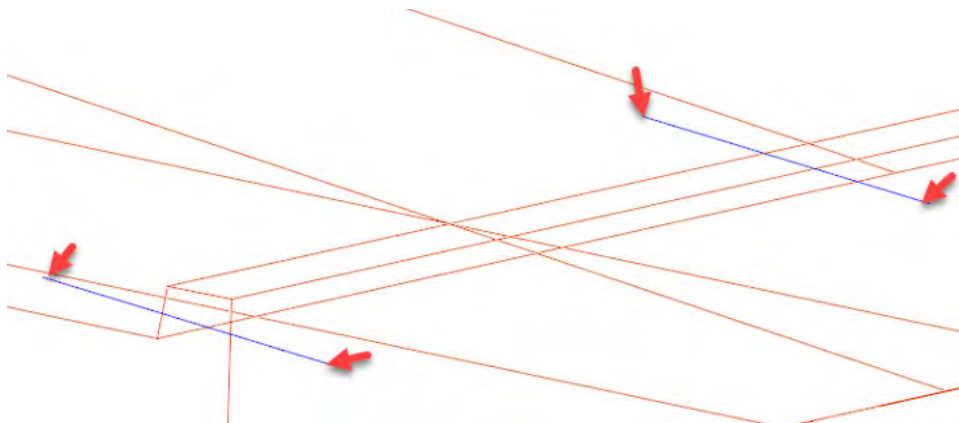
- 38) Select the vertical line just drawn and the curb, then accept (This places a node where the vertical line intersects the top surface of the curb).



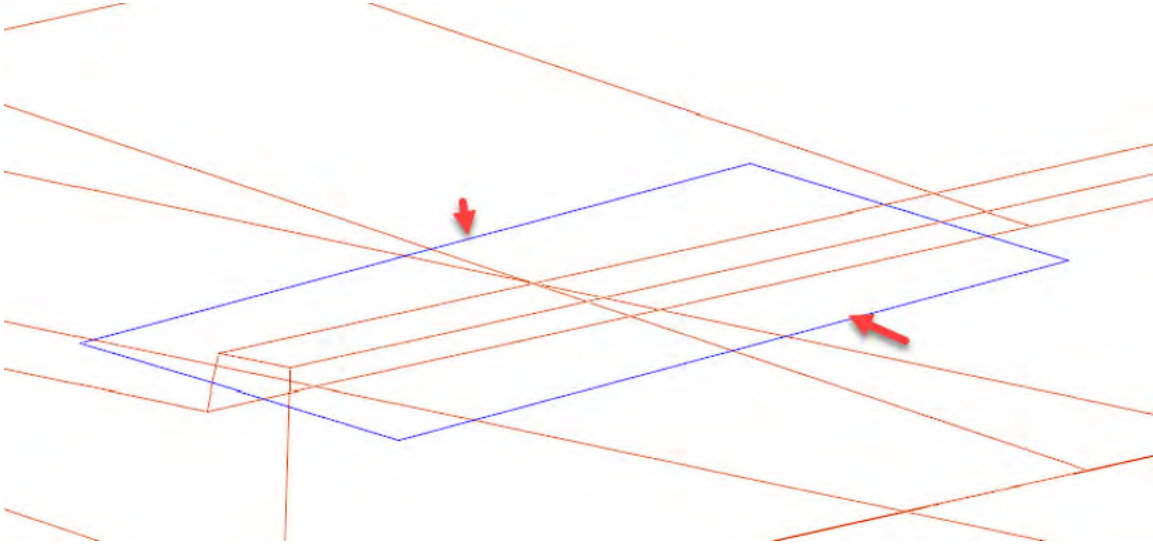
- 39) Delete the vertical line, then move the horizontal line up to node.



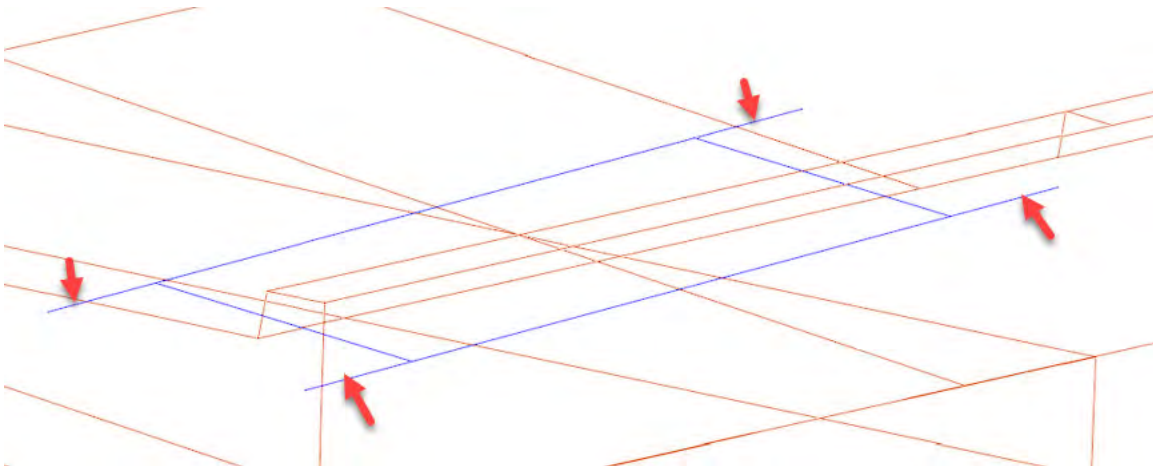
- 40) Using the “**Extend Line**” tool, extend both lines an arbitrary distance such as 1’-0” at each end.



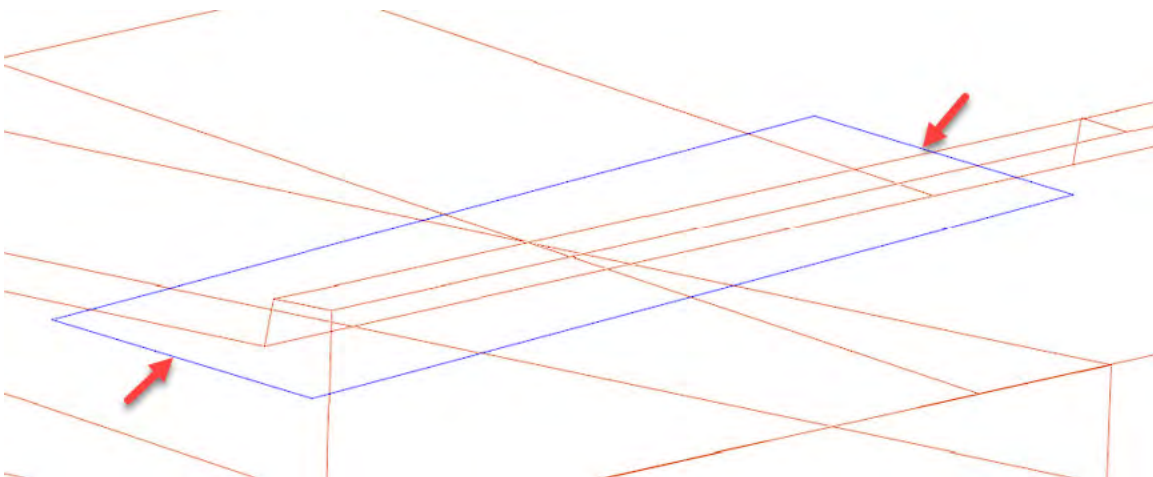
41) Using the **“Place Line”** tool, draw two lines connecting these two lines together.



42) Extend the two newest lines at arbitrary distance, such as 1'-0" at each end.

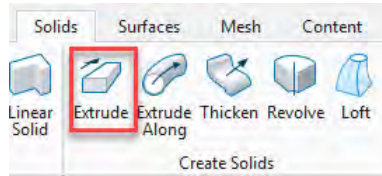


43) Move the two interior lines so that we will have a closed shape.

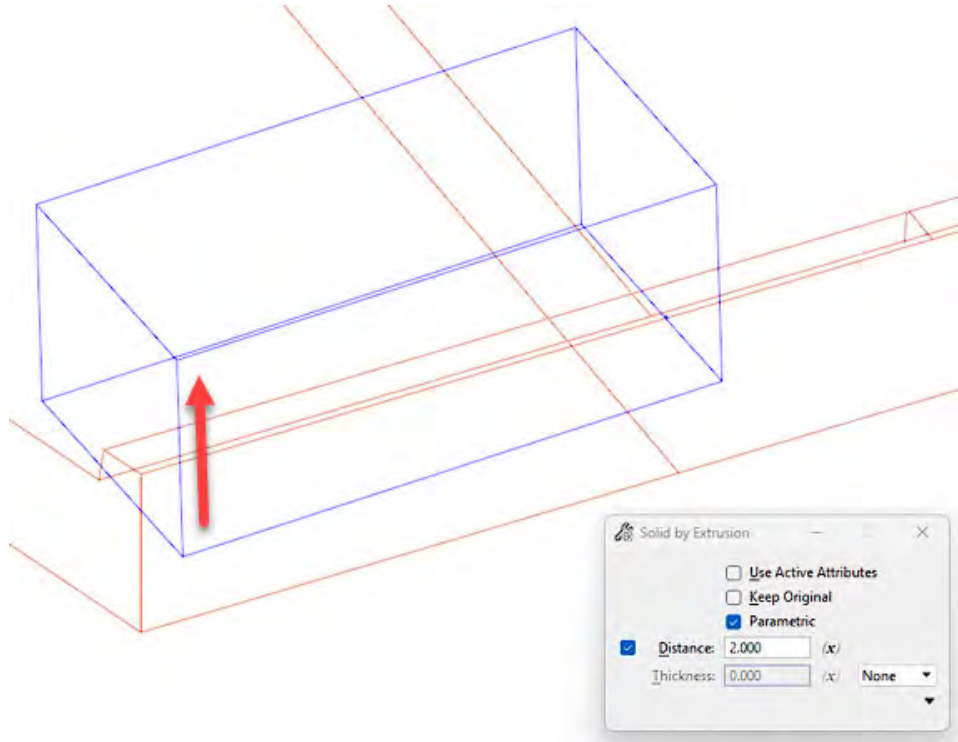


44) Using the **“Create Complex Shape”** command, connect these four lines together.

45) From the “**Modeling**” workflow and the “**Solids**” tab, select the “**Extrude**” tool.

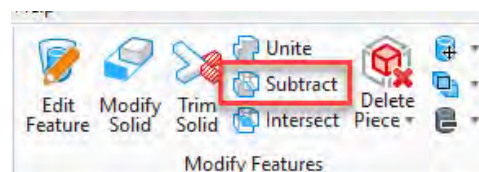


46) Using an arbitrary distance, such as 2'-0", extrude the solid up.

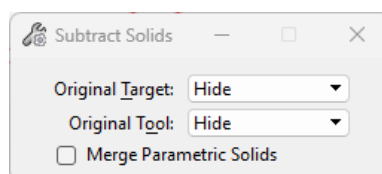


47) Repeat steps 24 through 47 for the Southwest curb (If you were to subtract out the SE taper shape before doing the SW taper shape, that would create problems. You would be forced to convert the approach into a SmartSolid as opposed to the Parametric Solid that it is by default in order to subtract out both taper solids. That could be done; however, you would lose any parametric properties of the approach if it were converted to a SmartSolid).

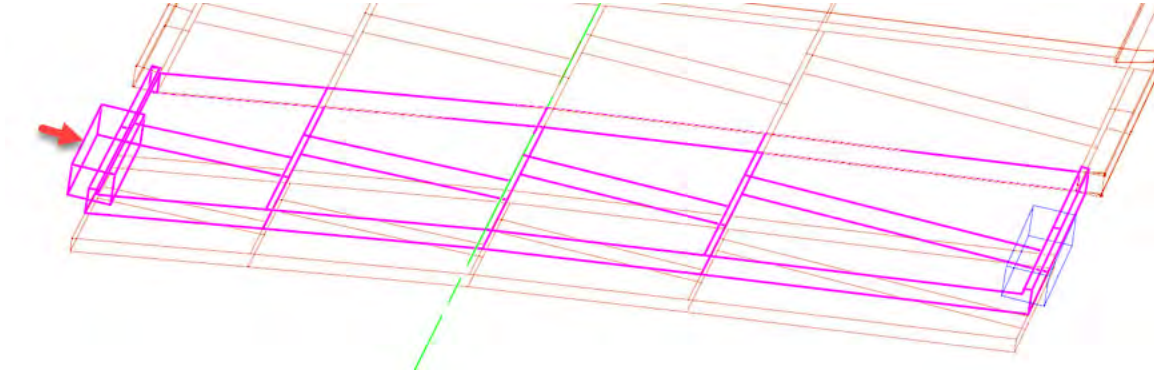
48) Select the “**Subtract**” command in the “**Modify Features**” group of commands.



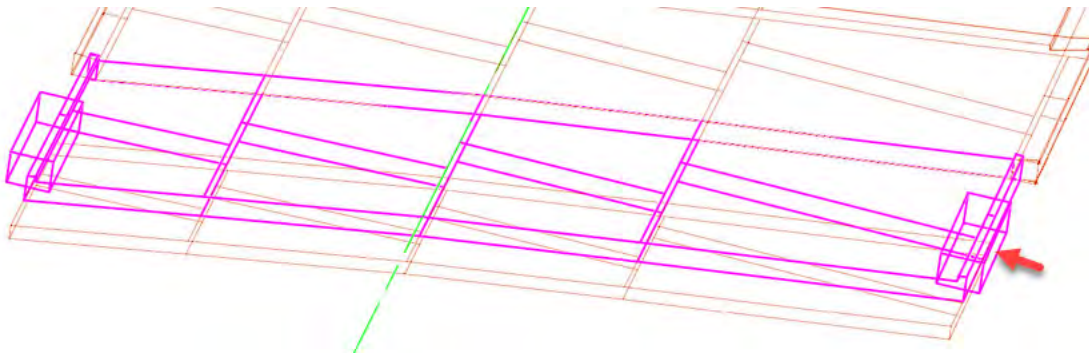
49) Ensure that the dialog has the following values set:



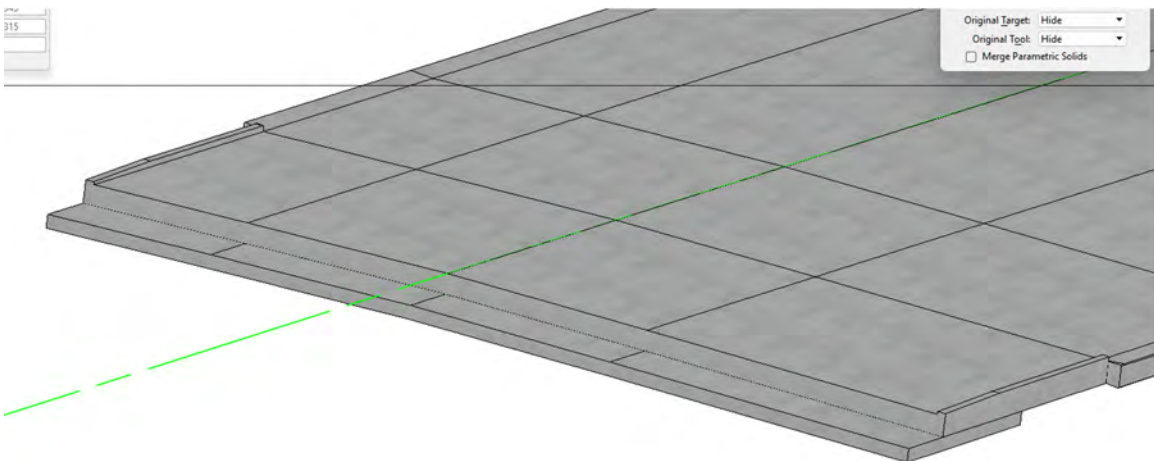
50) Select the approach slab, then select one of the solids to subtract.



51) Hold down the “Ctrl” key on the keyboard, then select the other solid to subtract on the same approach slab.



52) Left-click to accept.



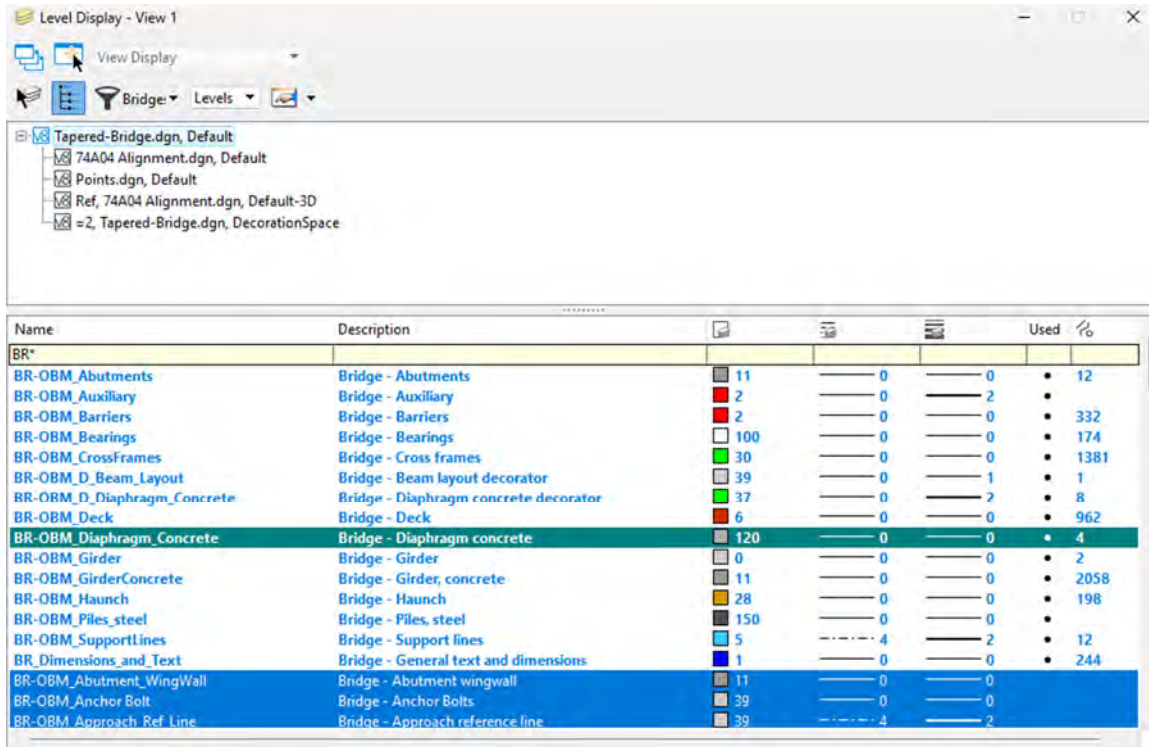
53) Repeat steps 24 through 53 for the North approach.

54) Turn all levels back on.

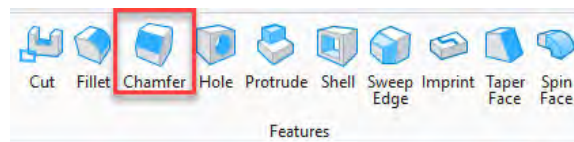
Chapter 11 – Concrete Diaphragm Chamfers

Bottom Chamfers

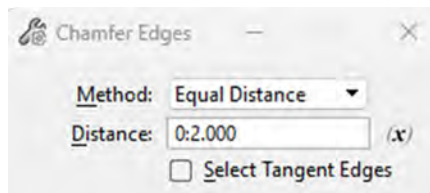
- 1) Turn off all levels except for “BR-OBM_Diaphragm_Concrete”.



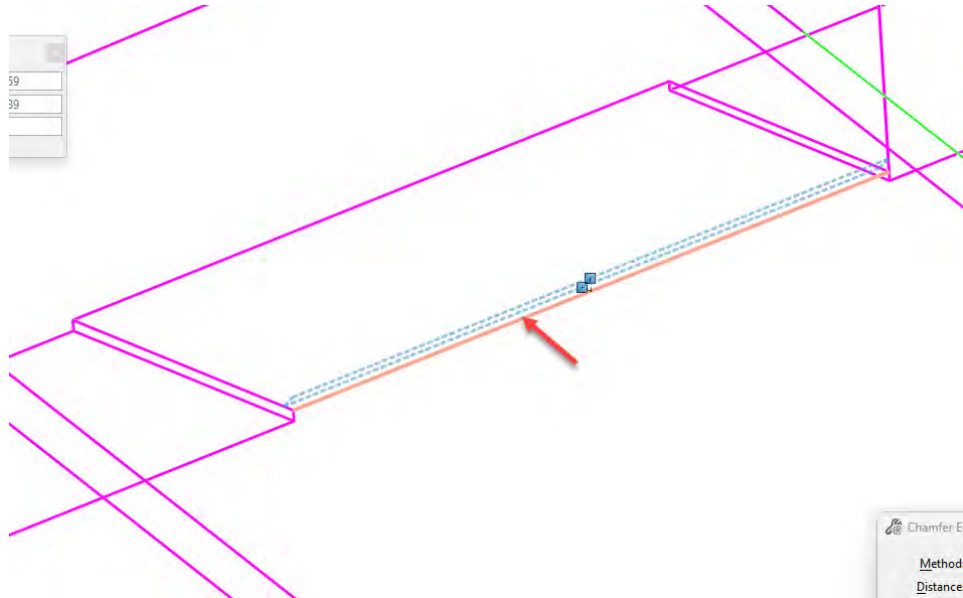
- 2) In the “Modeling” workflow and under the “Solids” tab, select the “Chamfer” command.



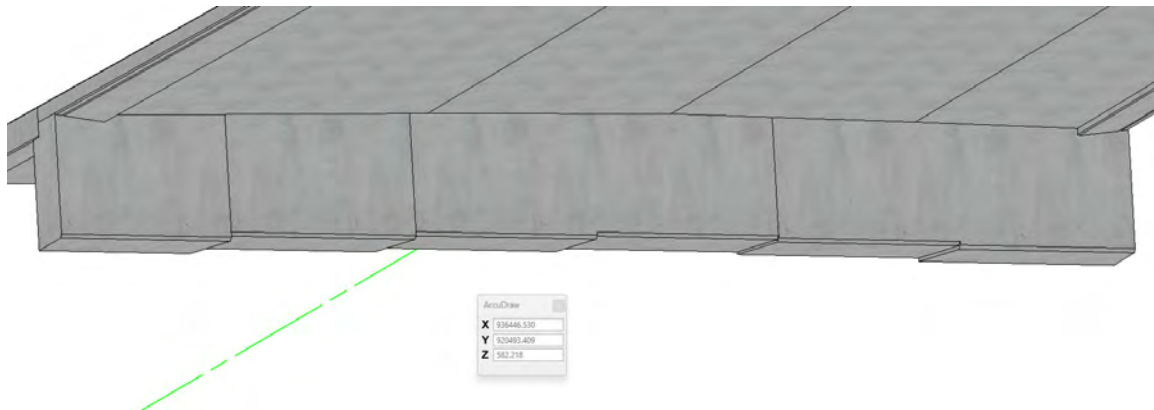
- 3) Change the “Chamfer Edges” dialog values as shown.



- 4) Working from the inside of the bridge outwards, select the bottom corner to be chamfered.



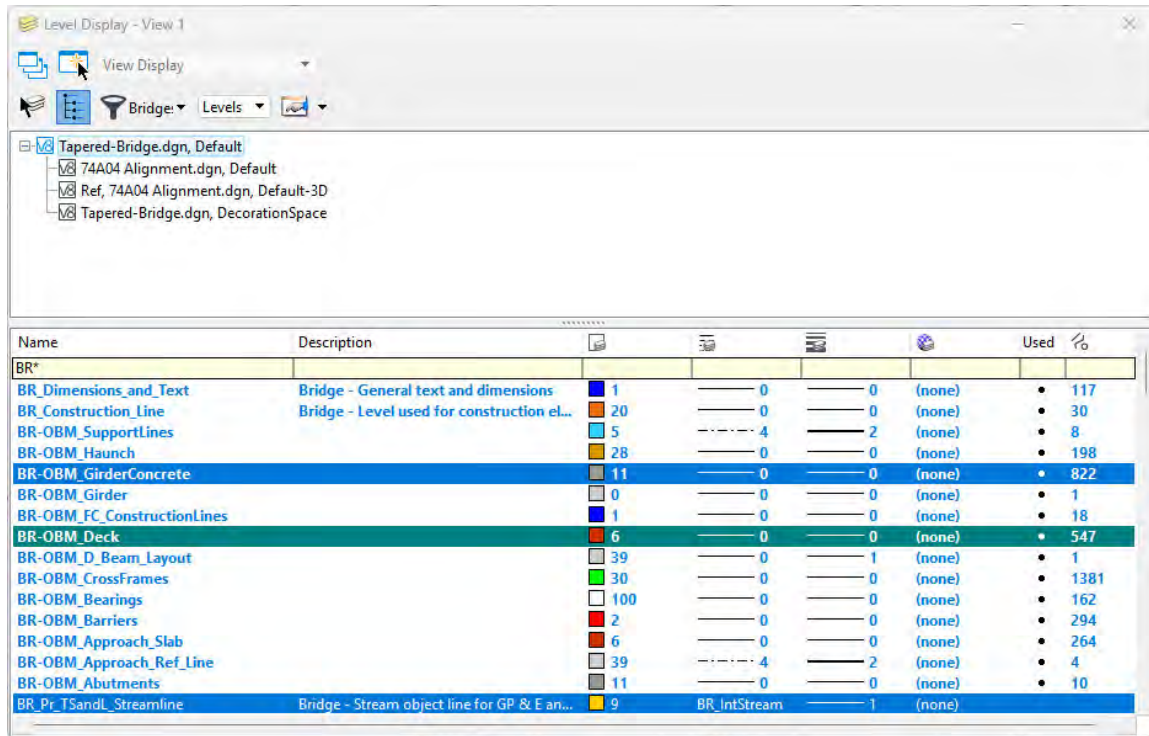
- 5) Ensure that the tentative chamfer appears correctly, then accept.
- 6) Create the remaining chamfers working from the inside out.



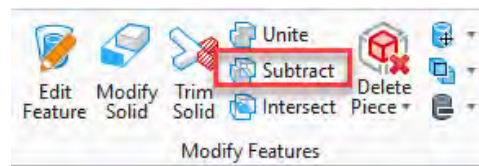
- 7) Repeat steps 2 through 6 for the other diaphragm.

Top Chamfers

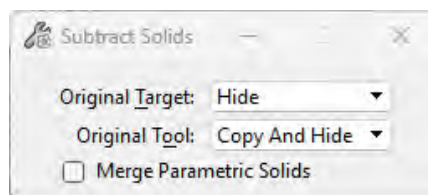
- 8) In the “**Level Display**” dialog, turn on the “**BR-OBM_GirderConcrete**” level.



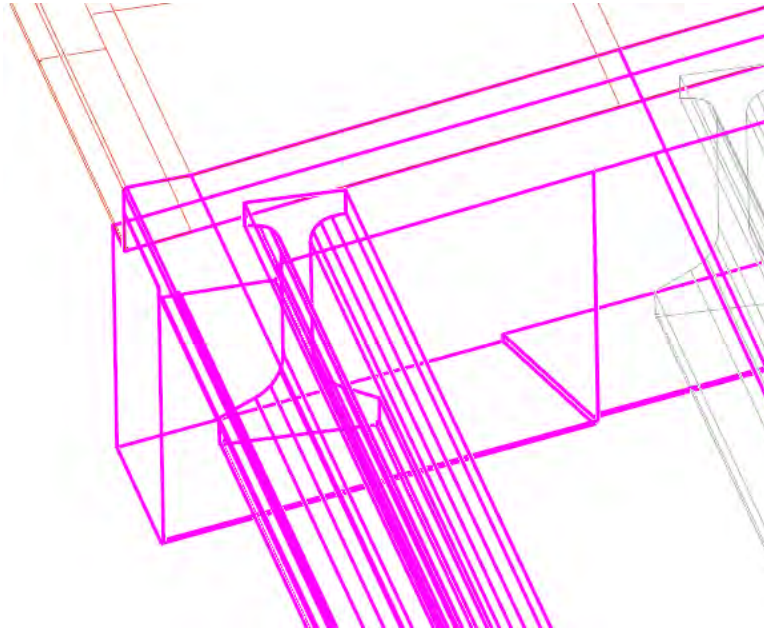
- 9) From within the “**Modeling**” workflow and the “**Solids**” tab, pick the “**Subtract**” command.



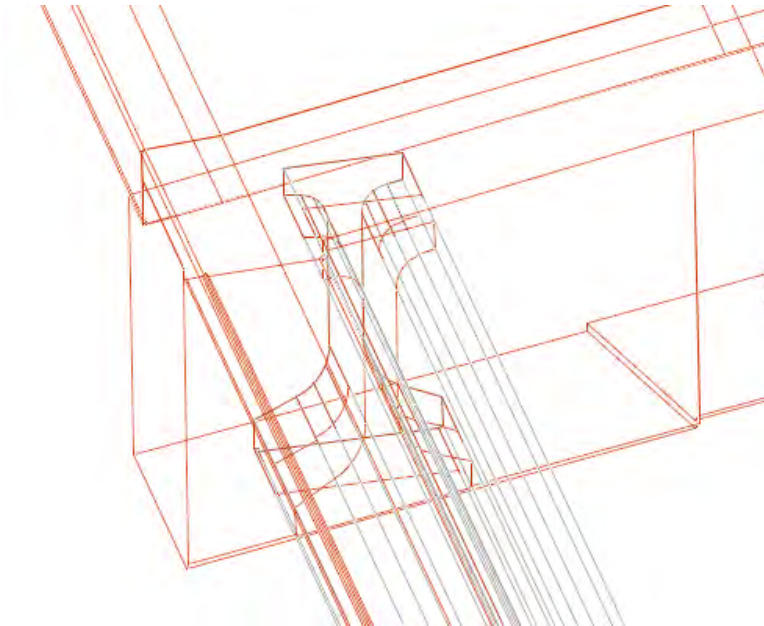
- 10) Make the following changes to the “**Subtract Solids**” dialog.



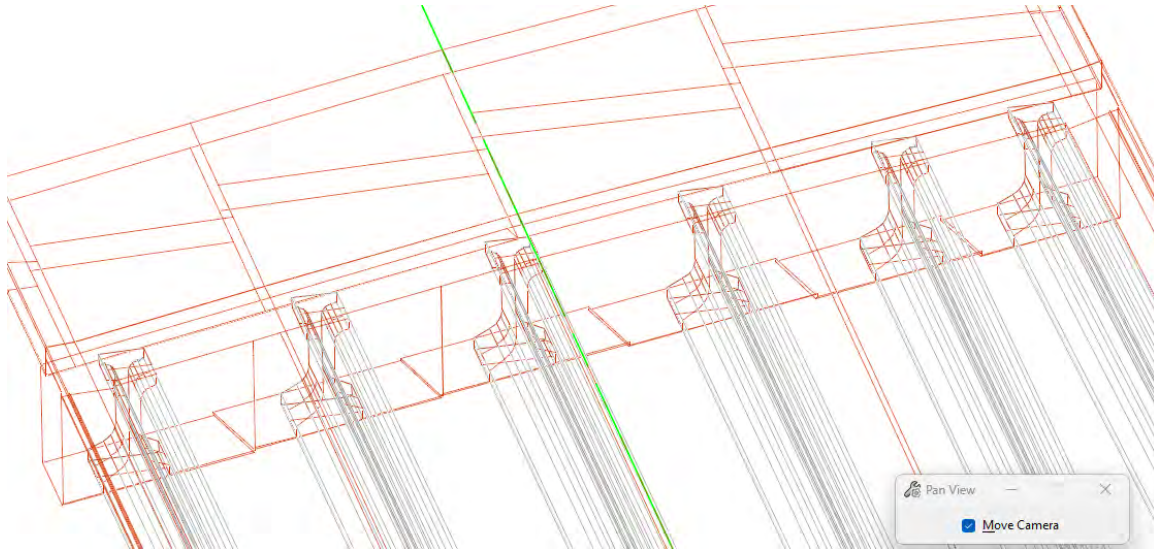
11) Select a diaphragm, then one of the beams.



12) Accept.

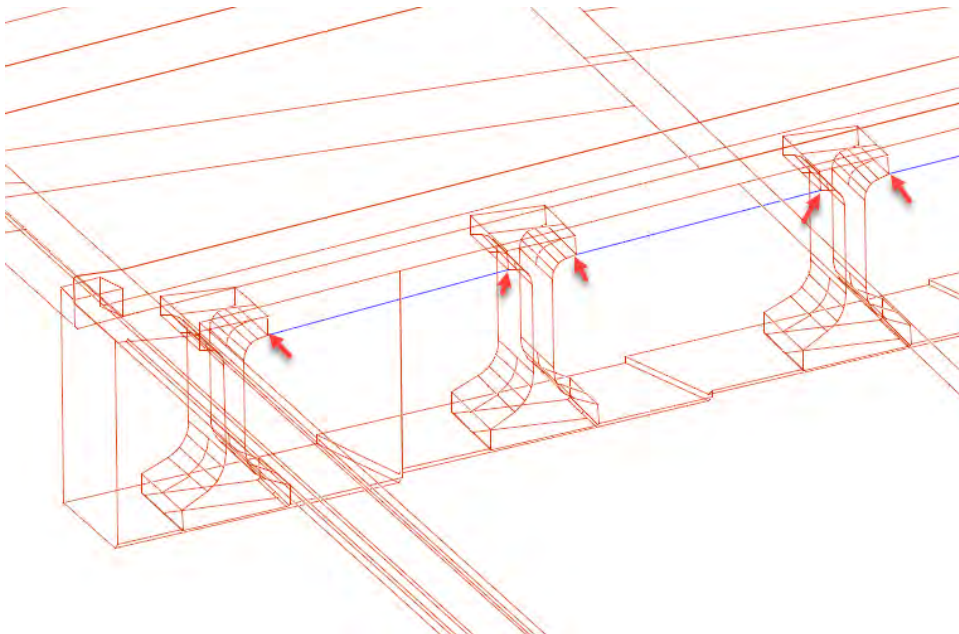


13) Do the same for the other five beams in the same diaphragm.



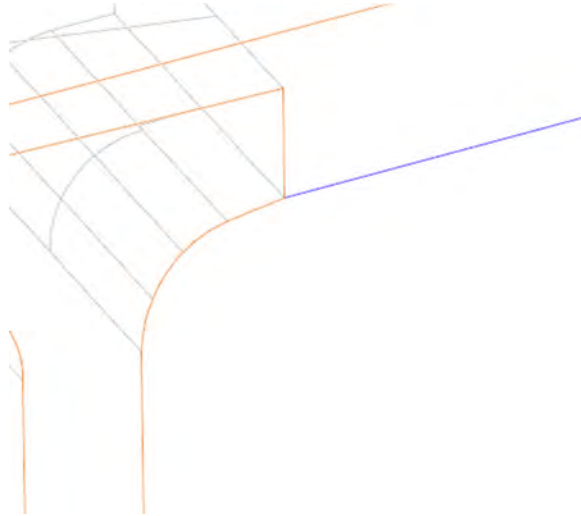
14) In the “**Level Display**”, turn off the level “**BR-OBM_GirderConcrete**” and make an unused level active.

15) Using the “**Place Line**” tool, draw lines that connects the bottoms of the top flanges of the beams where the beams enter the diaphragm.

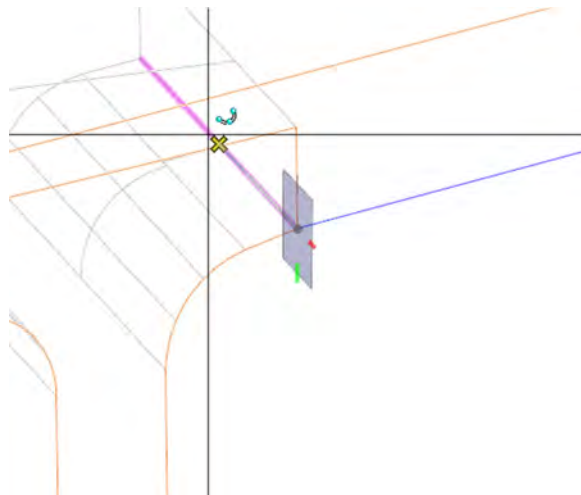


17) Change to an isometric or similar dynamic view.

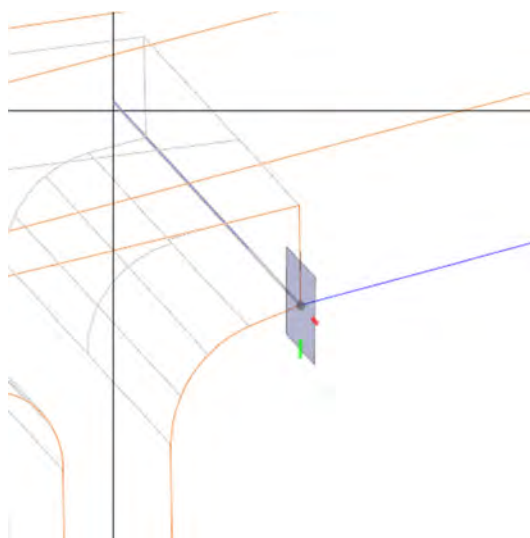
18) With the “Place Line” tool active, snap to the end of the line.



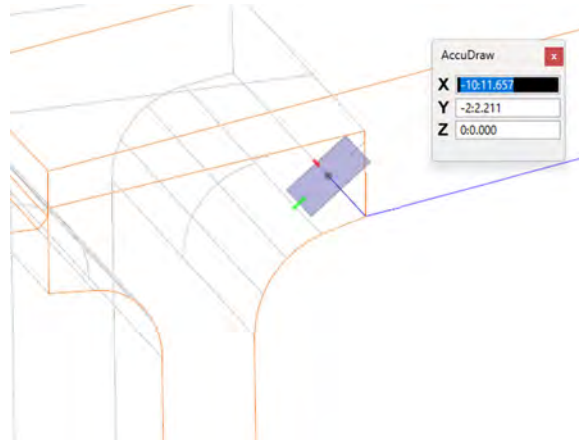
19) Type “**RE**” and pick the bottom of the top flange line to orient the compass.



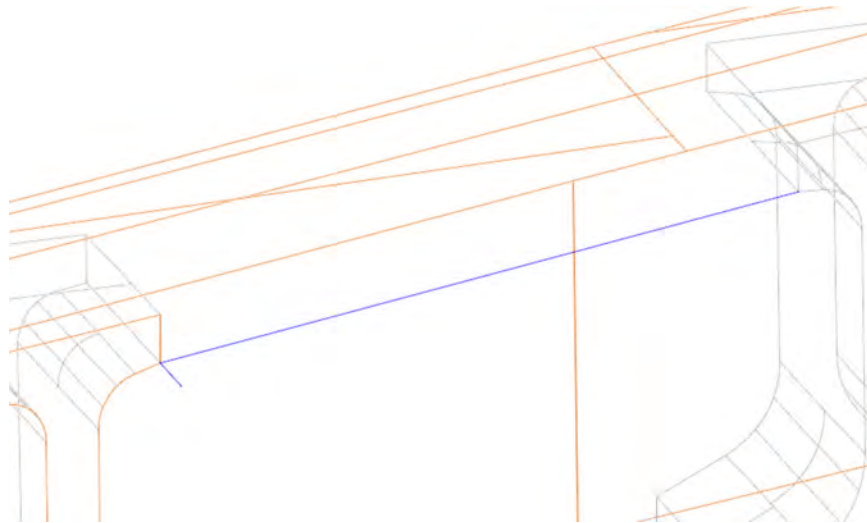
20) Hit enter to lock the axis in the direction along the bottom of the top flange.



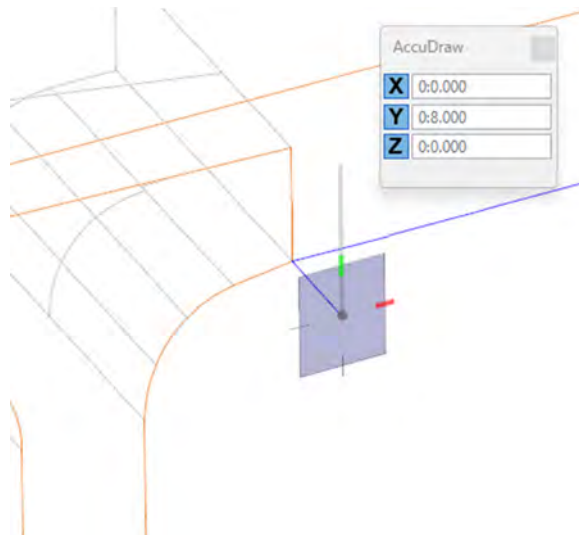
21) Key in “0..8” and datapoint.



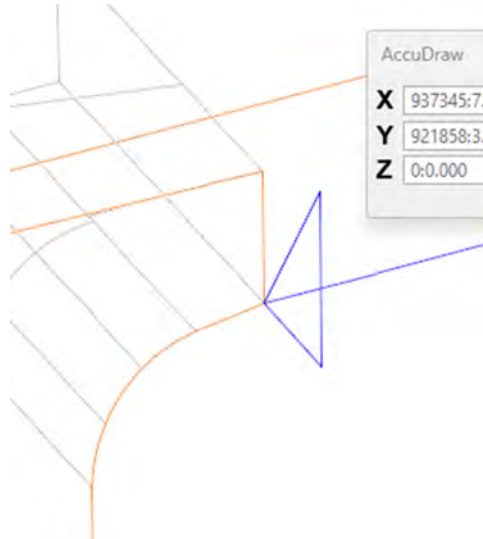
22) Move this line to the endpoint of one of the exterior lines.



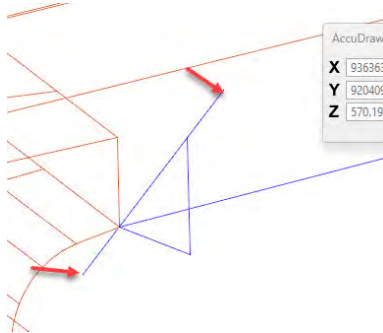
23) Draw a line vertically 8" (Use “F” to rotate the compass).



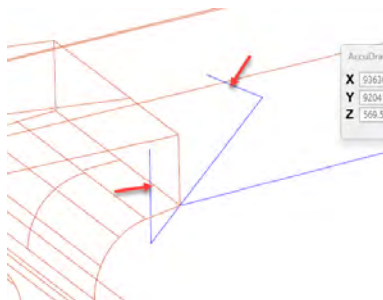
24) Draw a line to close the shape forming a triangle.



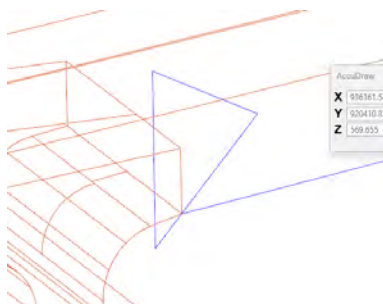
25) Extend the hypotenuse of the triangle 6" at each end.



26) Move the horizontal and vertical lines as shown.

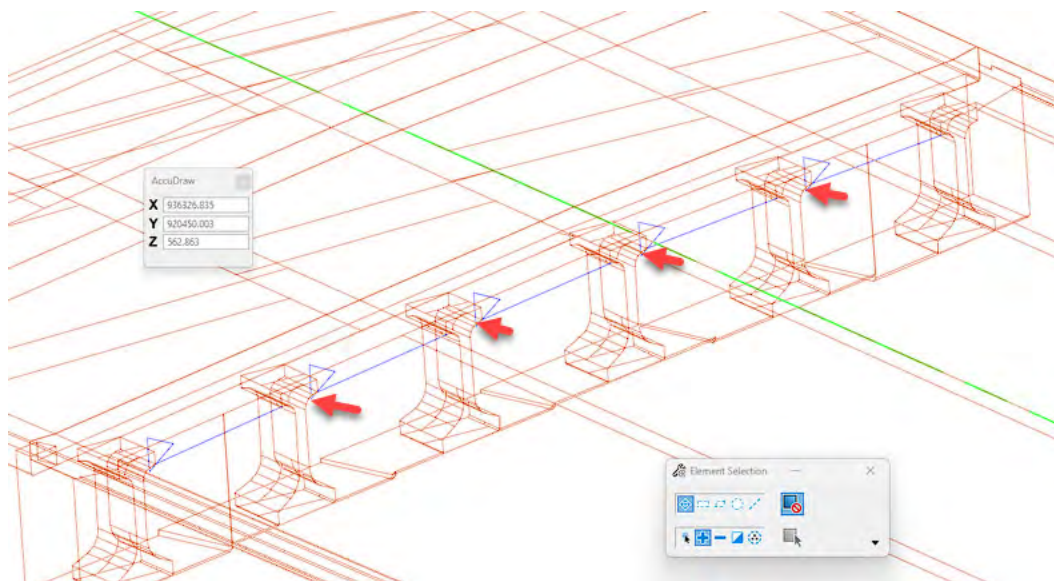


27) Use the **"Trim to Intersection"** command to close the shape.

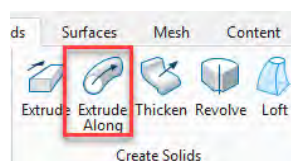


28) Use the **“Create Complex Shape”** command to create a single element.

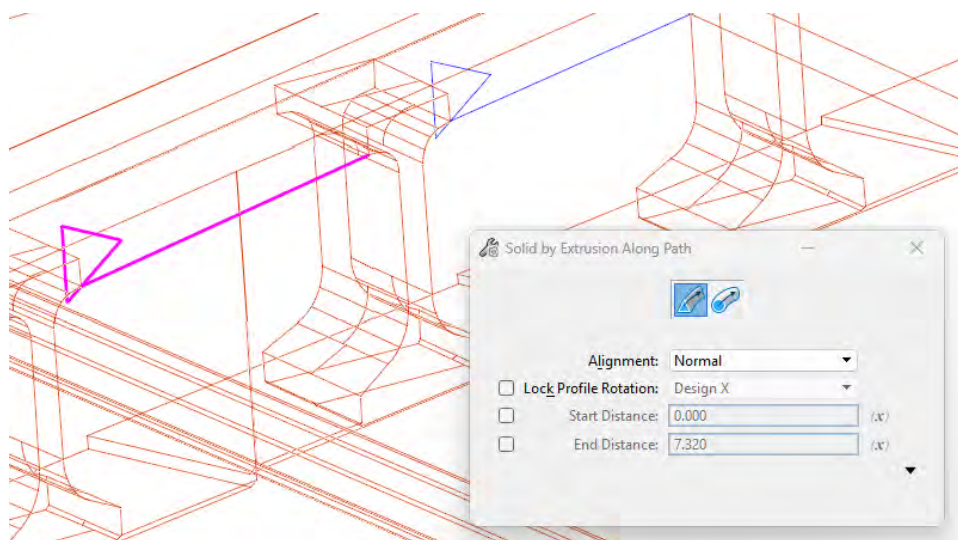
29) Copy the triangle to one end of each of the other lines.



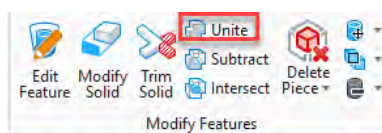
30) In the **“Solids”** tab of the **“Modeling”** workflow, pick the **“Extrude Along”** command.



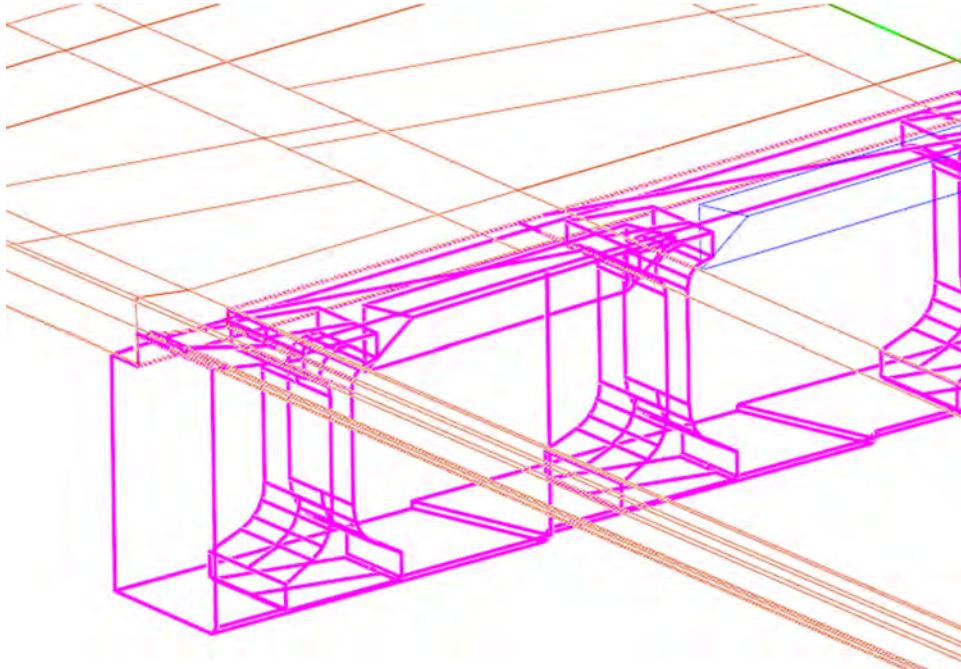
31) Extrude each of the triangles along the paths defined by the lines by picking each path, then the associated triangle.



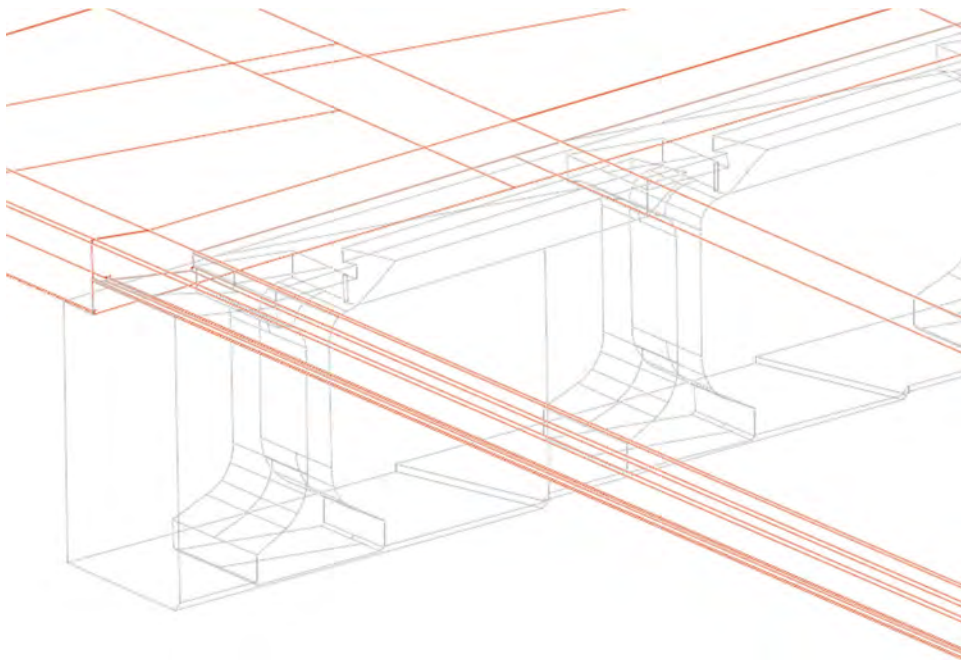
32) From the **“Modeling”** workflow and the **“Solids”** tab, pick the **“Unite”** command.



33) Select the diaphragm and then one of the extruded triangles.

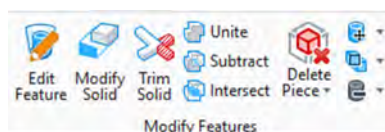


34) Press and hold the “**Ctrl**” key on the keyboard, pick the other extruded triangles, then accept.

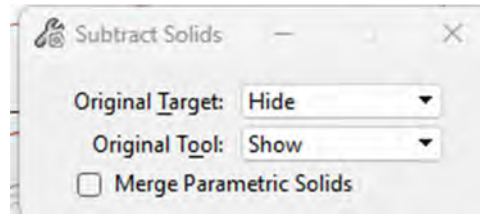


35) Turn on the level “**BR-OBM_Deck**” if not already on.

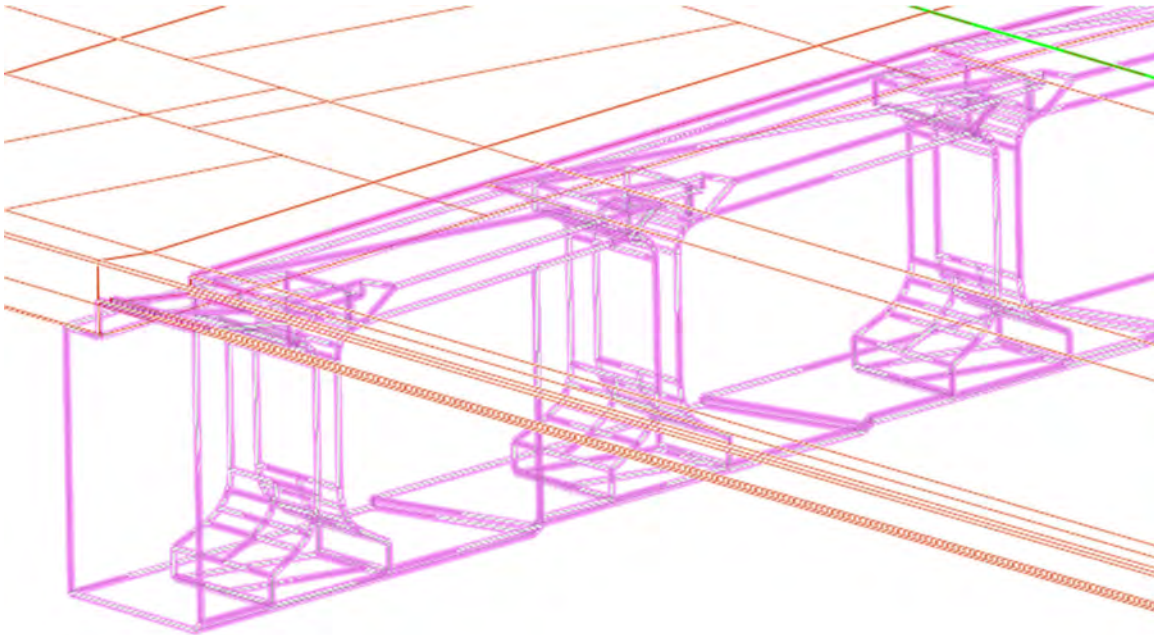
36) From the “**Modeling**” workflow and the “**Solids**” tab, pick the “**Subtract**” command.



37) Change the tool settings as shown:

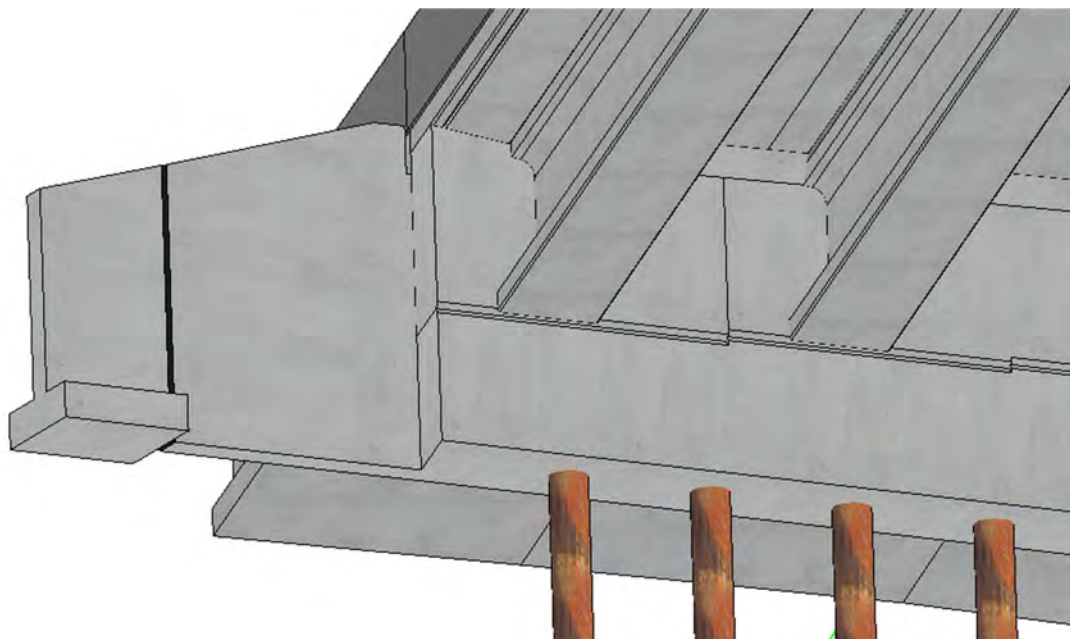


38) Select the diaphragm, then the deck and accept.



39) Repeat steps 17 thru 36 for the other diaphragm.

40) In the “**Level Display**”, turn all levels back on.

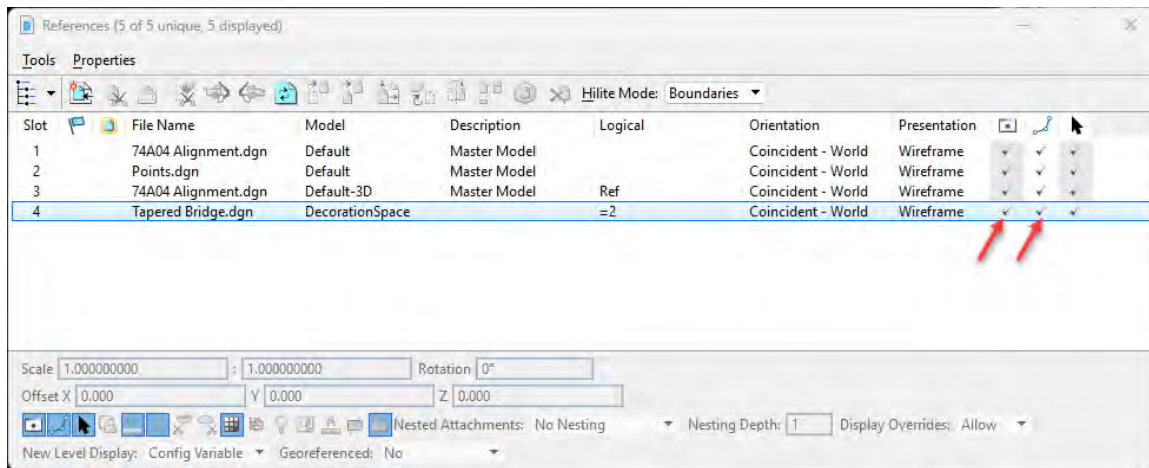


Chapter 12 – ProSteel Permanent Bracing

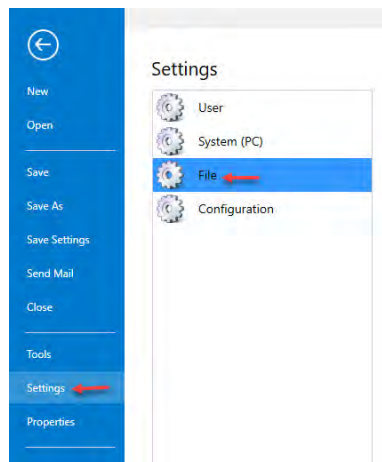
Although the permanent bracing was already placed within OBM, it does not contain the holes, bolts, or threaded rods for the connections. If that level of development is desired, the ProSteel portion of ProStructures must be used to place them. Since the ProStructures tools will only operate on a solid created by that software, the permanent bracing members will need to be recreated. It is not terribly difficult and we can use the referenced OBM bracing to aid in the placement within the ProStructures model.

PERMANENT BRACING COMPONENT PLACEMENT (CHANNELS AND BENT PLATES)

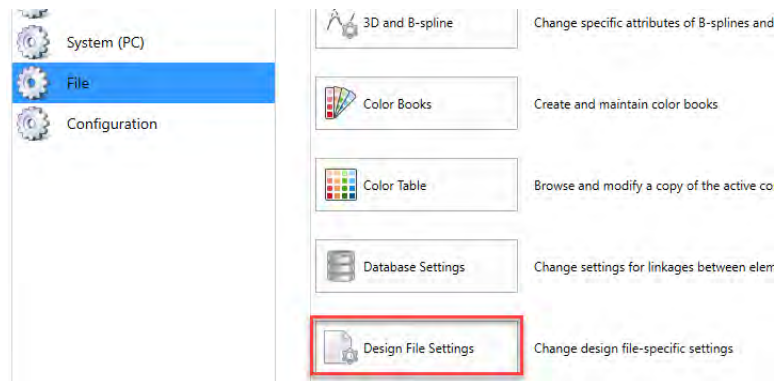
- 1) Within OpenBridge Modeler, open the file “**Tapered Bridge.dgn**” and bring up the References dialog.
- 2) Select the “**DecorationSpace**” model and turn on the snap and locate checkmarks if they are not already on.



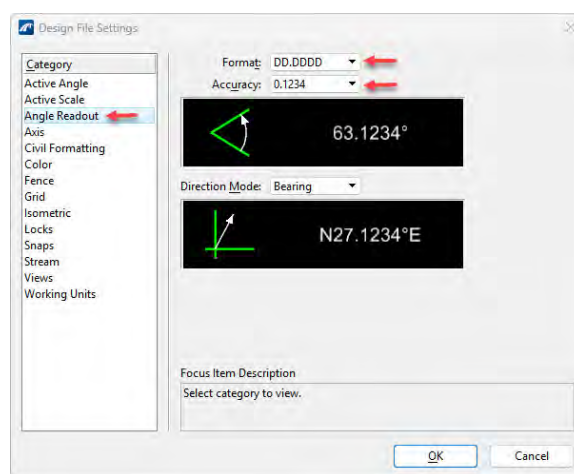
- 3) Save Settings.
- 4) Create a new 3D file within OBM and name it “**Permanent Bracing PrStl.dgn**”.
- 5) Go to “File”, “Settings” and select “File”.



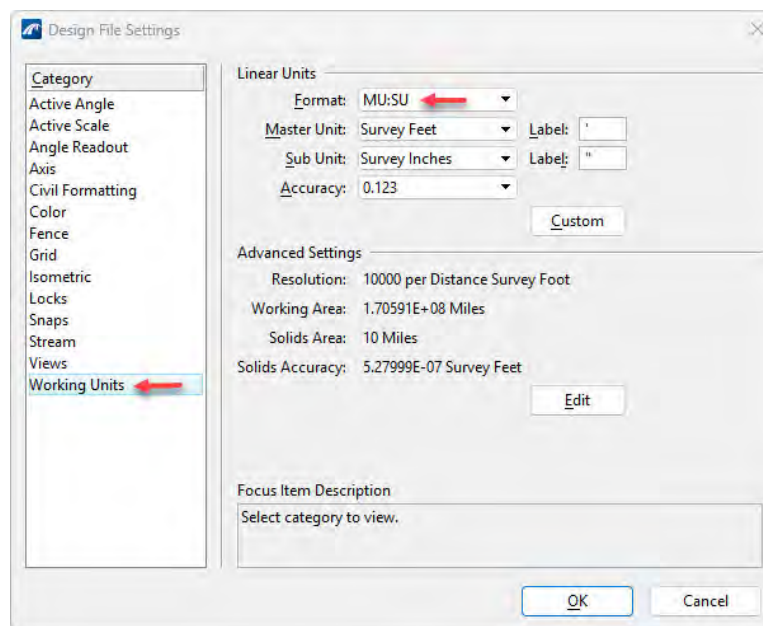
6) Select “Design File Settings”.



7) In “**Angle Readout**”, change the format to “**DD.DDDD**” and the accuracy to “**0.1234**”

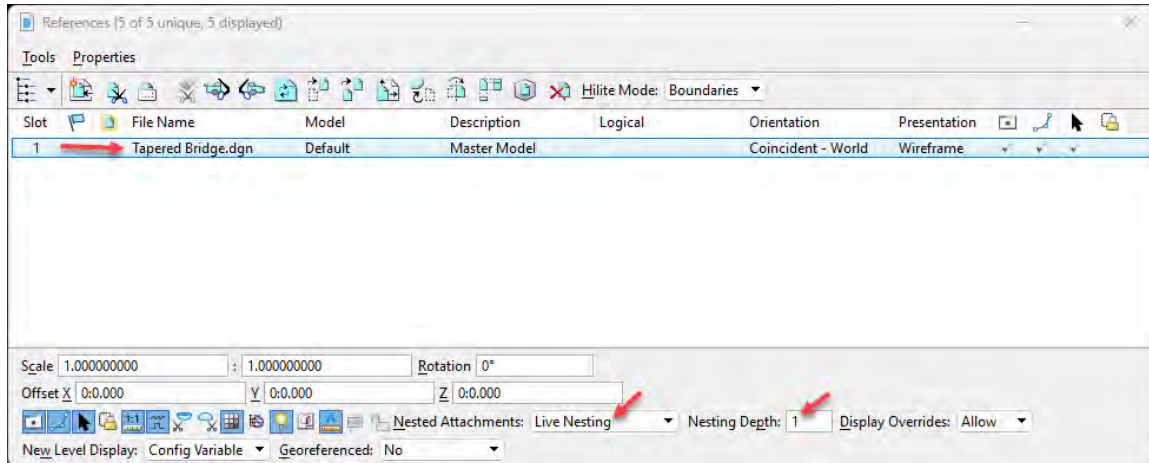


8) In “**Working Units**”, change the format to “**MU:SU**”, then click “**OK**”.

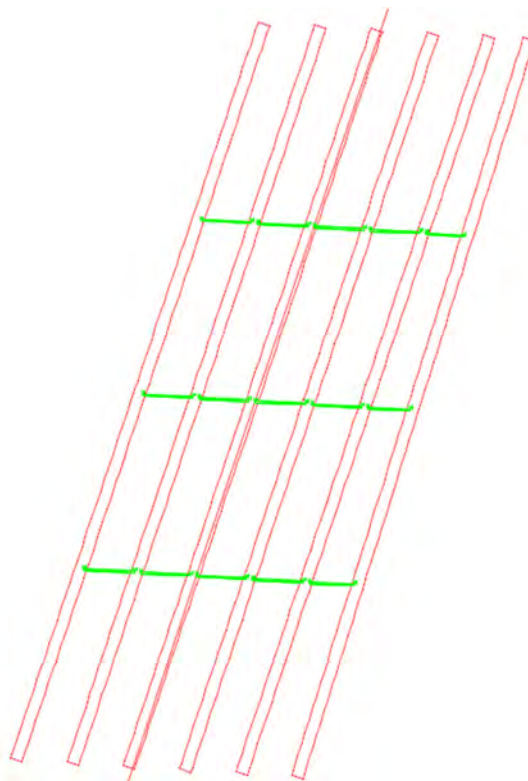


9) Return to the file.

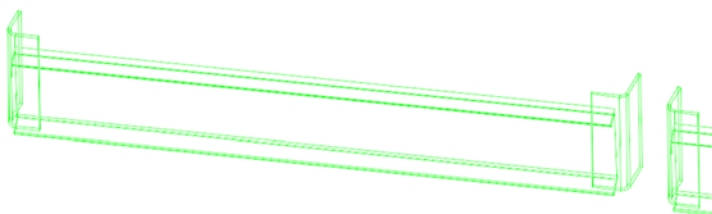
- 10) Change the Geographic Coordinate System to **“IL83/2011-EFNSRS11(NAD83/2011) Illinois, East Zone, US Foot”** to match that of the main bridge model file.
- 11) Attach the file **“Tapered Bridge.dgn”**.
- 12) In the References dialog, select the reference, turn on **“Live Nesting”** with a **“Nesting Depth”** of 1.



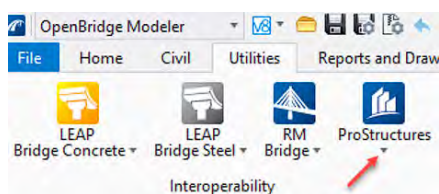
- 13) Set the Drawing Scale to something such as 1" = 30'.
- 14) In the Level Display dialog, select the **“Tapered Bridge.dgn, Default”** model in the hierarchy window and turn off all levels except for **“BR-OBM_CrossFrames”**. (Note that changes in the software places girder decorators without a level associated to them so they cannot be turned off).
- 15) Select the other files below it and turn off all levels in each.
- 16) You should only see the permanent bracing channels, bent plates, beam footprint, and an alignment decorator.



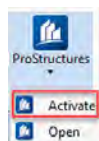
17) Dynamically rotate so that you can see one of the braces.



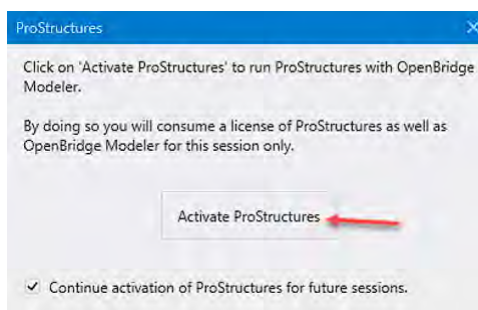
18) From within the “**OpenBridge Modeler**” workflow, go to the “**Utilities**” tab and click on the arrow below “**ProStructures**”.



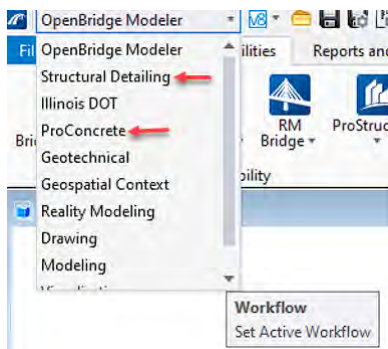
19) Select “**Activate**”.



20) Toggle “**Continue activation of ProStructures for future sessions**” and select “**Activate ProStructures**”.



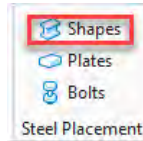
21) You will now have a “**Structural Detailing**” and “**ProConcrete**” workflow available.



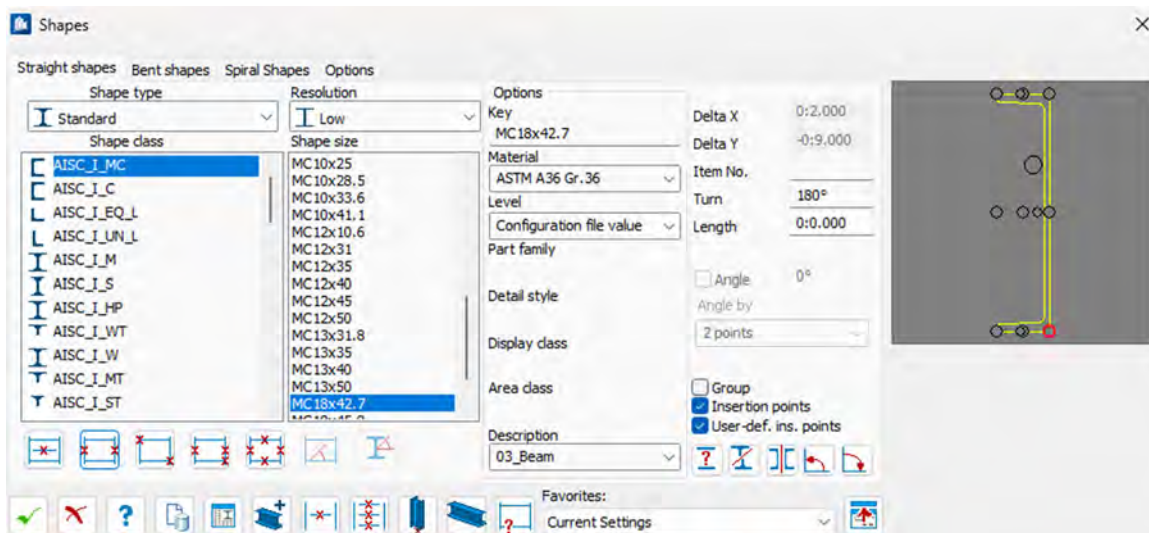
22) Select the “**Structural Detailing**” workflow and go to the “**Steel Connections**” tab.



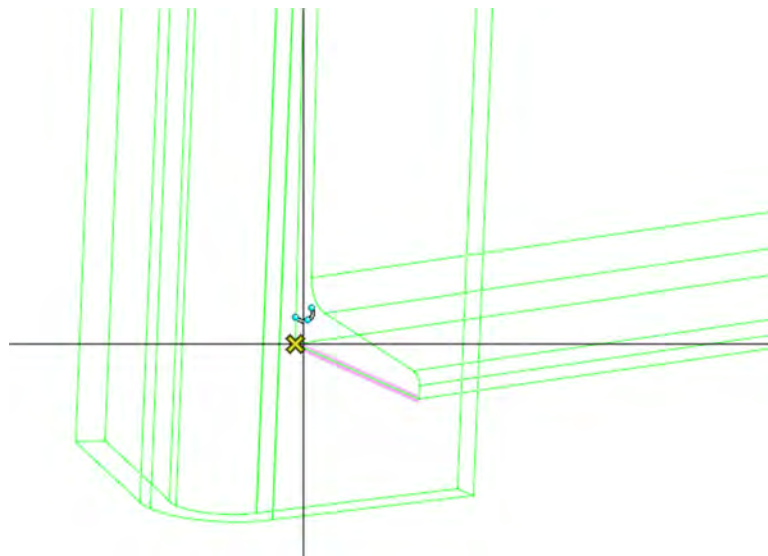
23) Select the “**Shapes**” tool in the “**Steel Placement**” group of commands.



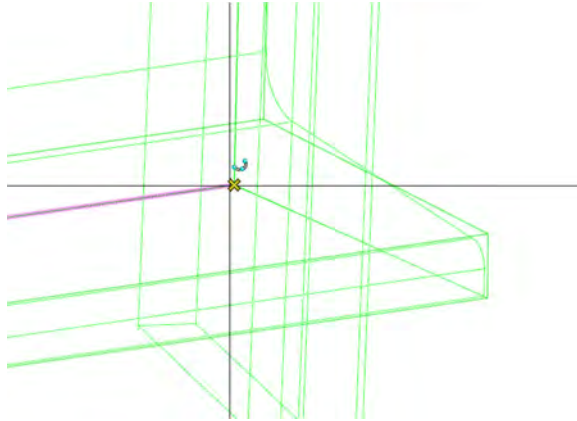
24) Change the settings as shown below and select the “**Insert shape using two points**” button.



25) Select the bottom rear corner on the left end of the channel.

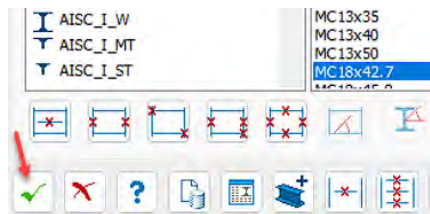


26) Select the bottom rear corner of the channel at the right end.

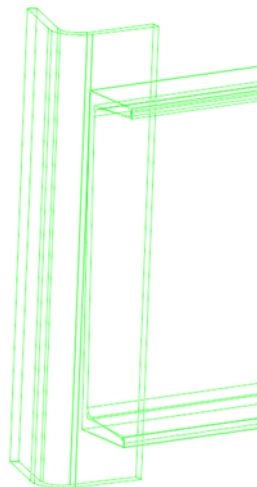


27) Repeat for the other bracing channels in the same line, then right-click.

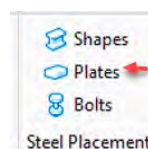
28) Select the green checkmark in the lower left corner of the “**Shapes**” dialog.



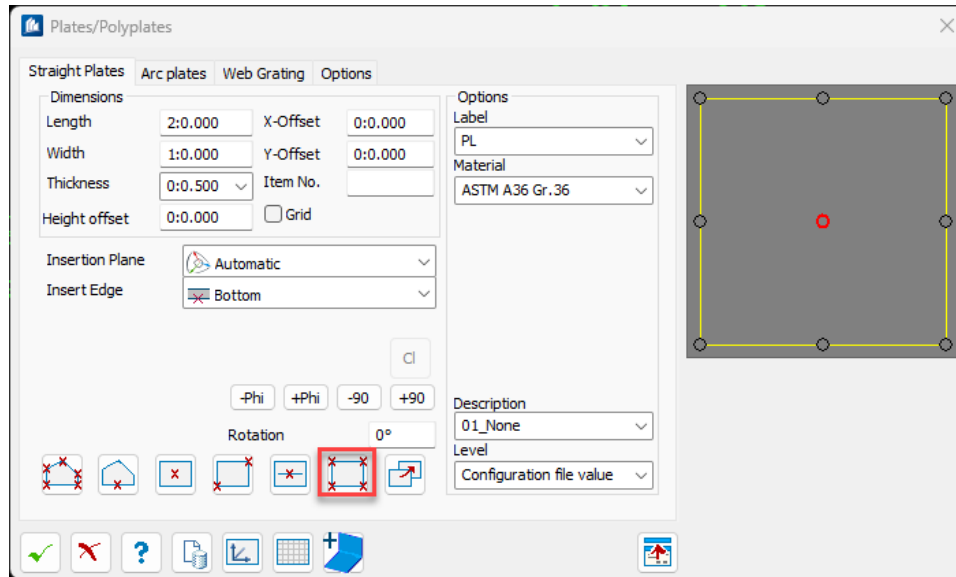
29) Zoom into the furthest left (West) bent plate.



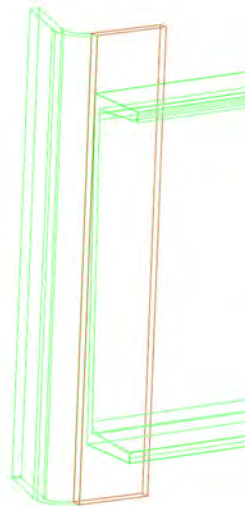
30) Select the “**Plates**” command in the “**Steel Placement**” group.



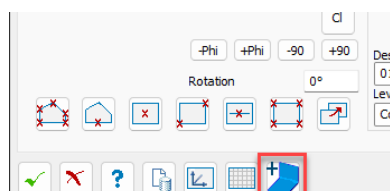
31) Change the dialog values as shown and pick the ***“Inserts a plate by four points”*** button.



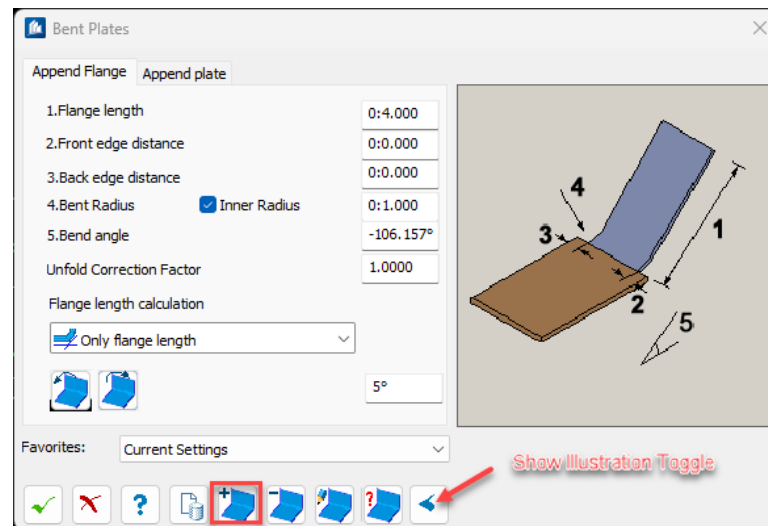
32) Pick the points as directed at the rear of the plate.



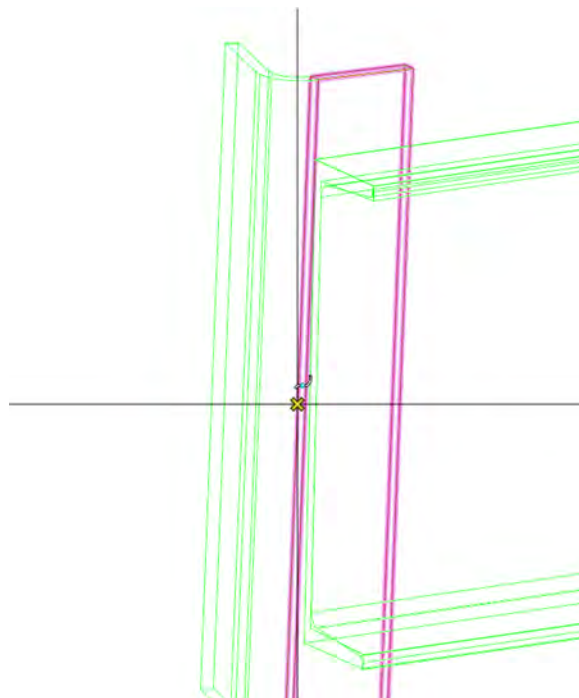
33) Click on the ***“Add/Remove/Edit Flanges”*** button at the bottom of the dialog.



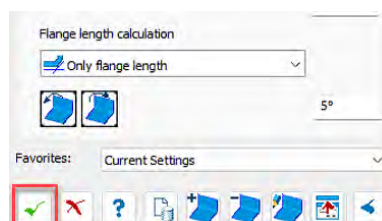
- 34) Change the values as shown and pick **“Add flange using parameters”** button (To see a graphic illustration where the values are applied, toggle the **“Show Illustration”** button).



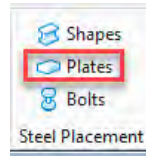
- 35) Pick a point at the left rear of the added plate.



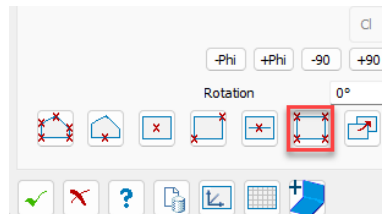
- 36) Select the green checkmark at the bottom left corner of the **“Bent Plates”** dialog to accept. (Note that if you do not click on the checkmark, any additions or changes made will be lost).



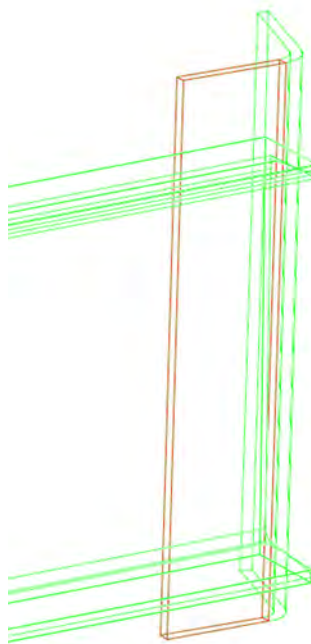
37) Again, pick the **“Plates”** command in the **“Steel Placement”** group.



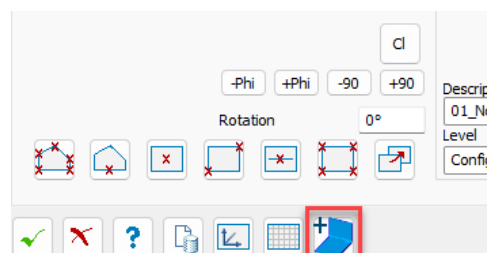
38) Change the **“Thickness”** value to **0:0.5”** and then pick the **“Inserts a plate by four points”** button.



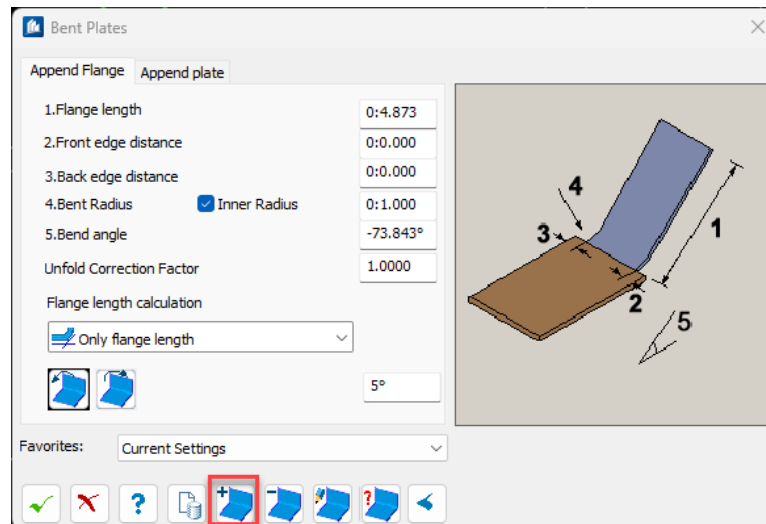
39) As before, pick the four points as directed for the next bent plate.



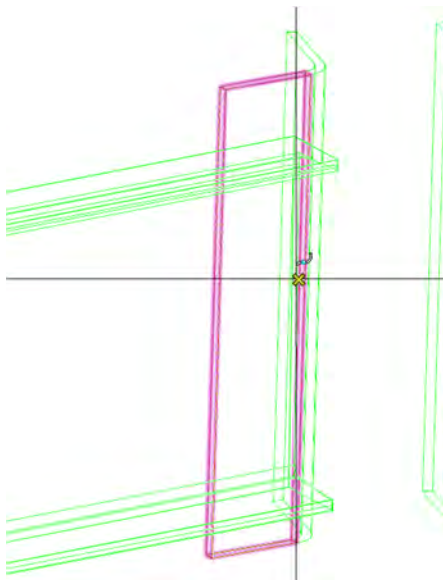
40) Again, pick the **“Add/Remove/Edit Flanges”** button at the bottom of the **“Plates/Polypates”** dialog.



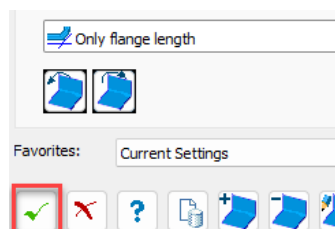
41) Change the values as shown and pick the **“Add flange using parameters”** button.



42) Pick the rear vertical line on the right side.



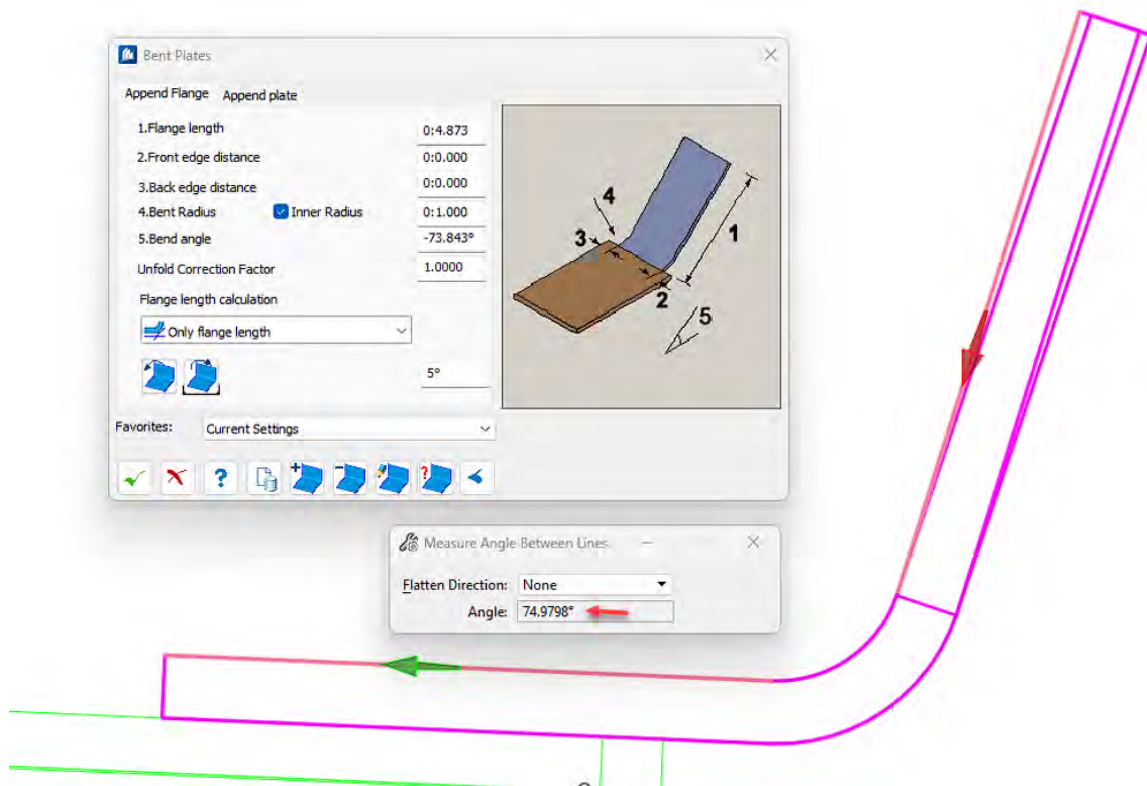
43) Pick the checkmark in the lower left corner of the **“Bent Plates”** dialog to accept.



44) Steps 30 through 43 would be repeated for the remainder of the line of bracing.

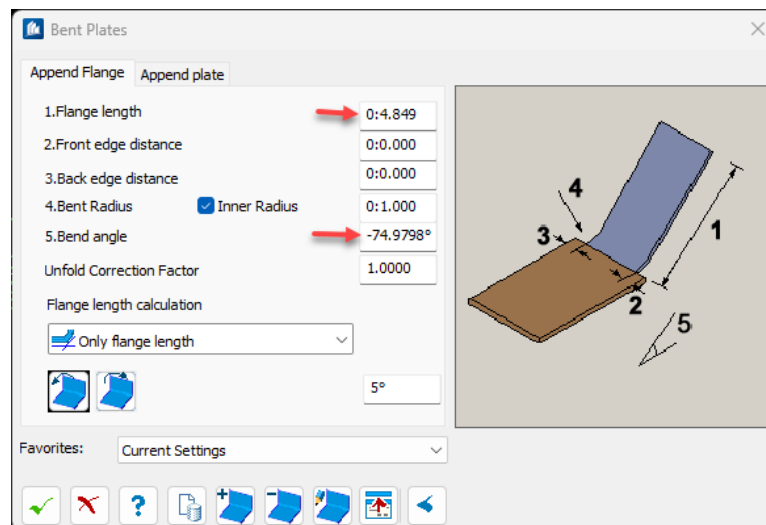
45) Before accepting the last bent plate, change to a top view and zoom into it (the bent plate that attaches to the tapered beam). The angle will need to be changed.

46) Measure the angle that is needed (based on the OBM bent plate).



47) Change the “**Bend angle**” to **-74.9798**” (the bent plate will dynamically change).

48) Also, change the “**Flange length**” to **4.849**” and pick the green checkmark.



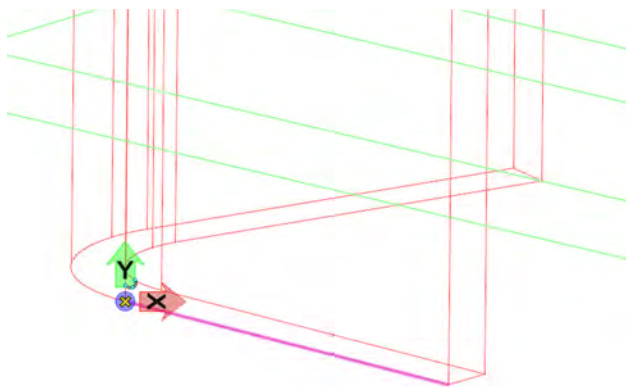
49) In the Level Display, turn off the level “**BR-OBM_CrossFrames**” for the “**Default**” model of the “**Tapered Bridge.dgn**” reference.

CHANNEL TO BENT PLATE CONNECTION

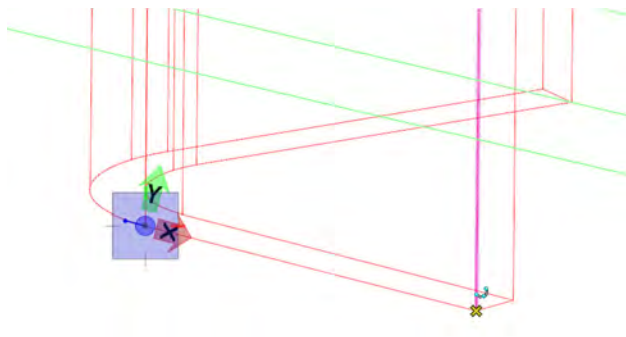
50) Turn on a second view and zoom into the lower part of the West fascia connection plate. (Note that you will need to apply the level settings previously set for view 1 to the newly opened view).

51) Type “**ra**” after making the AccuDraw dialog active.

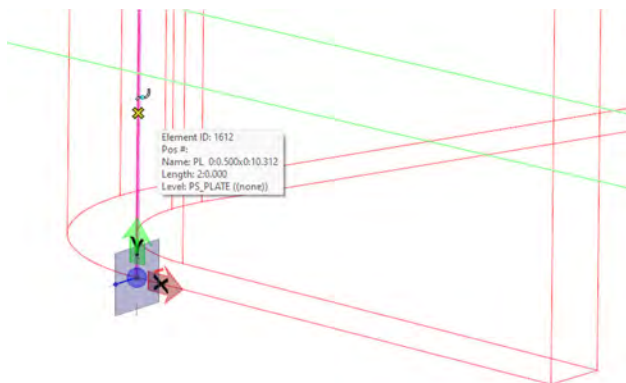
52) Snap to the bottom left part of the straight leg that is to be bolted to the channel.



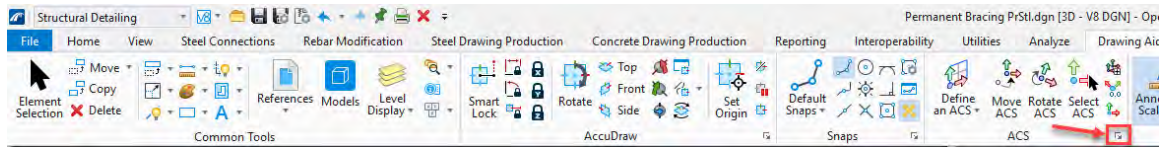
53) Snap to the end of the plate to define the “**X**” axis direction.



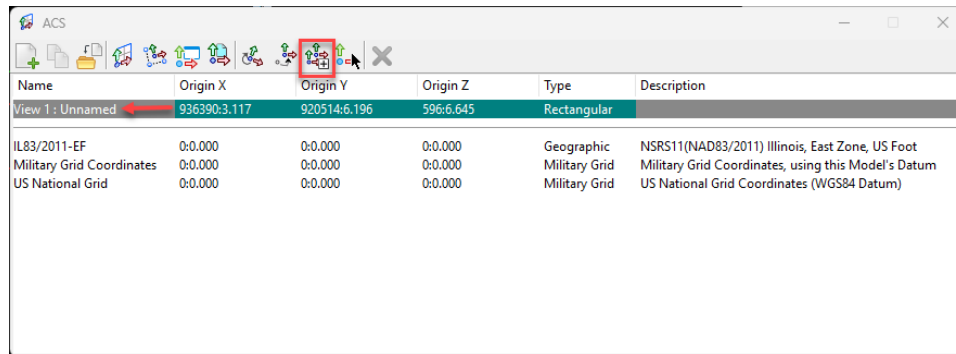
54) Snap to a point along the vertical line defining the “**Y**” axis direction.



- 55) Go to the **“Drawing Aids”** tab in the **“Structural Detailing”** workflow and click the glyph at the lower right corner of the **“ACS”** group.



- 56) With **“View 1 : Unnamed”** selected, pick the icon **“Apply ACS to Selected View”** and pick the second open view.



- 57) Close or minimize the **“ACS”** dialog.

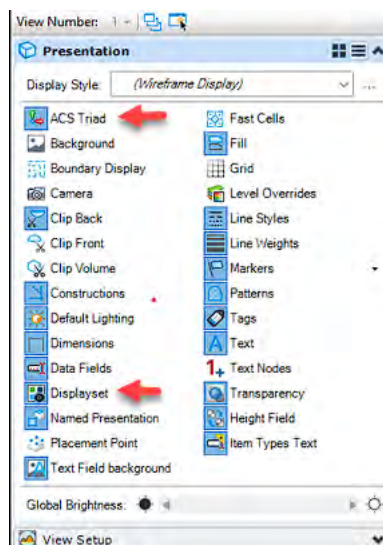
- 58) In the **“Active Locks”**, turn on **“ACS Plane Lock”**.



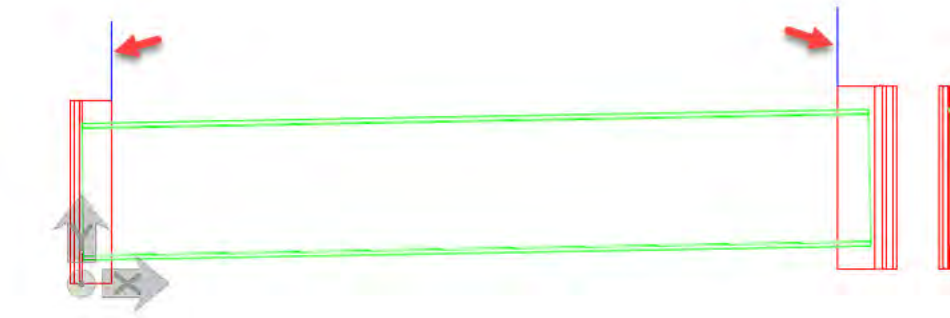
- 59) Rotate view 1 to **“Top”** and view 2 to **“Front”**.

- 60) **“DisplaySet Set”** can be used to isolate the components if desired.

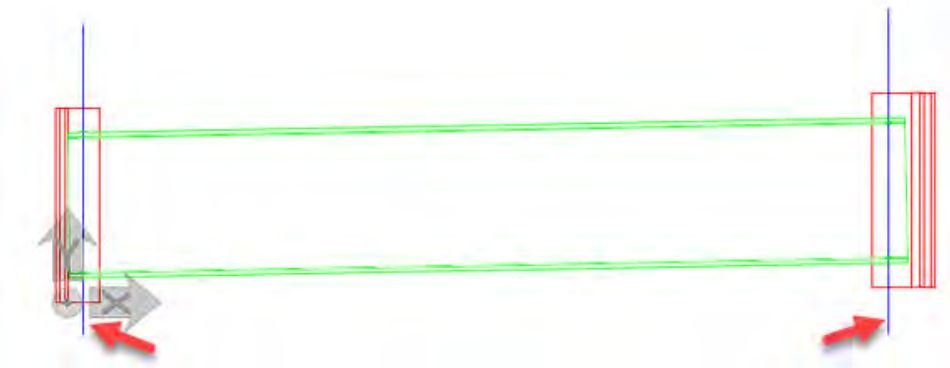
- 61) If the DisplaySet commands are used, make sure that **“DisplaySet”** and **“ACS Triad”** are toggled on and applied to all open views.



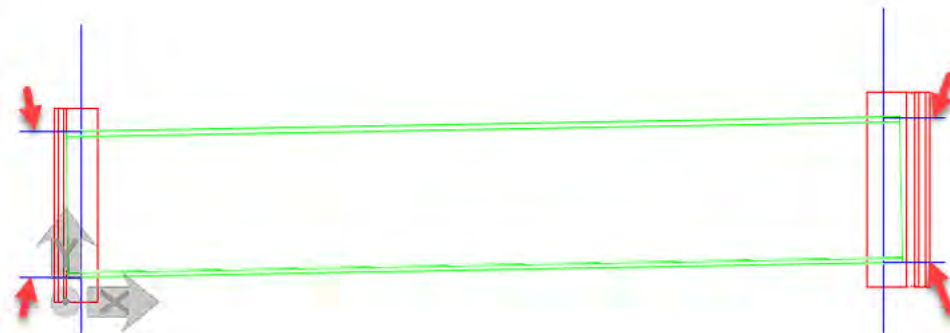
62) Draw two vertical lines, one at the edge of each plate.



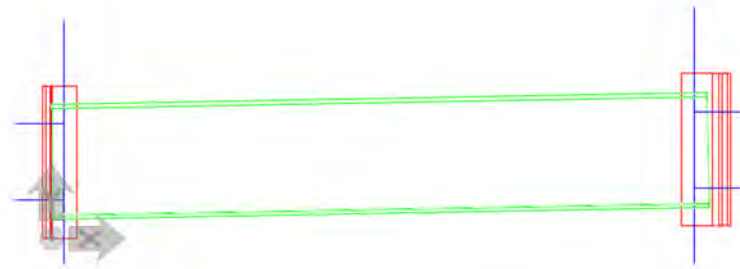
63) Move the lines parallel towards the ends of the channels by 2", then extend the line well below the bent plate.



64) Draw horizontal lines at the top and bottom where the channel intersects with the vertical lines.



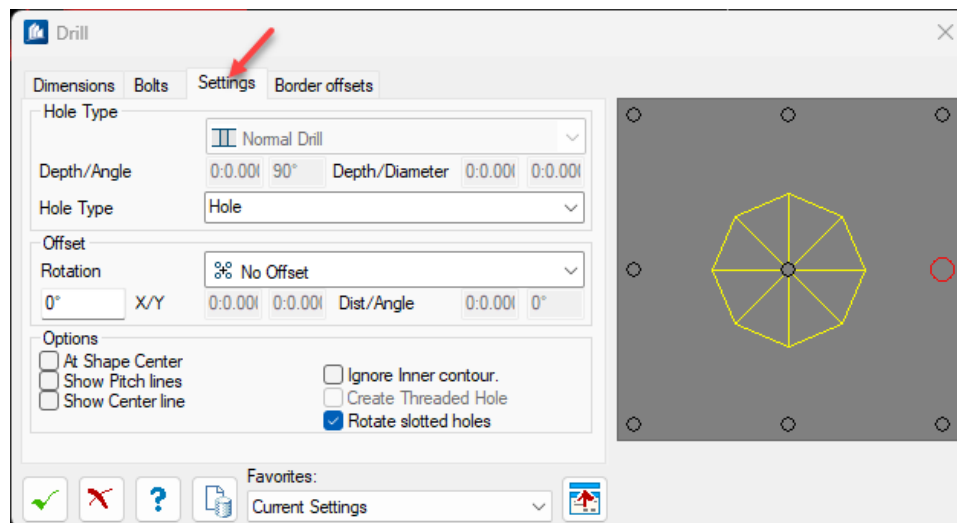
65) Move the horizontal lines 3" from the top and bottom of the channel. These are to be the bolt locations.



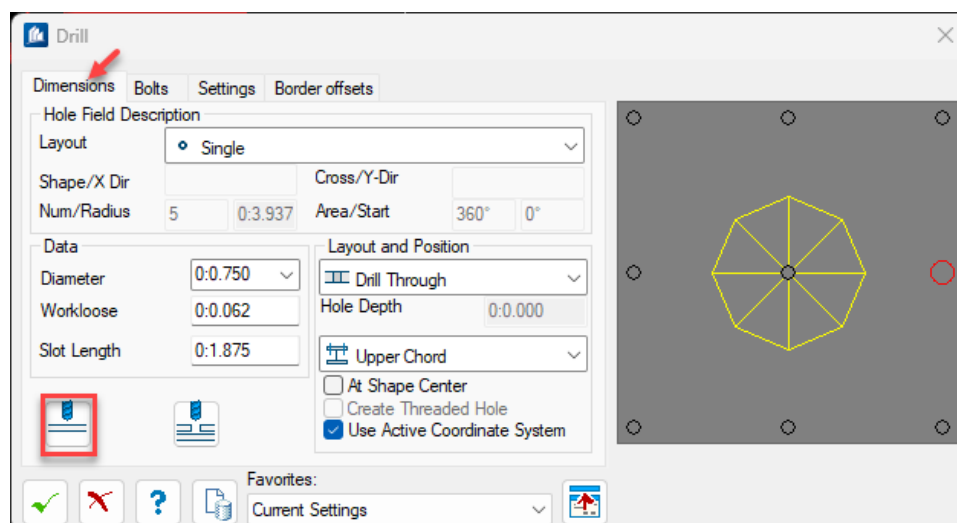
66) Zoom into the left connection plate.

67) From the **“Structural Detailing”** workflow and the **“Steel Connections”** tab, select the **“Drill”** command in the **“Edit Steel Elements”** group.

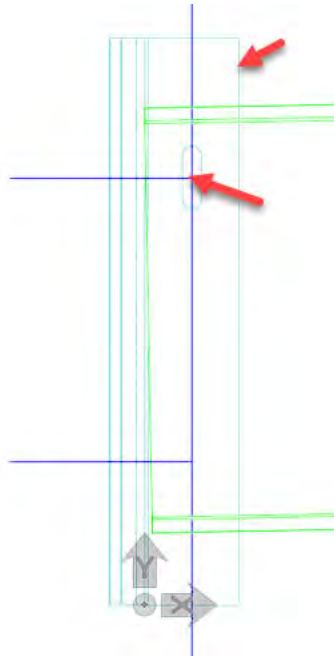
68) Change the values in the **“Settings”** tab of the **“Drill”** dialog as follows:



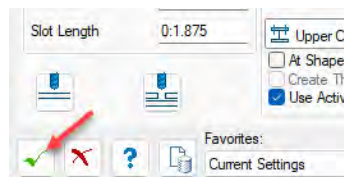
69) Change the values in the **“Dimensions”** tab of the **“Drill”** dialog and click the **“Add Drills to a Part”** button.



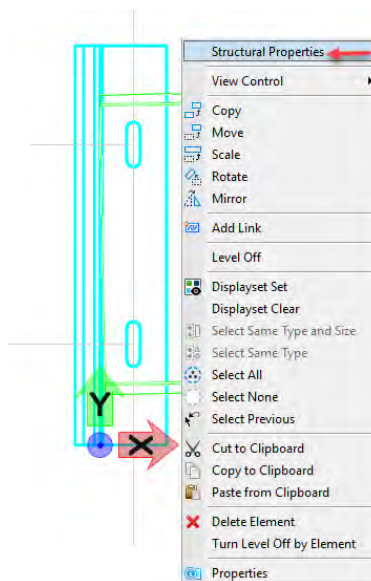
- 70) Select the bent plate, then snap to the intersection of the recently created construction lines followed by a reset.



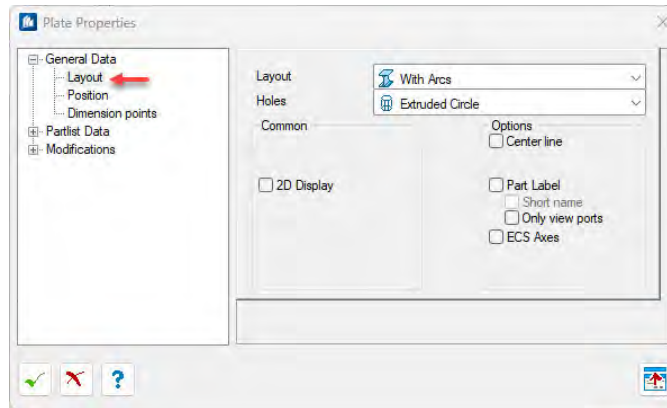
- 71) Repeat by picking the “**Add Drills to a Part**” button, then selecting the bent plate followed by snapping to the intersection of the lines defining the bolt location.
- 72) Click the green checkmark to accept the slotted holes.



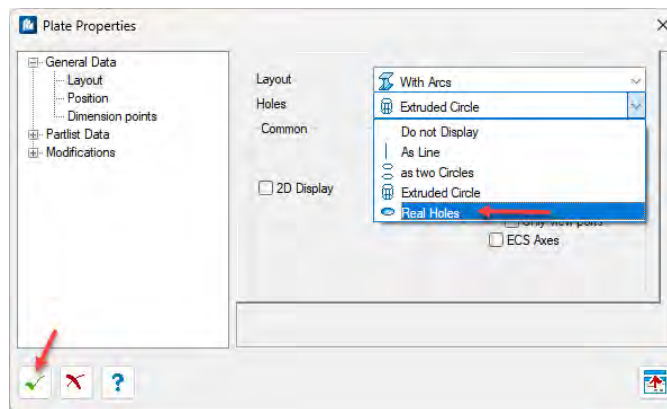
- 73) Select the bent plate, right click and hold, then select “**Structural Properties**”.



74) In the resulting **“Plate Properties”** dialog, select **“Layout”** in the **“General Data”**.

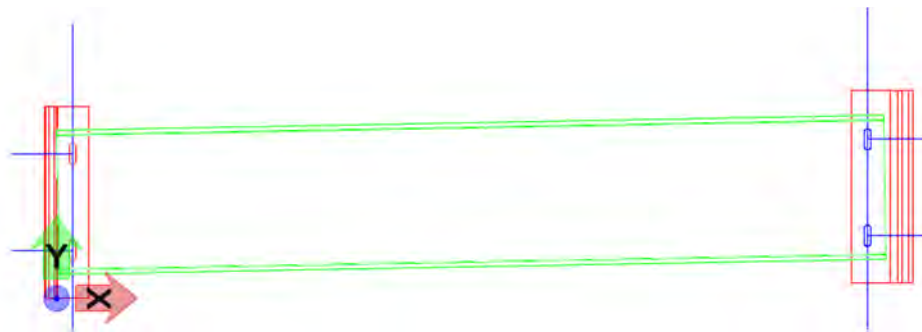


75) Change **“Extruded Circle”** to **“Real Holes”** (This enables the ability to see the holes when rendered).

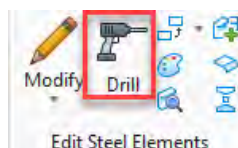


76) Select the green checkmark.

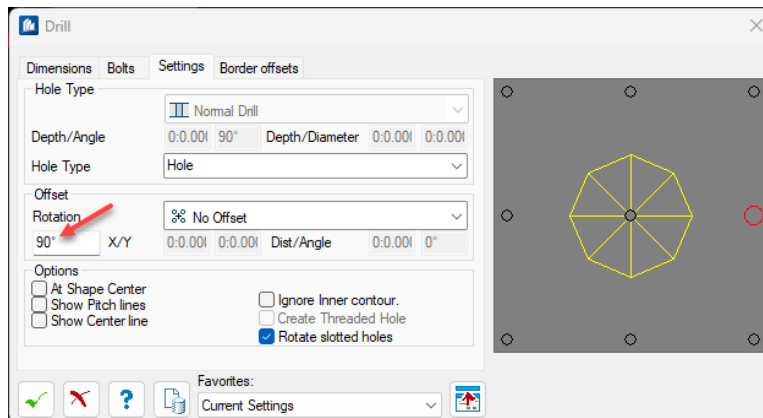
77) Repeat steps 62 thru 76 for the other bent plate.



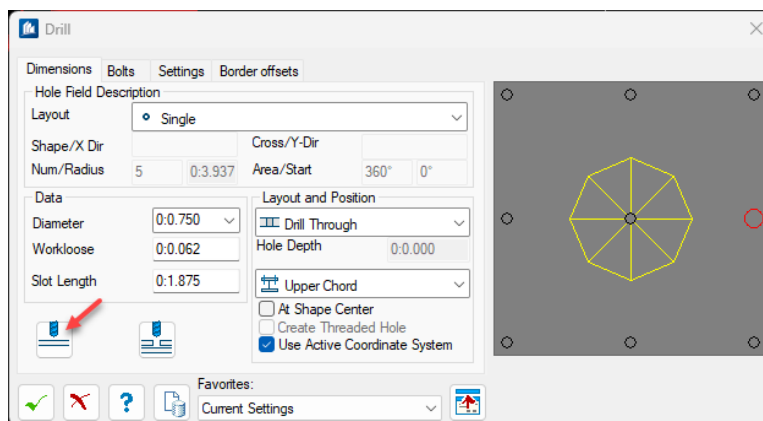
78) Select the **“Drill”** command.



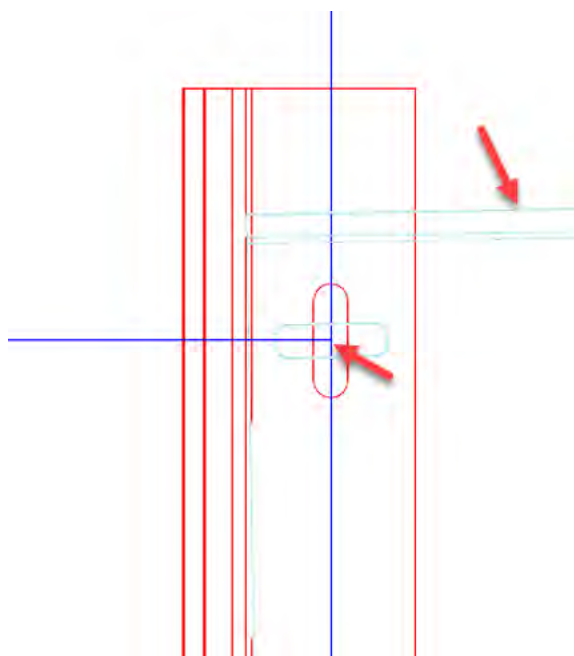
79) In the “**Settings**” tab, change the “**Rotation**” to 90 degrees.



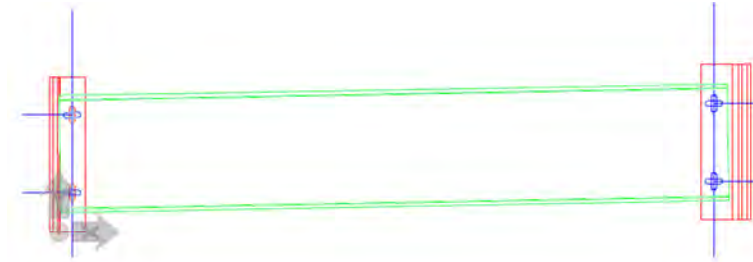
80) Return to the “**Dimensions**” tab, then pick the “**Add drills to a part**” button.



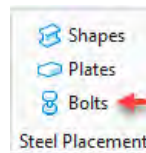
81) Select the channel, then snap to one of the four hole locations and reset.



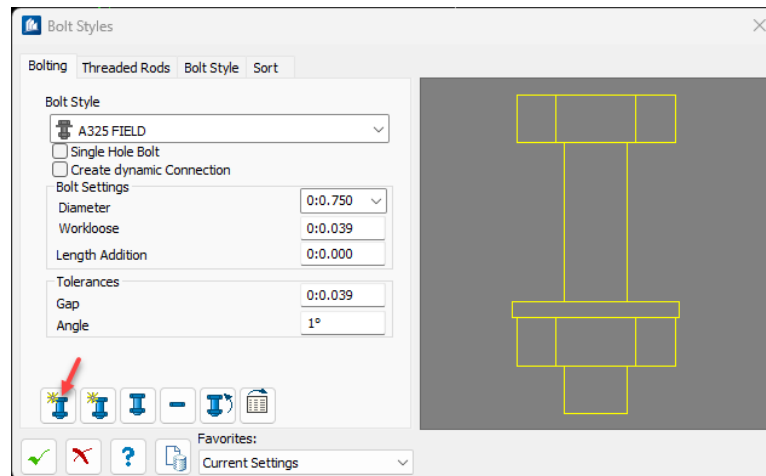
82) Repeat for the other three hole locations and pick the green checkmark.



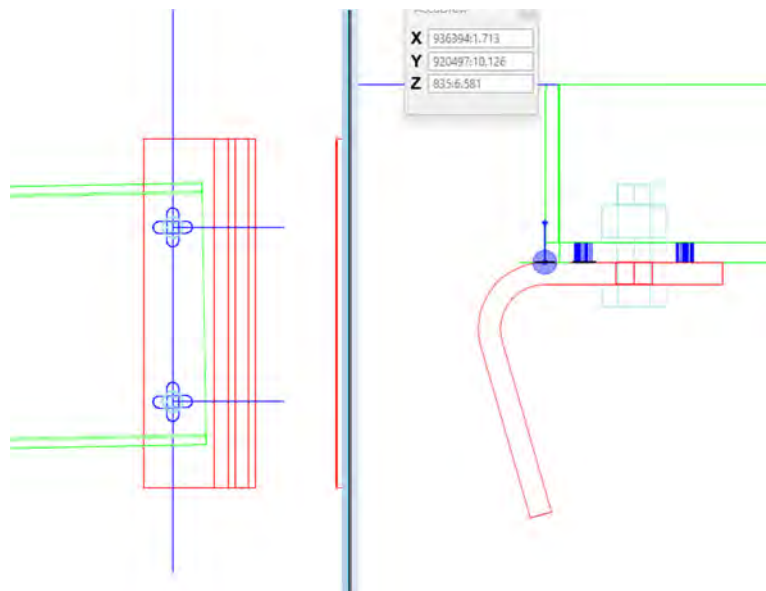
83) Pick the “**Bolts**” command in the “**Steel Placement**” group.



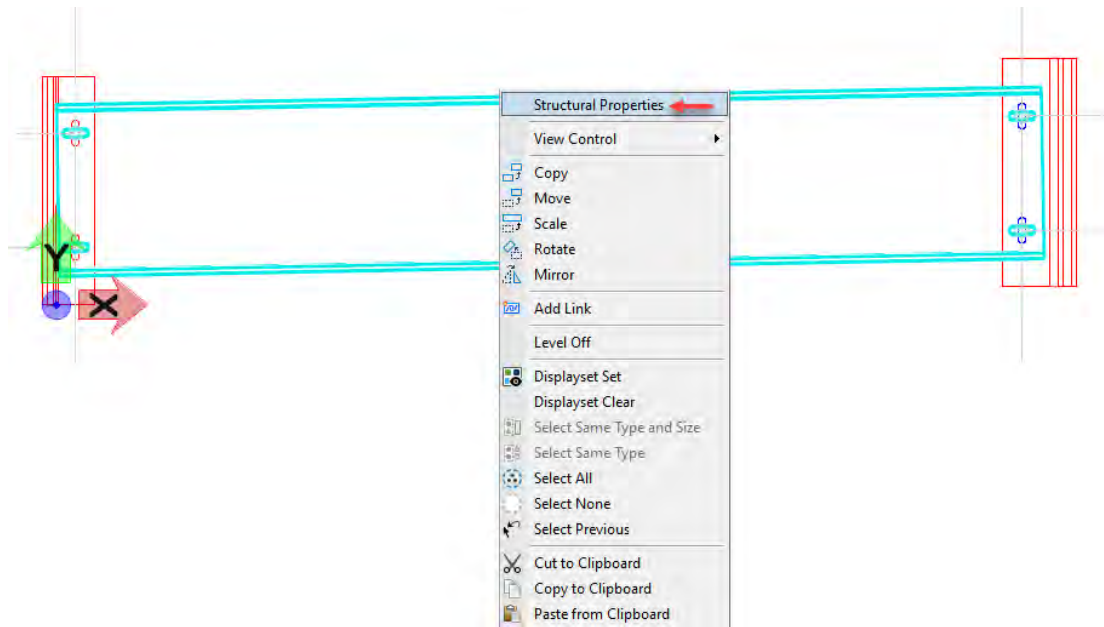
84) Change the settings of the “**Bolt Styles**” dialog as shown and select the “**Bolt all selected parts automatic**”.



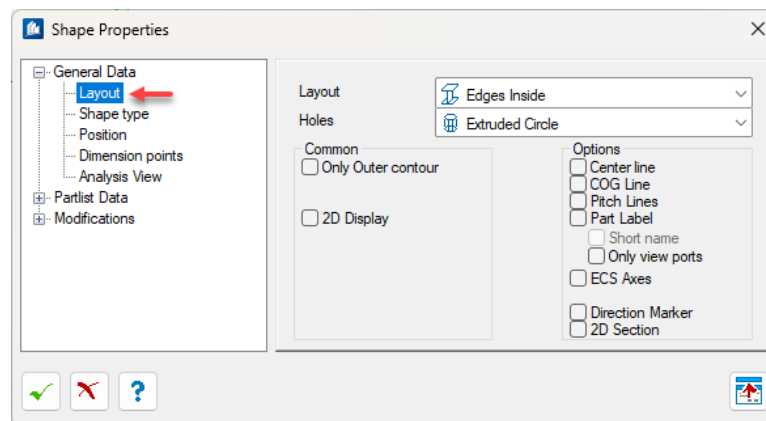
85) Click and drag to encompass both bent plates and the channel, accept, then select the green checkmark.



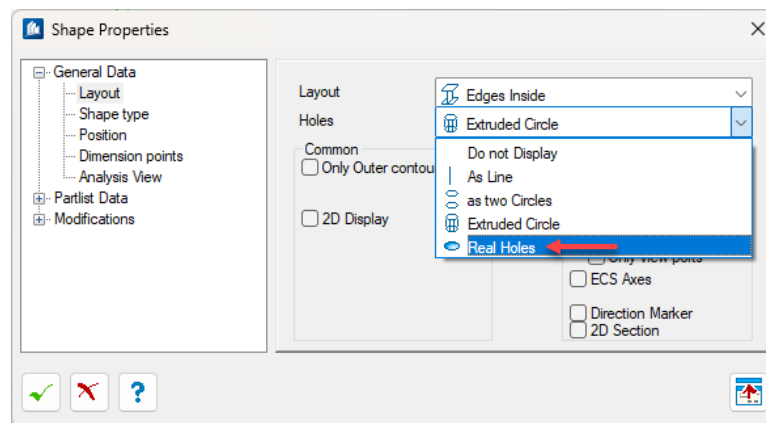
86) Select the channel, right click and hold, then select **“Structural Properties”**.



87) In the resulting **“Plate Properties”** dialog, select **“Layout”** in the **“General Data”**.



88) Change **“Extruded Circle”** to **“Real Holes”** (This enables the ability to see the holes when rendered).



89) Select the green checkmark.

90) The same process (steps 62 thru 89) is to be repeated for the remaining braces. (Note that the connection at the tapered beam will have to be adjusted from the previous settings).

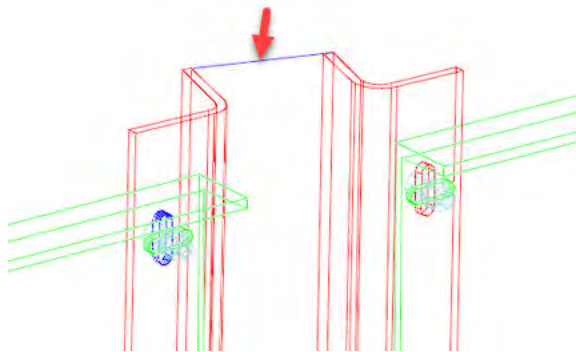
BENT PLATES TO BEAM CONNECTION

91) Clear your DisplaySet if previously used.

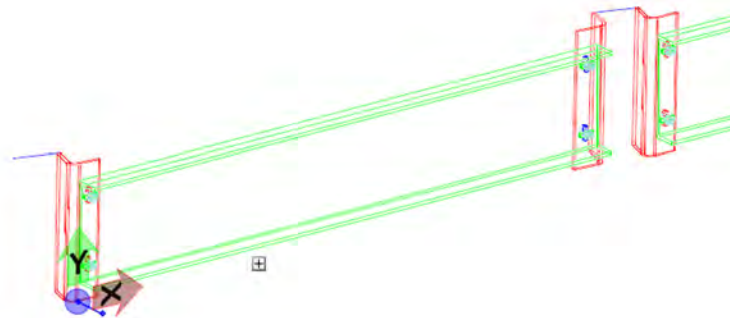
92) Turn off the “**ACS Plan Lock**”.



93) Dynamically rotate view 1, then draw a line connecting the plates for the first interior beam (Make sure the line runs from the edges of the plates that will be in contact with the washers and bolts).

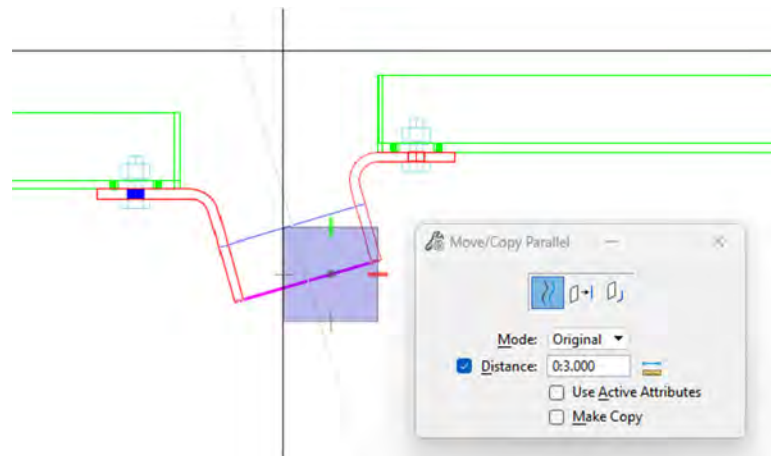


94) Do the same for the other bent plates except for the bent plate at the tapered beam location. You will need to copy one of these lines to the single bent plate of the West fascia.

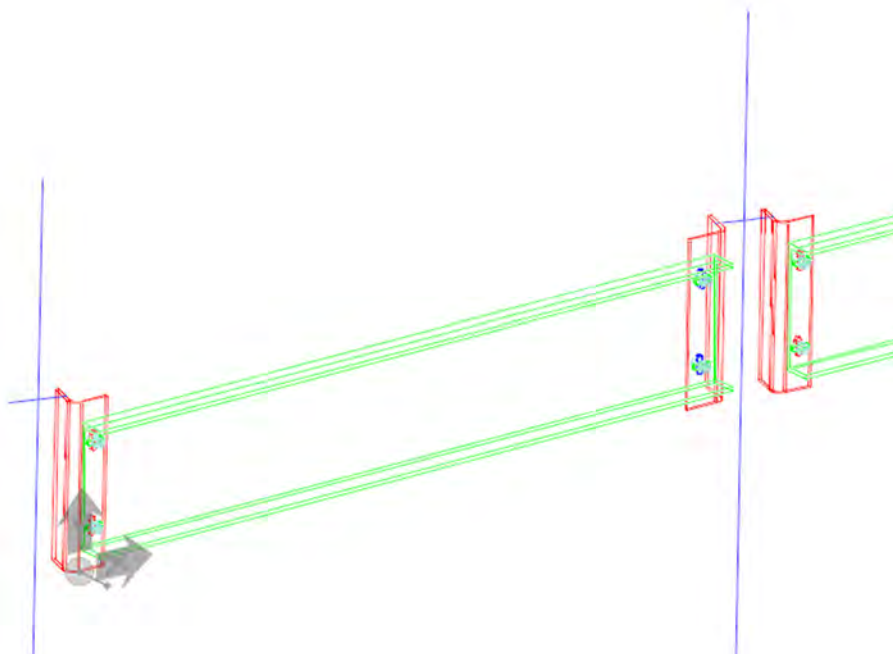


95) In the Level Display, turn on “**BR-OBM_D_Beam_Layout**” in the “**DecorationSpace**” model of the reference file “**Tapered Bridge.dgn**” for all open views.

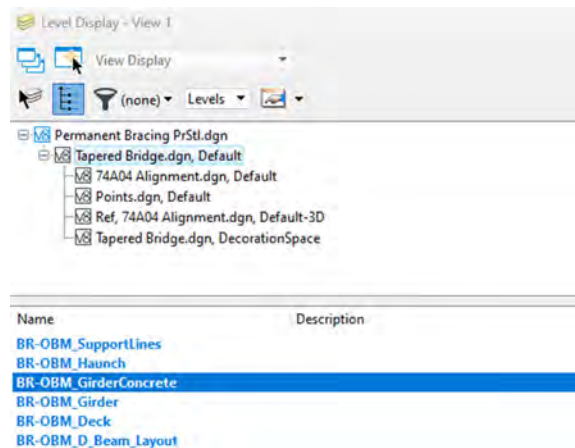
96) Move each of the lines parallel in an actual top view 3" to locate the threaded rod centerlines (Note that due to the ACS, you will need to type "**F**" to orient the tool to the actual top view).



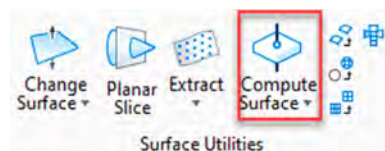
97) From a top or isometric view, draw a vertical line at the intersection of each beam line with its corresponding lines that we drew at the top of the plates. This line needs to go above the top of the actual beam (We just need this to locate a point at the top surface of each beam). Typing “S” will allow the line to lock vertically in the real-world z direction.



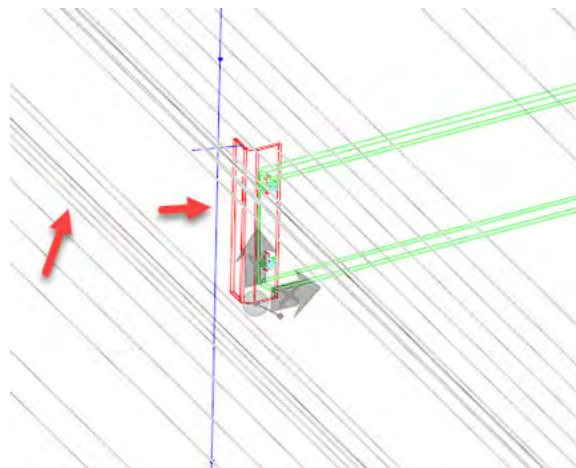
- 98) In the Level Display, turn on “**BR-OBM_GirderConcrete**” in the “**Default**” model of the “**Tapered Bridge.dgn**” reference file for all open views.



- 99) In the “**Modeling**” workflow and the “**Surfaces**” tab, select the “**Compute Surface Intersections**” tool.

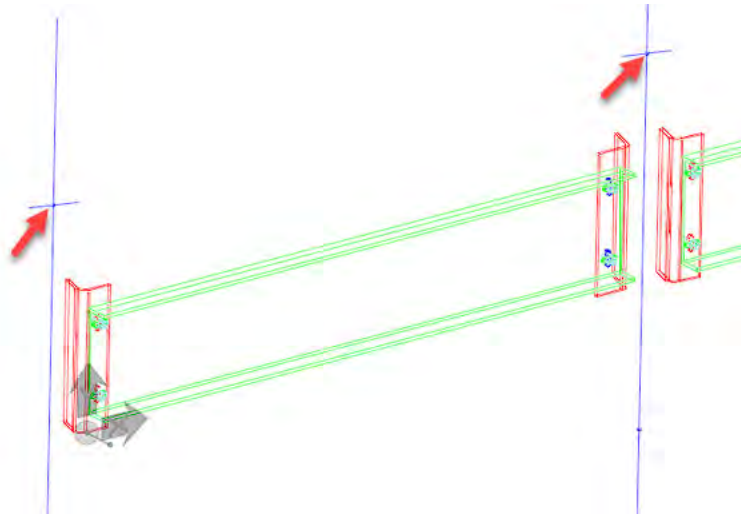


- 100) Select a vertical line, then select the corresponding beam and accept.

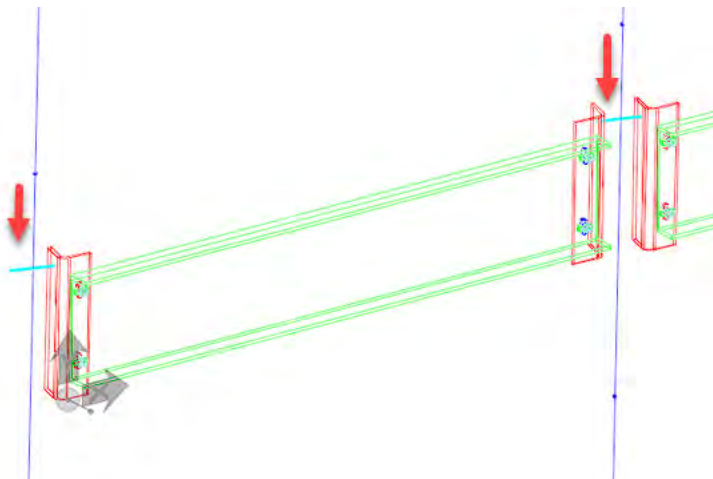


- 101) Repeat for the other beams.
- 102) In the Level Display, turn off “**BR-OBM_GirderConcrete**” in the “**Default**” model of the “**Tapered Bridge.dgn**” reference file for all open views.

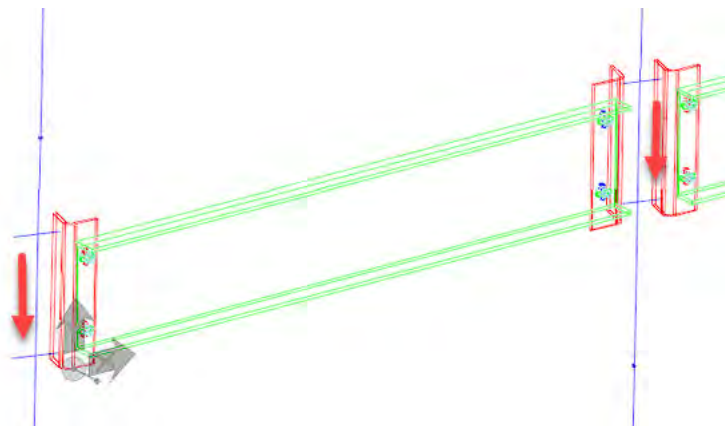
103) Move the lines representing the threaded rod centerlines to the points that were created at the top of each beam.



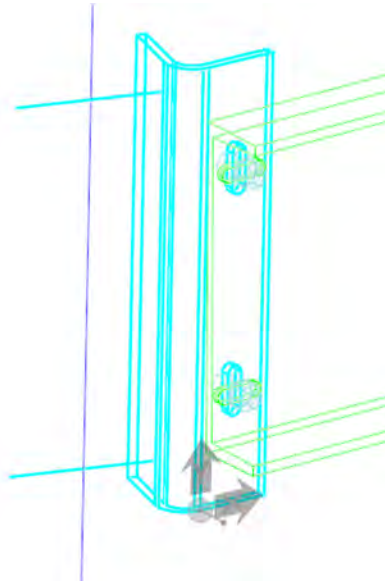
104) Select the lines just moved and move them down 1'-4".



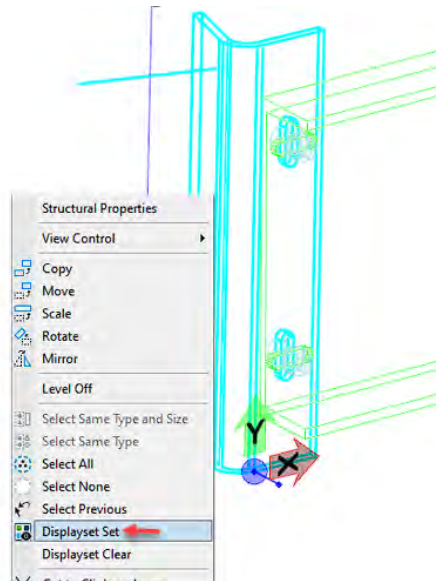
105) With the lines still selected, copy them down another 1'-8".



- 106) Select the single bent plate at the fascia beam as well as the two lines representing the centerlines of the threaded rods.

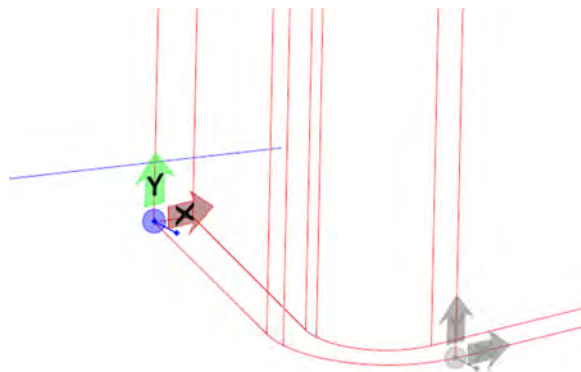


- 107) Right click anywhere on the screen, then select **"DisplaySet Set"**.

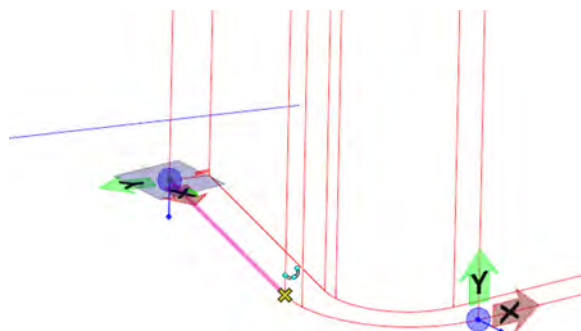


- 108) Clear the selection, pick on the AccuDraw dialog and type **"ra"** (We will be making the connection plate surface that will be in contact with the fascia beam our new **"Top"** view).

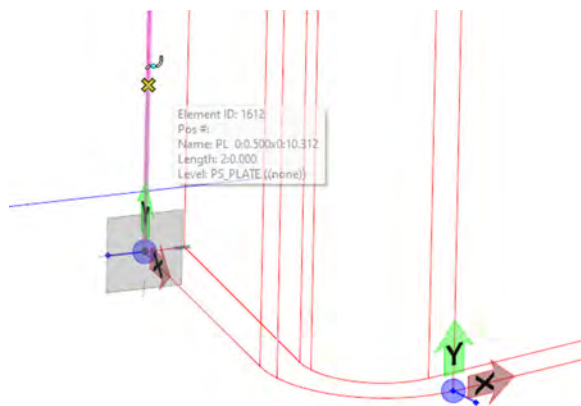
109) Select the point on the bent plate as shown below:



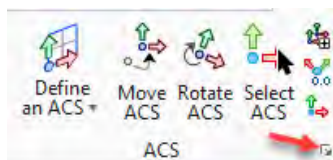
110) Pick the point as shown to define the x axis:



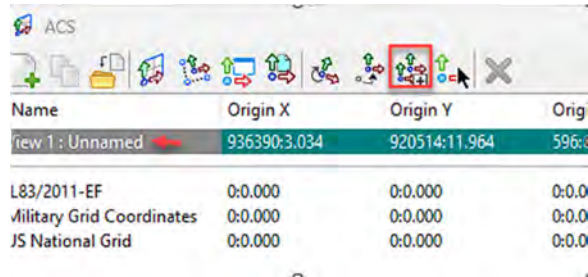
111) Pick a point along the vertical edge of the bent plate as shown below to define the y axis.



112) In the “**Drawing Aids**” tab, select the glyph in the lower right of the “**ACS**” group.

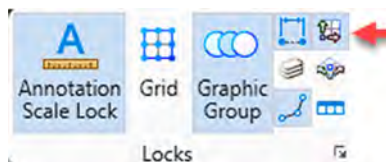


113) With “**View 1 “Unnamed”**” selected, pick the “**Apply ACS to Selected View**” button.

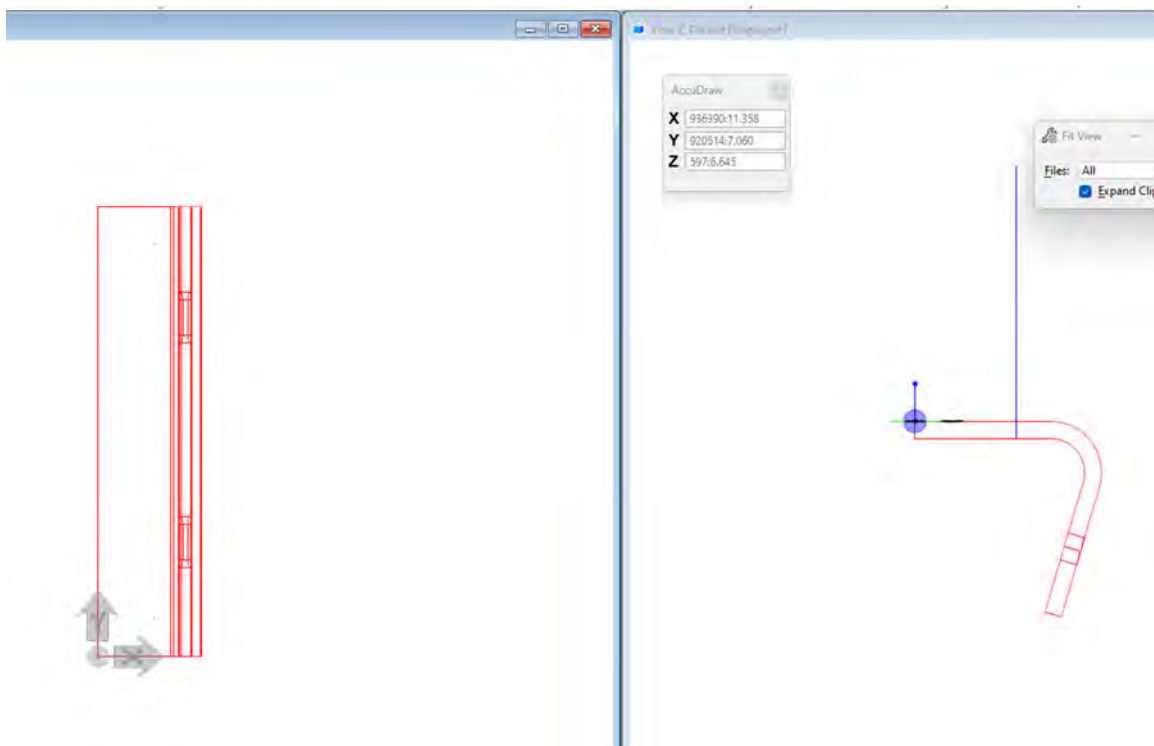


114) Pick the other view to apply the new ACS to it.

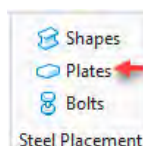
115) Turn on the “**ACS Plane Lock**” if it is off.



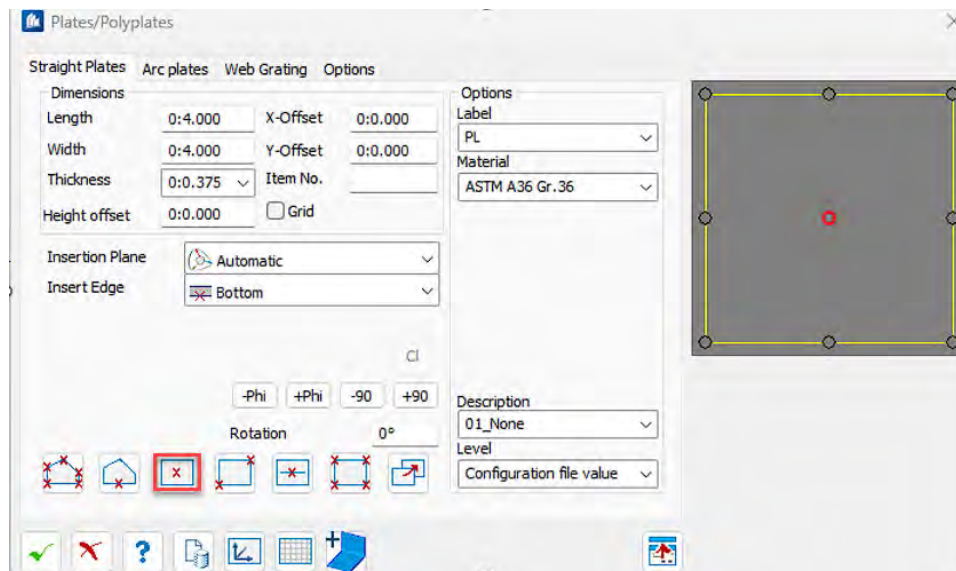
116) Make View 1 a top view and View 2 a Front view.



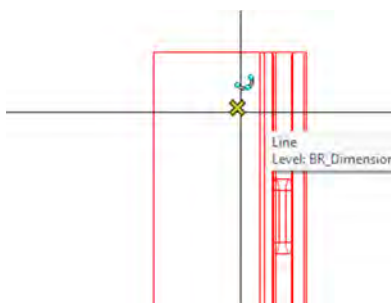
117) From the “**Structural Detailing**” workflow and the “**Steel Connections**” tab, select the “**Plates**” command in the “**Steel Placement**” group.



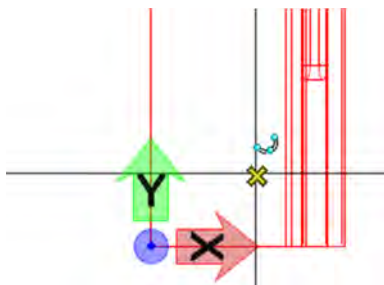
118) Change the settings as shown below and pick the ***“Inserts a rectangular plate on an insertion point”*** button:



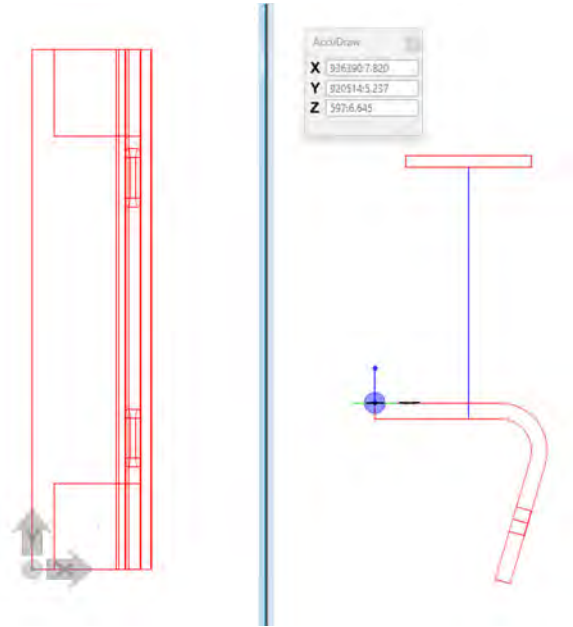
119) Pick the top point.



120) Pick the ***“Inserts a rectangular plate on an insertion point”*** button again and select the bottom point.



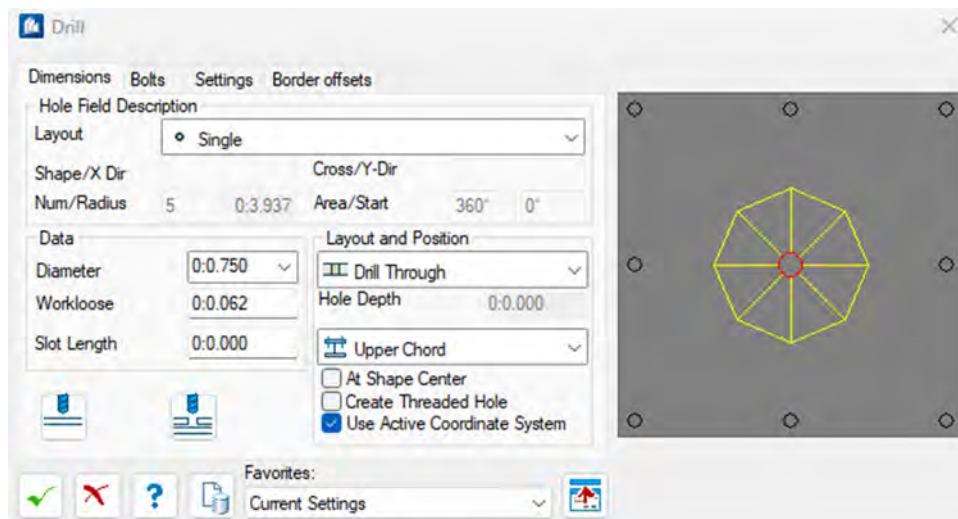
121) Select the green checkmark to accept the plate locations.



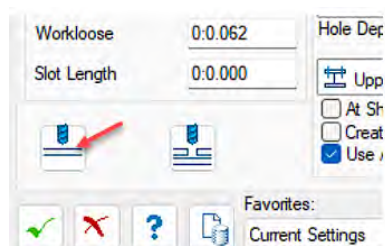
122) Select the “Drill” command in the “Edit Steel Elements” group.



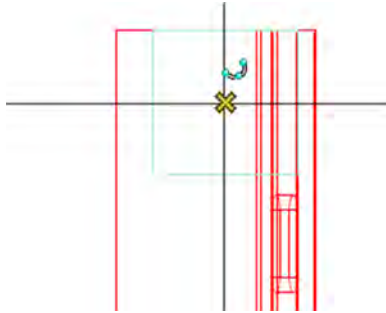
123) Change the dialog values as shown below:



124) Pick the “Add drills to a part” button.

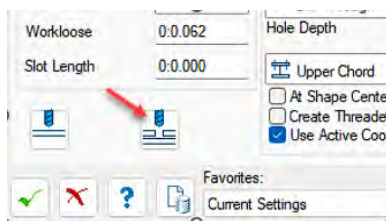


125) Select the plate, then the centerline point and reset.

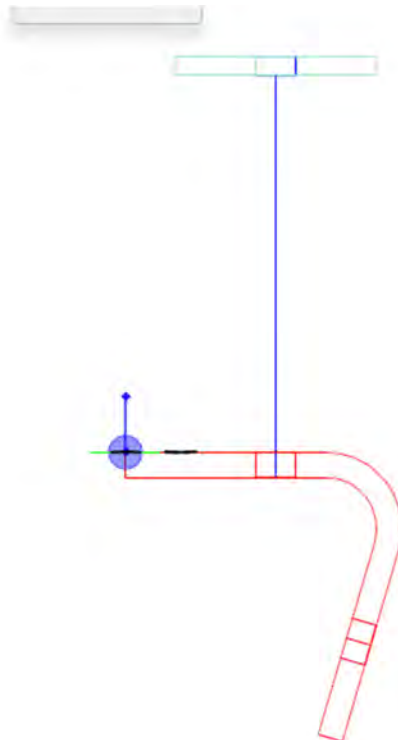


126) Repeat for the bottom plate.

127) Pick the ***“Copy drills from one or more parts into one or more parts”*** button.

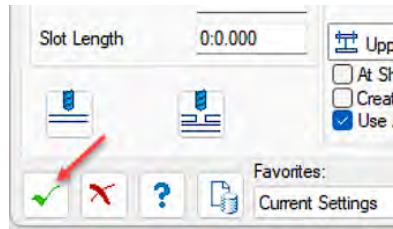


128) Pick the top plate, then pick the bent plate.

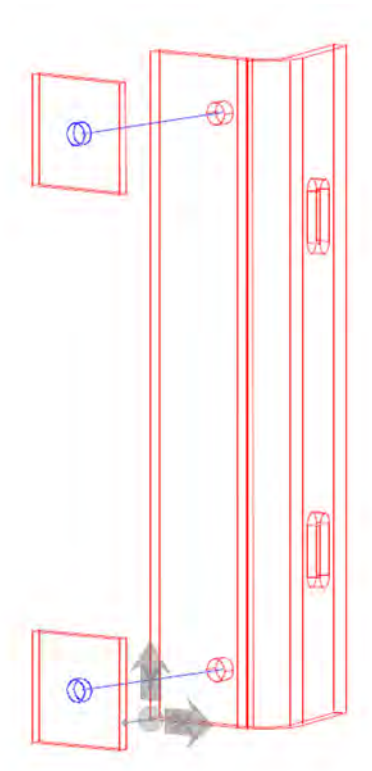


129) Pick the command again, selecting the bottom plate first, then the bent plate.

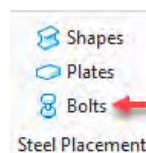
130) Select the green checkmark in the lower left corner of the dialog.



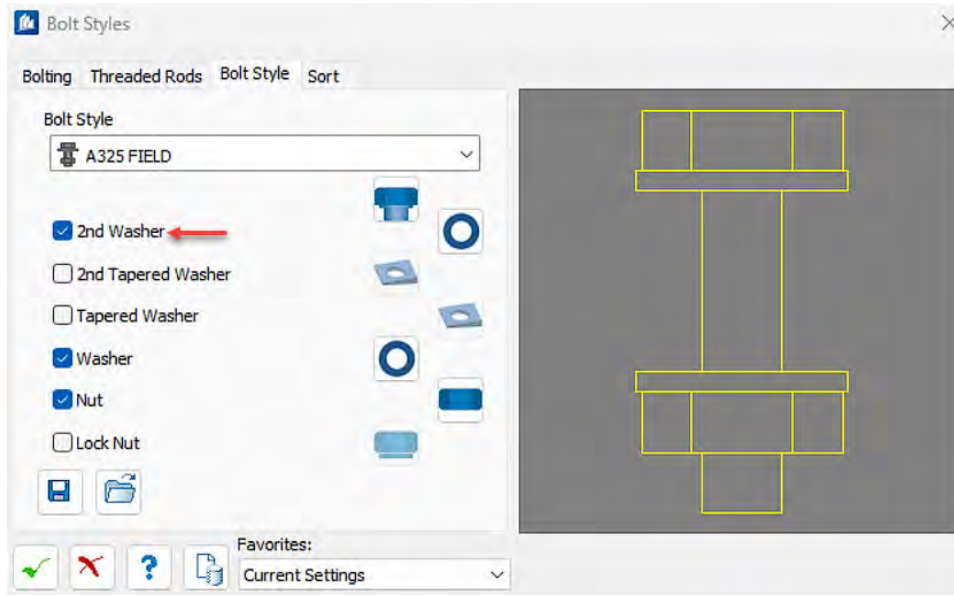
131) Dynamically rotate View 1 to verify the holes pass through both the bent plate and both 4" square plates.



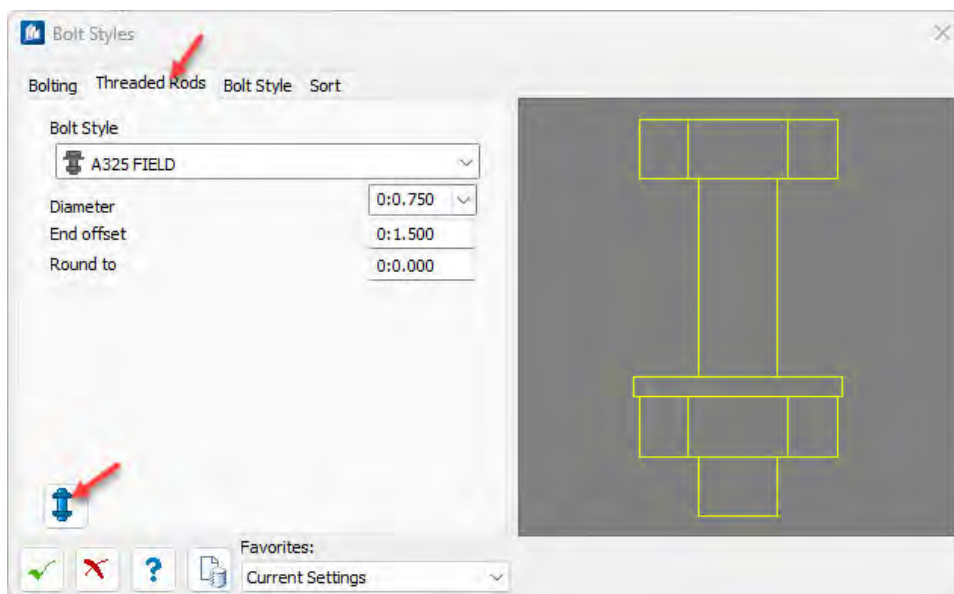
132) Select the “**Bolts**” command in the “**Steel Placement**” group.



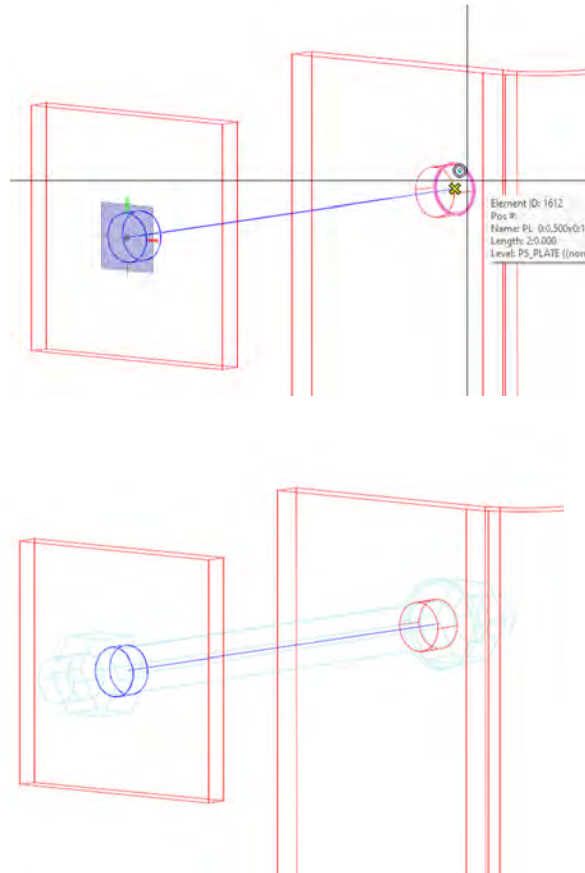
133) In the “**Bolt Style**” tab, select the “**2nd Washer**” toggle.



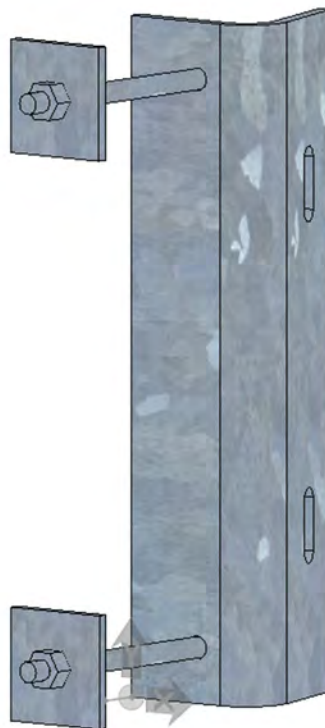
134) Modify the “**Threaded Rods**” tab as shown below and pick the “**Create a threaded rod according to given insertion points**” button.



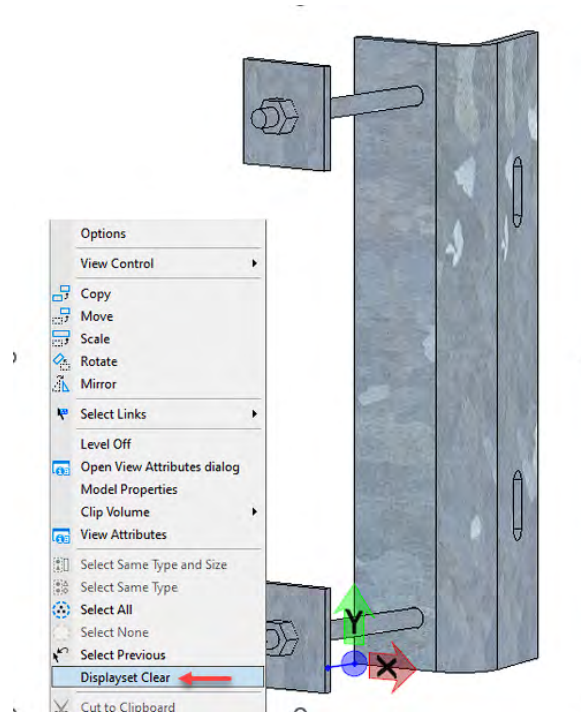
135) In a rotated View 1, snap to the centers of the outermost circles of both holes.



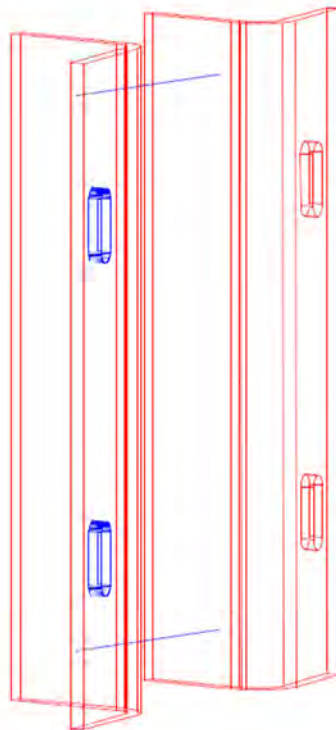
136) Repeat to place the bottom threaded rod and select the green checkmark.



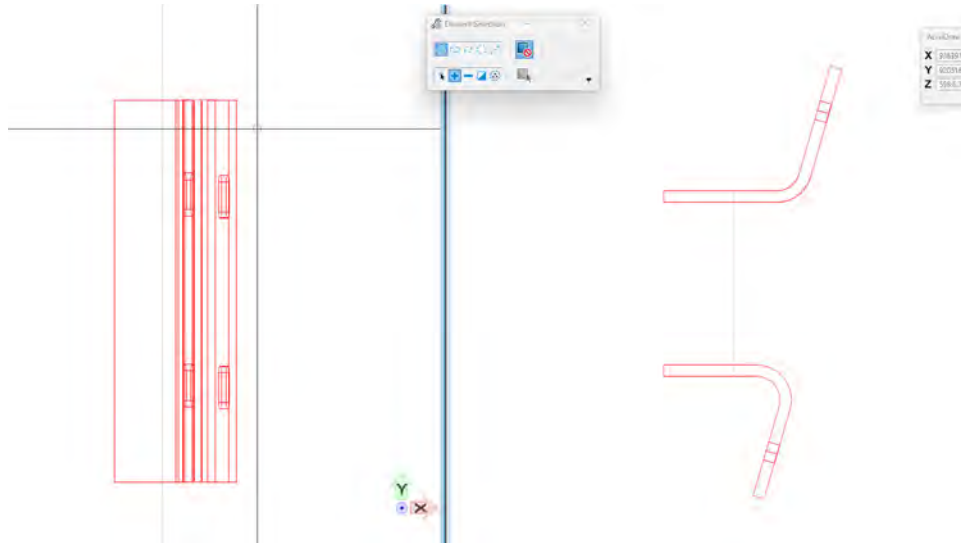
137) Right click anywhere on the screen and hold, selecting “**DisplaySet Clear**”.



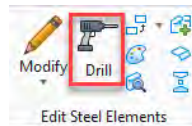
138) Pick the first pair of interior bent plates along with the two corresponding centerlines and do a “**DisplaySet Set**”.



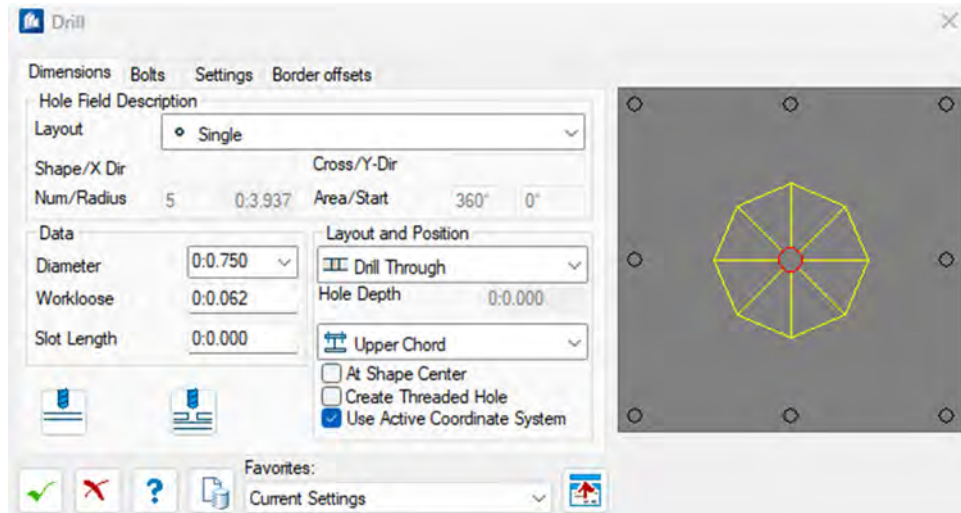
139) Rotate View 1 back to a **“Top”** view and the other view to a **“Front”** view.



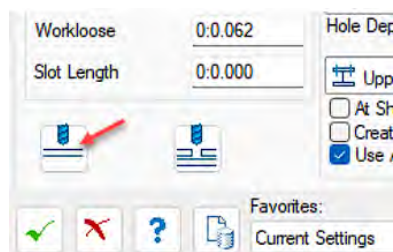
140) Select the **“Drill”** command in the **“Edit Steel Elements”** group.



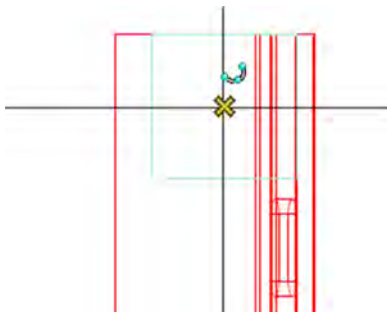
141) Change the dialog values as shown below:



142) Pick the **“Add drills to a part”** button.

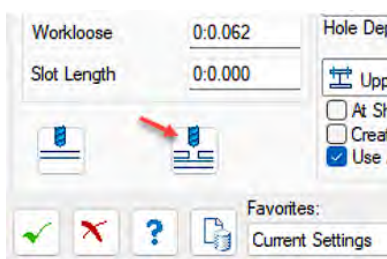


143) Select the plate, then the centerline point and reset.

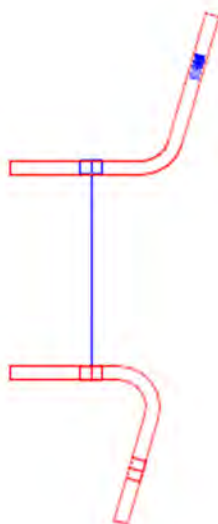


144) Repeat for the bottom of the plate.

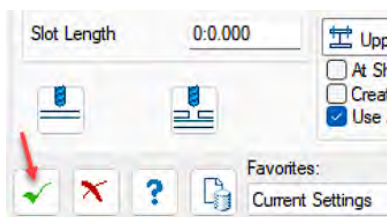
145) Pick the ***“Copy drills from one or more parts into one or more parts”*** button.



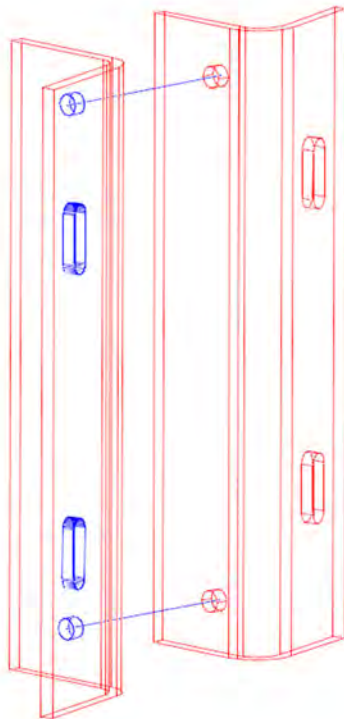
146) In the other view (the actual top view) pick the top bent plate (containing the holes), then pick the bottom bent plate.



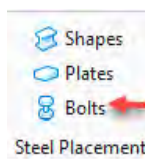
147) Select the green checkmark in the lower left corner of the dialog.



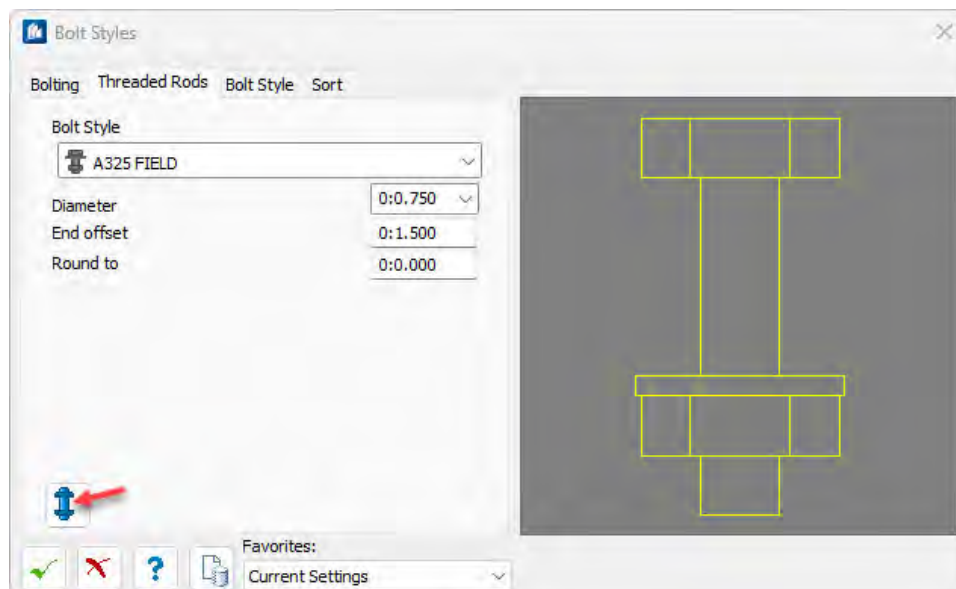
148) Dynamically rotate View 1 to verify the holes pass through both bent plates.



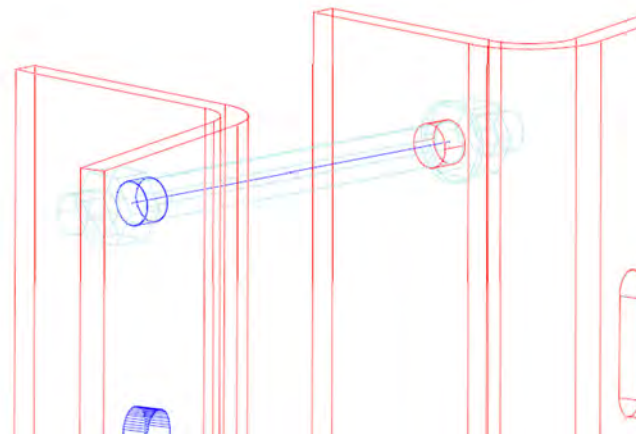
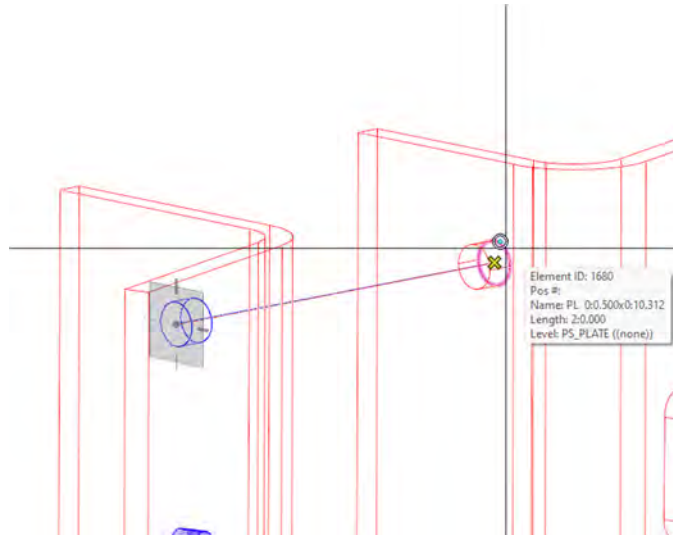
149) Select the “**Bolts**” command in the “**Steel Placement**” group.



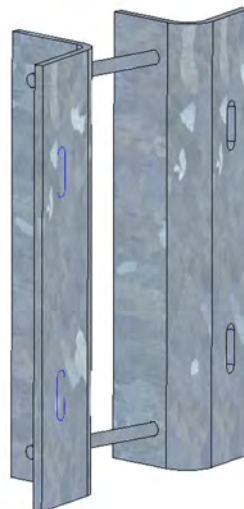
150) Modify the “**Threaded Rods**” tab as shown below and pick the “**Create a threaded rod according to given insertion points**” button.



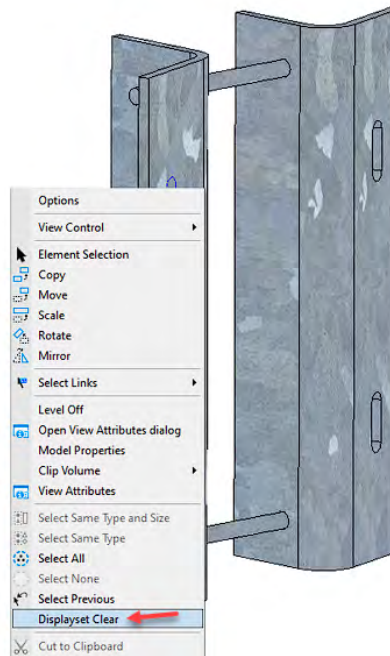
151) In the rotated View 1, snap to the outermost circles of both holes.



152) Repeat to place the bottom threaded rod and select the green checkmark.



153) Right click anywhere on the screen and hold, selecting ***“DisplaySet Clear”***.



154) Repeat steps 136 thru 153 for the next three pairs of bent plates.

155) The bent plate connection at the tapered beam is done in a similar way as the first; however, the ACS needs to be changed to align with the leg of the plate that is to be in contact with the beam.

156) The other two lines of permanent bracing is merely a repeat of steps 14 thru 153.

157) When complete, turn all levels back on except for the level ***“BR-OBM_CrossFrames”*** in the ***“Default”*** model of the file ***“Tapered Bridge.dgn”***.