



OpenBridge Modeler/Designer Training Manual

Bridge Design, Bridge Division

April 2024

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Introduction

This training manual is intended for Transportation Engineers, Engineer Assistants, Transportation Specialists, and Design Technicians that are planning on create 3D models of existing and future bridges using OpenBridge Modeler.

OpenBridge Modeler is not a design tool, it is only a modeling application. This manual will not go into the details of the design and analysis applications included in OpenBridge Designer.

The training is broken into sections:

- Interfaces – Goes over the OBD and OBM Interfaces
- Create Bridges one element at a time. – Goes through the steps to place the different bridge elements.
- Create Bridges using the Bridge Wizard – Goes through the instructions on how to use the wizard and finish the bridge after placement.
- Place Excavation – Demonstrates the excavation tools.
- Place Riprap – Demonstrates the linear templates tools in OBM.
- Generate Reports – Goes through the different reports included in OBM.
- Create and Modify Bridge Templates – Shows how to modify and create templates.
- Plan Production – Shows how to use the plan production tools in OBM.
- Interoperability – Shows how to transfer to the design and analysis applications included in OBD.

For questions about the content included in this manual please contact bridge3ddesign@txdot.gov

Interfaces of OpenBridge Designer and OpenBridge Modeler

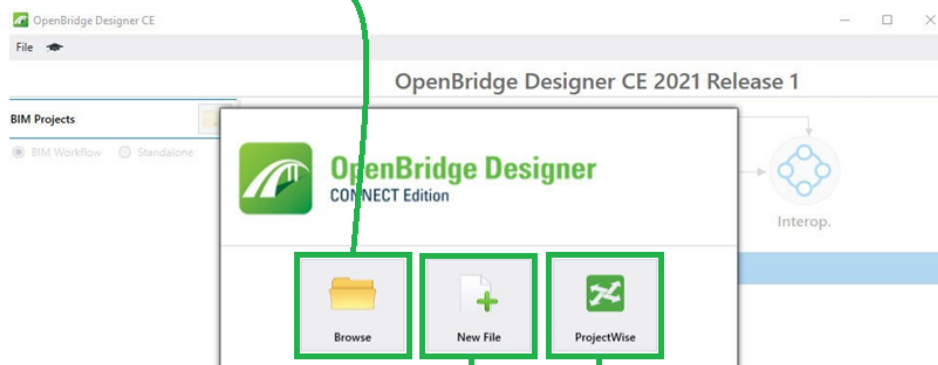
In this section the user will review the OpenBridge Designer and OpenBridge Modeler interface.

OpenBridge Designer Interface

If OpenBridge Designer is not getting used, please skip to page 8 or the next section to learn about the OpenBridge Modeler interface.

- Open OpenBridge Designer from the Desktop shortcut or the Start menu.
- The welcome page: In this page the user will have three options. Open a file, create a file, and login to ProjectWise (the user must first log-in to ProjectWise, if the files to be opened or created, are stored in ProjectWise)

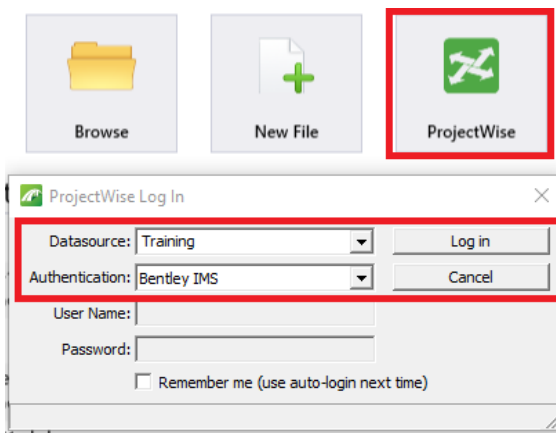
Press this to open existing OBD files stored locally or in ProjectWise



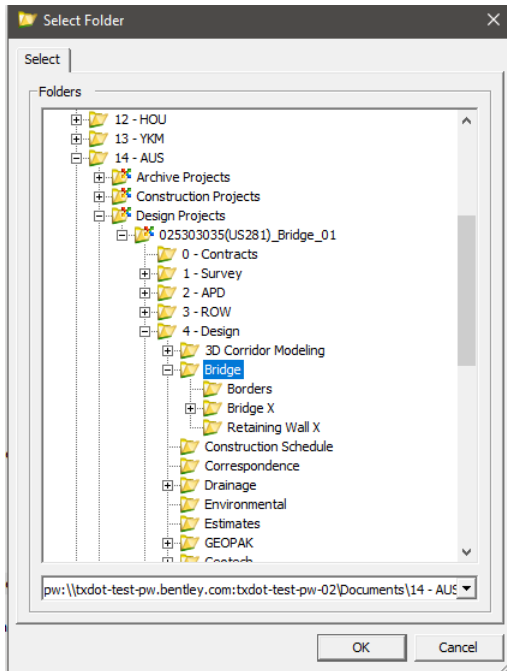
Press this to create new OBD files locally or in ProjectWise

Press this to login to ProjectWise (this needs to be done before opening or creating files)

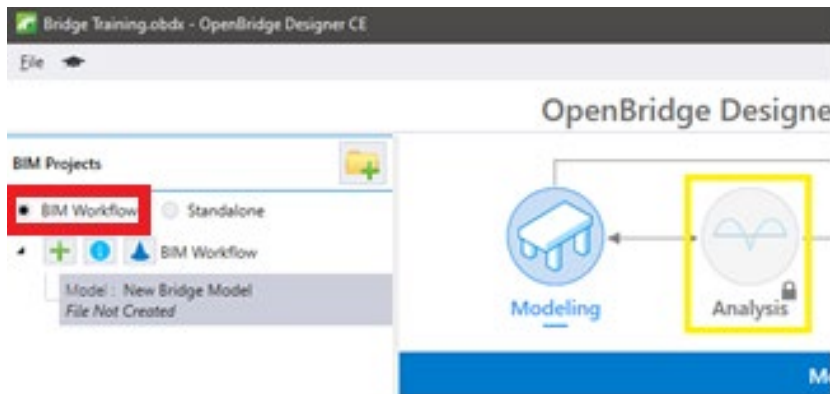
- Login to ProjectWise using the ProjectWise button. Make sure to NOT enable the auto-login option as this will cause possible inconveniences in the future. The datasource used for trainings is Training and the Authentication is always set to Bentley IMS.



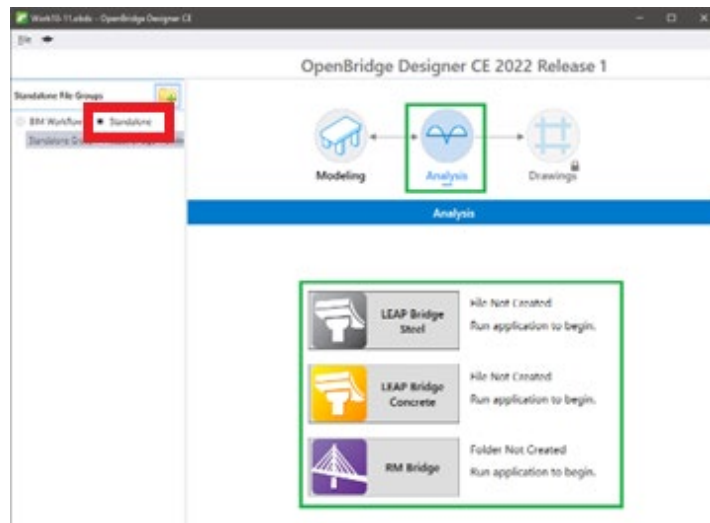
- Once logged in, press the **Browse** button, and navigate to **Documents\14 - AUS\Design Projects\025303035(US281)_Bridge_XX\4 - Design\Bridge** and open the OBD Interface.obdx file.
Note: The XX in the project name will be replaced by the user's initials.




- BIM Workflow: This workflow is used when the user wants to strictly manage all models using OpenBridge Modeler. In this workflow the user is not allowed to add LEAP or RM files.




- Standalone: This workflow is used when the user wants to create OpenBridge Modeler files. From OBM the models can be exported to LEAP or RM Bridge. The models can then be analyzed and designed. Model changes done in LEAP or RM will not be pushed back to OBM. In this workflow the user can select the Analysis group to add LEAP or RM files without having an OBM file first.



- Drawings: The Drawings button is only available in the BIM workflow. This button provides previews of drawings generated using the plan production tools in OBM. OBD will list all sheets created within the same OBM file when the Drawings button is pressed. For modifications to the sheets, the user needs to launch OBM and make the necessary modifications there. Please note that the TxDOT workflow separates the OBM File from the drawing and sheet files and this button may not be used.
- At the lower right-hand section of the OBD dialog box the user can find the ProjectWise Log-in status.

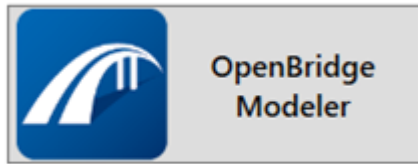
ProjectWise Status: Logged Out 

ProjectWise Status: Logged In 

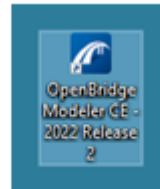
OpenBridge Modeler Welcome Interface

When the user opens **OpenBridge Modeler** from the OBD interface the user will first see the Welcome page.

- Open **OpenBridge Modeler** either by pressing the **OpenBridge Modeler** button in OBD or by double clicking the **OpenBridge Modeler** icon in the desktop or start menu.

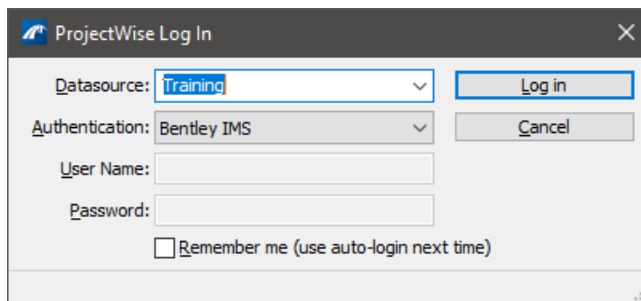


Icon in OpenBridge Designer



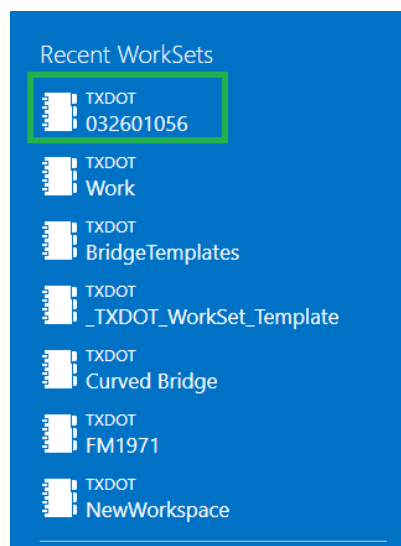
Icon in Desktop (Standalone OBM)

- When prompted, login to ProjectWise, the datasource used for trainings is Training and the Authentication is always set to Bentley IMS.



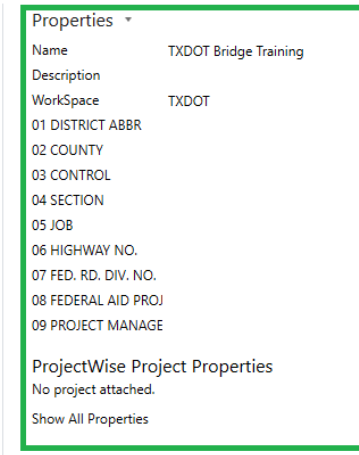
- Left Side Section: In this side of the welcome page, OBM will list the recently used WorkSets. The name of the Workspace assigned to the WorkSet is listed above the WorkSet name.

Note: The history will not be populated when working in ProjectWise.



- Right Side Section: In this side of the welcome page, OBM will report the properties of the selected WorkSet.

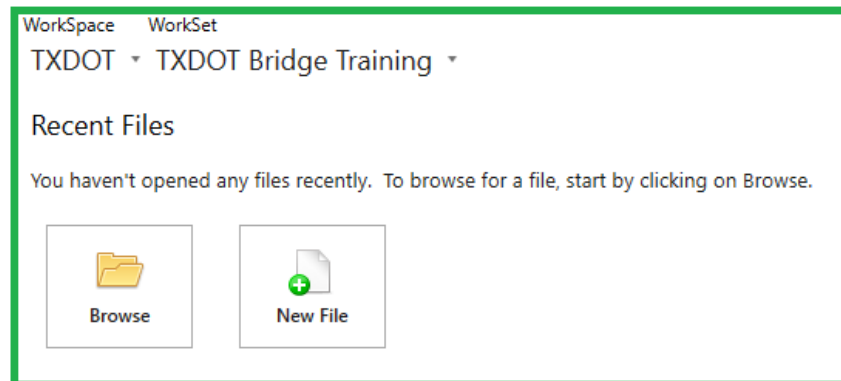
Note: The ProjectWise properties here refer to the ProjectWise 365 project, which is not the same as the ProjectWise Explorer application that is used in TxDOT.



- Middle Section: In this area of the welcome page, OBM will keep track of the previously opened files within the WorkSpace and WorkSet selected. In this section the user can also open existing files using the Browse button or create new files using the New File button.

Note: The file will appear if the user remains in the same OBM session and while the WorkSet is not changed. This may be lost if the WorkSet is changed, and the user will simply have to use the Browse button to open existing files.

OpenBridge Modeler CE

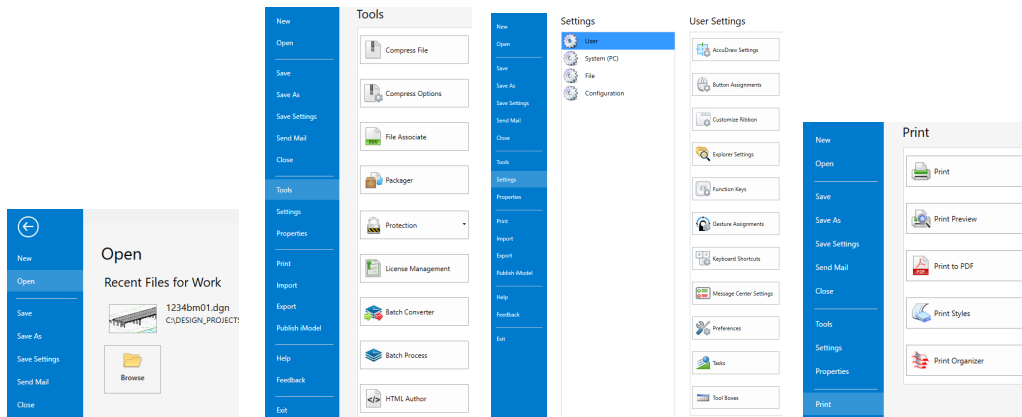


OpenBridge Modeler User Interface

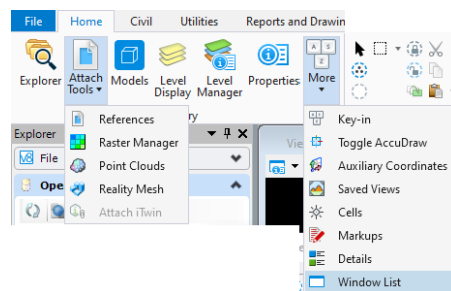
The OpenBridge Modeler interface is shared by MicroStation CONNECT Edition, ProStructures CONNECT Edition, and OpenRoads CONNECT Edition. The interface is now a ribbon-based interface leaving behind the Toolbox interface; however, toolboxes are still accessible for use.

The Ribbon is categorized by Tasks, in this guide we will go over the OpenBridge Modeler task interface.

- Continuing from the previous section, press the **Browse** button and navigate to **Documents\14 - AUS\Design Projects\025303035(US281)_Bridge_XX\4 - Design\Bridge\Bridge X** and open the OBM Interface.dgn. Accept the workspace reload when prompted and let the file load.
 - The File Tab or Backstage View: In this tab the user can access the “New”, “Open”, “Save”, “Save As”, “Save Settings”, “Print”, “Export”, “Import”, etc. The user can also find tools such as “Batch Convert”, “Batch Process”, “Packager”, and “Compress File”, etc. Finally, the user may also find “User Settings”, “File Settings”, and “Configuration Settings”.



- The Home Tab: In this tab the user will find all the tools to perform the activities of the Task selected. For this training manual we are focusing in the OpenBridge Modeler task, so the tools available in the Home tab are the tools to create and modify bridge models. The ribbon is separated by sections as follows:
 - Primary: This section contains the Reference, Raster, and Point Cloud attachments; Level Display and Level manager; Models; Key-In, Accu-draw, and Cells tools; Element Properties; and Explorer tool.



Note: Usually the icons will be small, but for this example the size was set to large.

- Selection: This section will contain the Cut, Copy and Paste which work with the clipboard. The section also contains the Select all, Select None, Select by Attributes, Place Fence and Fence manipulation tools, and Element lock and unlock tools.

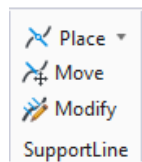


Note: Usually the icons will be small, but for this example the size was set to large.

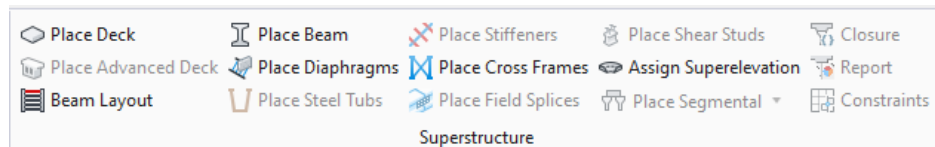
- Bridge Setup: This section has all the tools to setup a new bridge such as import geometry, add new bridge, add new unit, set the bridge alignment, set the bridge terrain, move bridge, and the add multi-unit bridge. In addition, the Bridge Wizard is also located in this section.



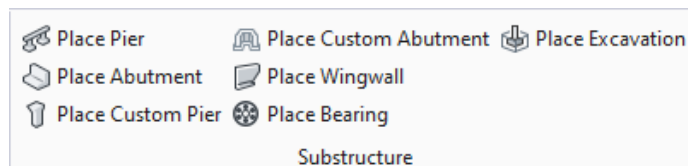
- Support Line: This section has all the tools for the placement and manipulation of support lines.



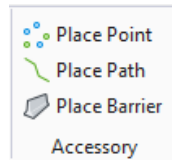
- Superstructure: This section has all the tools to place the superstructure of the bridge. Different tools become available when specific types of bridges are being modeled.



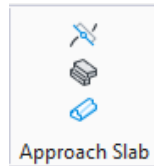
- Substructure: This section has all the tools to place substructure elements including excavation around footings, bearing pads and seats on abutment caps and interior bents.



- **Accessory:** This section contains all the tools to place ancillary structures such as traffic barriers, 3D cells for luminaries, overhead structures, and signs.

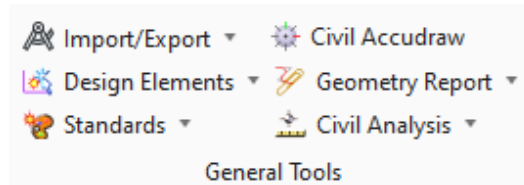


- **Approach Slab:** This section has the tools to place approach slabs and sleeper slabs. These tools require additional templates for the sleeper slabs.

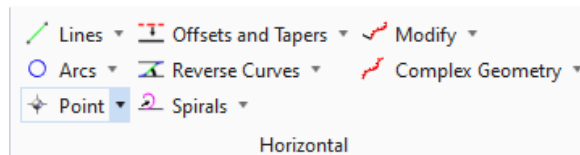


- **The Civil Tab:** In this tab the user will find all Civil tools needed to create a bridge geometry. However, it should be mentioned that all civil geometry should be created using ORD, this tab is strictly used to open dynamic views such as Cross Section or Profile views, and to open optional geometry reports such as Horizontal and Vertical reports, and Cross Section reports. The ribbon is separated by sections as follows:

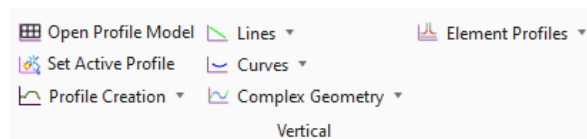
- **General Tools:** This section contains the tools to import and export geometry, apply and remove feature definitions to civil geometry, and the reporting and analysis tools.



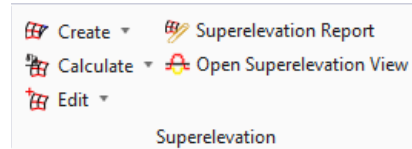
- **Horizontal:** This section has all the horizontal geometry tools. These tools are the same found in ORD. However, the number of tools is limited to what is needed to create a bridge. Additionally, these tools can be used to create riprap elements around abutments.



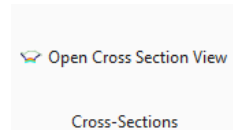
- **Vertical:** This section has all the vertical geometry tools. These tools are the same found in ORD. However, the number of tools is limited to what is needed to create a bridge. Additionally, these tools can be used to create riprap elements around abutments.



- **Superelevation:** This section has all the superelevation tools. These tools are the same found in ORD. However, the number of tools is limited to what is needed to create a bridge.



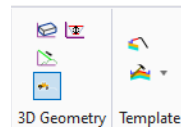
- **Cross-Sections:** The only tool available in this section is the Dynamic Cross Section viewer. This tool works the same as it does in ORD.



- **Terrain Model:** This section has all the terrain tools. These tools are the same found in ORD. However, the number of tools is limited to what is needed to create a bridge. Additionally, these tools can be used to create riprap elements around abutments.

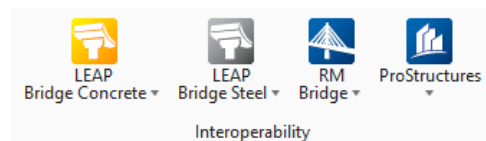


- **3D Geometry & Template:** These sections have the tools that can be used to create riprap elements around abutments when used along the horizontal, vertical, and terrain tools. These tools are the same found in ORD.

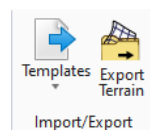


- **The Utilities Tab:** In this tab the user will find the interoperability tools which are used to transfer data to the analysis and detailing applications. Here the user will also find the import/export tools, templates tools, item types tools, and more. The ribbon is separated by sections as follows:

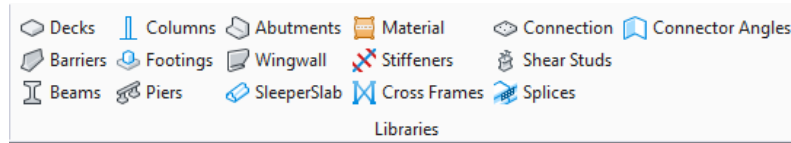
- **Interoperability:** This section has the tools to export and read-in the bridge information to and from LEAP and RM Bridge applications.



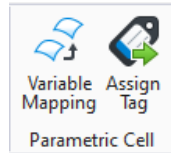
- **Import/Export:** This section has the tool to export and import superstructure and substructure templates, and to export the terrain model to different formats.



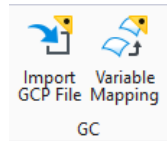
- Libraries: This section contains all the different template libraries used by OBM, in this section the user will create the different Deck, Beams, Barriers, Interior Bents, Abutments, and more templates used to create a bridge.



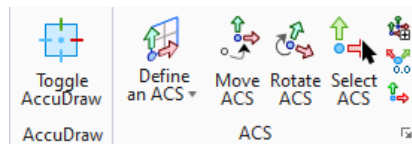
- Parametric Cell: This section contains the tools to map variables of parametric cells to select OBM variables and to tag certain elements of parametric cells as structural elements.



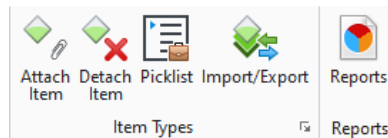
- Generative Component (GC): This section contains the tools for variable mapping for all generative components in OBM.



- Accu-draw & ACS: These sections have the Accu-draw toggle and the auxiliary coordinate system tools, these tools are the same as found in the Drawing task and in MicroStation.



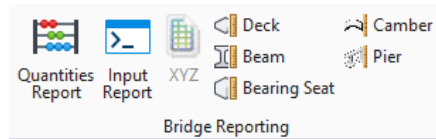
- Item Types & Reports: These sections have the item types that can be attached to elements of the OBM Model and the report tools to create reports used in the item types.



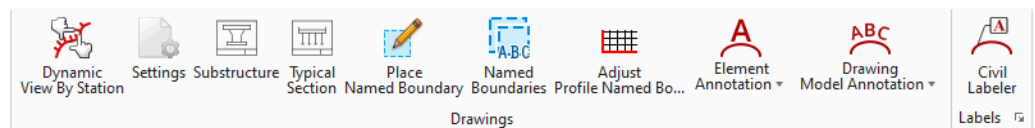
- The Reports and Drawings Tab: In this tab the user can find the plan production tools, reporting tools and other MicroStation tools such as measure, place line, and drawing scales.

The ribbon is separated by sections as follows:

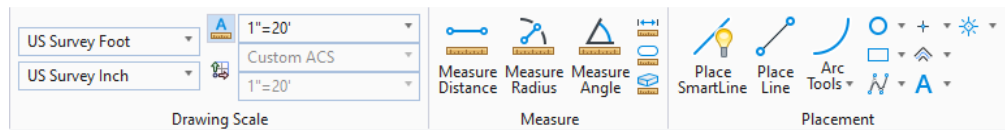
- Bridge Reporting: This section has the tools needed to create different types of reports for different structural elements of the bridge(s), in addition the user can create quantities report and input reports.



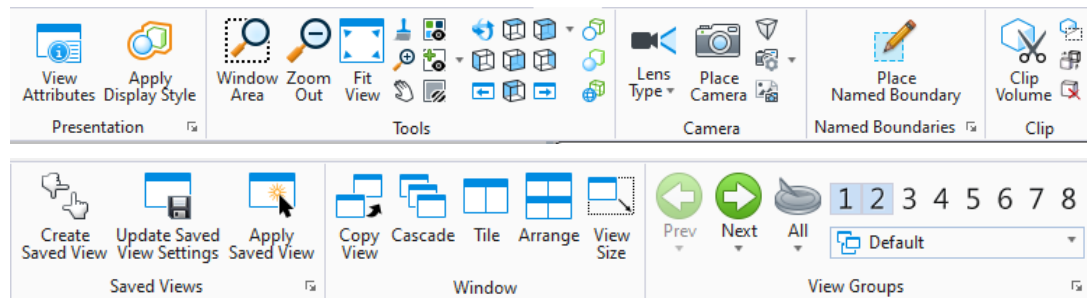
- Drawings & Labels: These sections contain all the tools to create drawings. Part of the tools are specific to OBM but the other tools are the same found in the plan production tools of ORD and MicroStation.



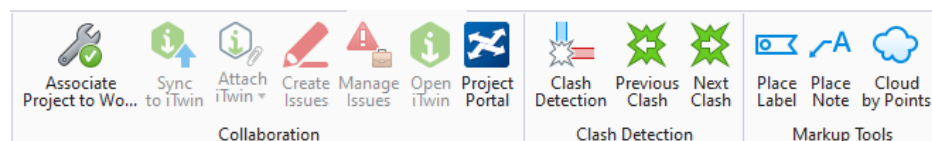
- Drawing Scale, Measure, and Placement: These sections have the same tools found in the Drawing task in OBM, ORD, and MicroStation. These tools can be used to change the annotation scale, place 2D/3D elements, and measure elements.



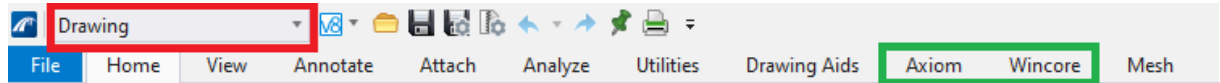
- The View Tab: This tab is common in all applications and tasks, and it has the same tools on all applications used in TxDOT. The user can find view manipulation tools, saved views, view clipping tools, and view navigation tools.



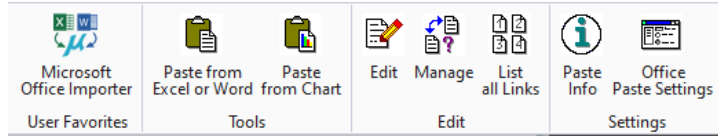
- The Collaborate Tab: This tab contains tools to connect the project with an iTwins project, to check the integrity of the model with clash detection and to markup or annotate the model during reviews.



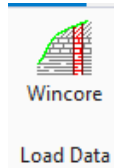
- TxDOT Custom Tools Tabs: These tabs will contain specific tools targeted only for TxDOT use. These tabs will only be found in the Drawing task because this task is common on all applications. Some of these tabs include Axiom, WinCore and possibly custom tools.



- Axiom Tab: To import Excel, Word, and Powerpoint data into 2D drawings only.



- WinCore Tab: To be used in 2D drawings only.



For additional information on the individual tools consult the OpenBridge Modeler help documents here:

[OpenBridge Modeler Help \(bentley.com\)](http://bentley.com)

Creating a Bridge Models – One element at a time.

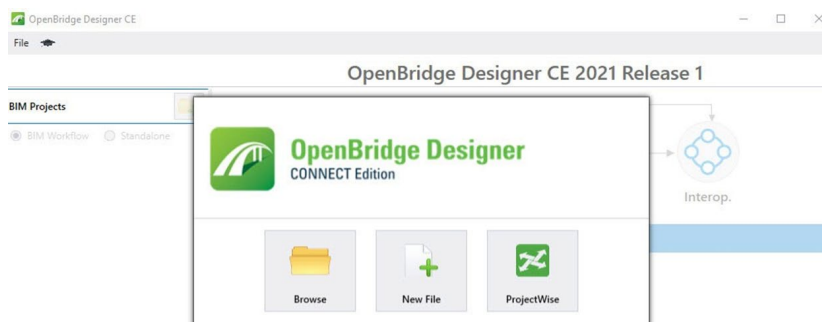
Now that we are familiar with the OpenBridge Interface we will proceed to create a new Bridge Model without using the Bridge Wizard. This section will use a workflow that strictly saves the files in ProjectWise and the local environment will not be used. In this section we will be creating one Precast Model and one Steel Model to review all the tools.

Note: This section will not guide the user on how to create terrain files and 3D alignment geometry for the bridges, the assumption is made that these files have been previously created by the Roadway group. To learn how to create these files and more using ORD please enroll to the [DES750: OpenRoads Designer for Plan Development training in Peoplesoft](#).

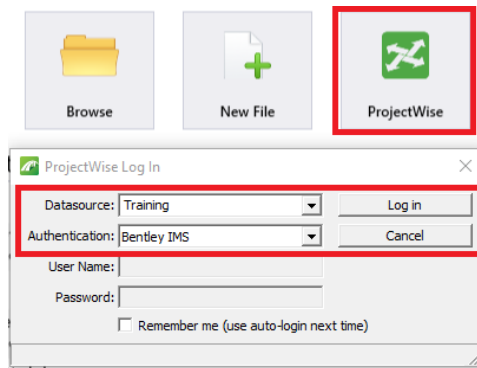
Create a New OpenBridge Designer File

If OpenBridge Designer is not getting used, please skip to page 20 or next section to start with OpenBridge Modeler.

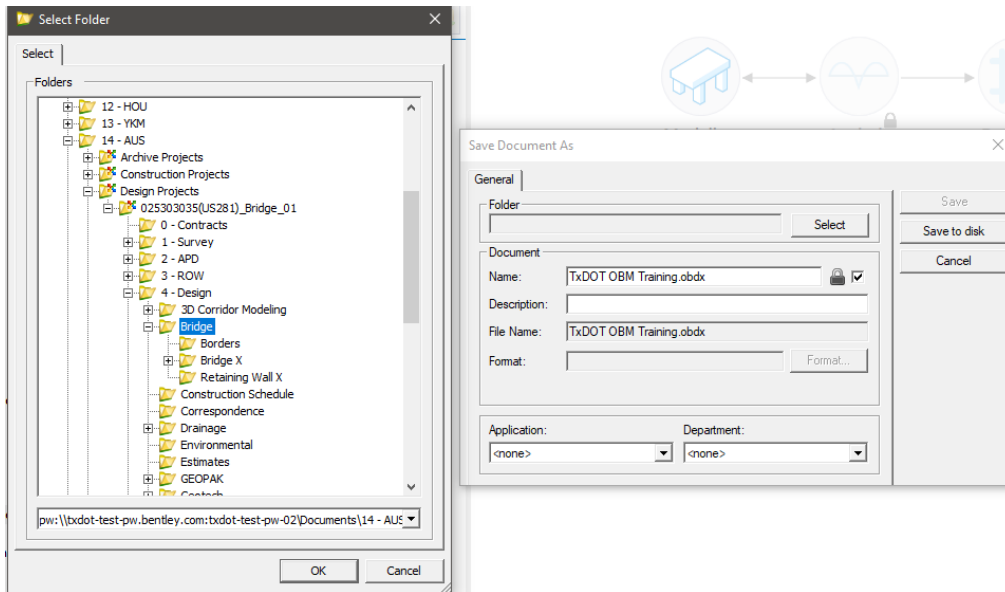
- Close all sessions of OBM and then close and re-open **OpenBridge Designer**.



- Login to ProjectWise using the ProjectWise button. Make sure to NOT enable the auto-login option as this will cause possible inconveniences in the future. The datasource used for trainings is Training and the Authentication is always set to Bentley IMS.



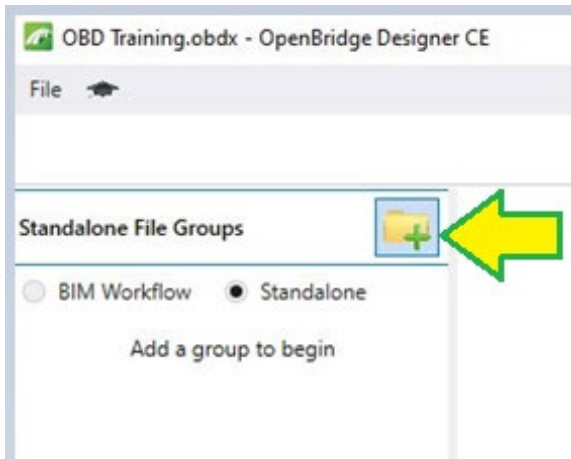
- Once logged in, press the **New File** button, and save the new OBDX file called *TxDOT OBM Training.obdx* in the Bridge folder of the ProjectWise Training Work Area assigned to the user.



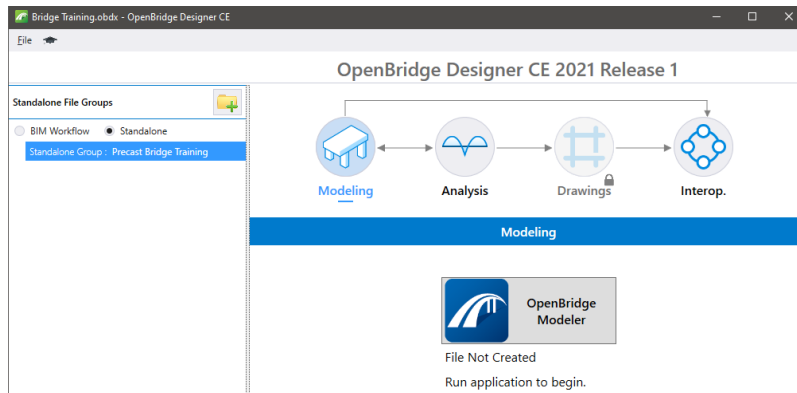
- Once the file is saved, select the **Standalone Workflow**.



- Select the **Add Standalone Group** icon.



- Use a named that describes the type of work that is going to be stored in the group. For this training use **Precast Bridge Training**.

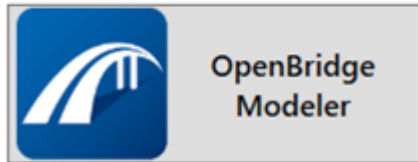


- Click the OpenBridge Modeler Button to run the application.

Create a New OpenBridge Modeler File

When working in ProjectWise the workspace and workset is setup automatically, the section can be ignored, and the user can proceed to create a new OBM file or to open an OBM file. For this training we will ignore the workspace and workset and use the new file button because the training is stored in projectwise.

1. If OBM is open, close and re-open **OpenBridge Modeler** either by pressing the **OpenBridge Modeler** button in OBD or by double clicking the **OpenBridge Modeler** icon in the desktop or start menu.

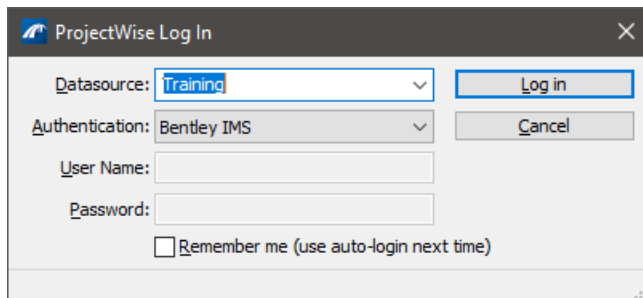


Icon in OpenBridge Designer

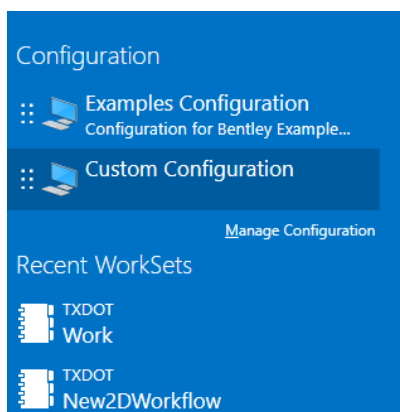


Icon in Desktop (Standalone OBM)

2. When prompted, login to ProjectWise, the datasource used for trainings is Training and the Authentication is always set to Bentley IMS.



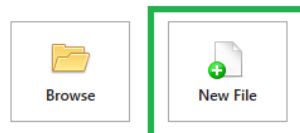
3. Once OBM is loaded, ignore the *WorkSpace* and the *WorkSet* area. Press the **New File** to create a new OBM file.



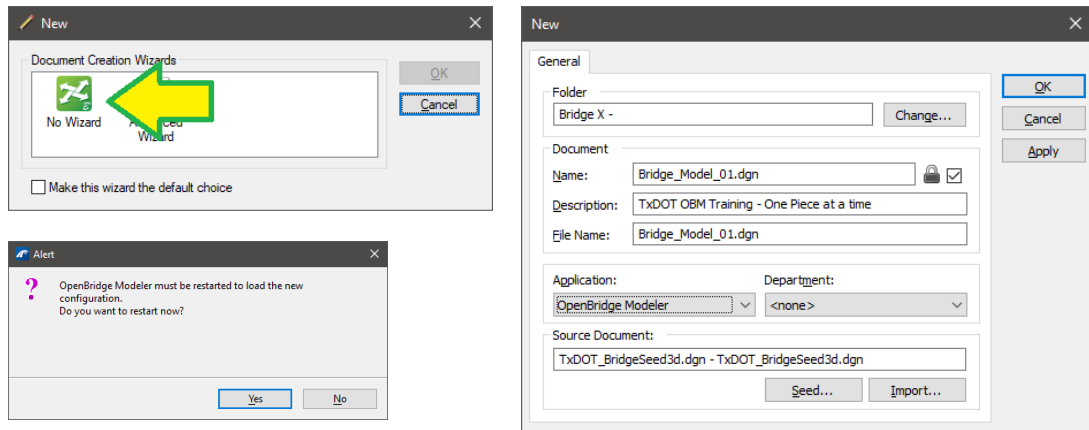
OpenBridge Modeler CE



You haven't opened any files recently. To browse for a file, start by clicking on Browse.



4. During the file creation verify that the TxDOT_BridgeSeed3d.dgn seed file is selected and save the file to the correct path as shown below.
 - File creation method: **No Wizard**
 - Browse to **Documents\14 - AUS\Design Projects\025303035(US281)_Bridge_XX\4 - Design\Bridge\Bridge X**
 - Verify that the Seed is **Documents_Resources\ClientWorkspaces\TxDOT\TxDOTConnect10.12\Organization-Civil\TxDOT_Bridge\OpenBridge Modeler\Seed\TxDOT_BridgeSeed3d.dgn**
 - Key-in the new file name **Bridge_Model_01.dgn**.
 - Set the application to **OpenBridge Modeler**
 - When prompted accept the reload of the workspace.



Create a Bridge with Concrete Superstructure.

1. Once the file is created, proceed to attach the geometry files and terrain file as references. These files will be used in the creation of the new bridge.

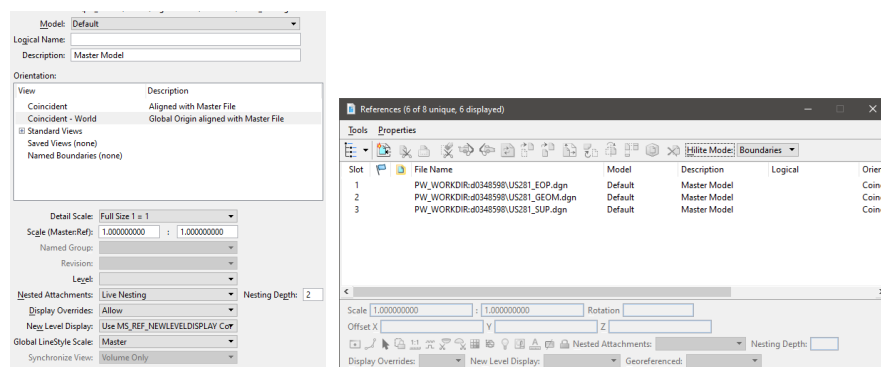
Note: Only the horizontal and vertical alignments are required to create a bridge, but this training will also utilize terrain files to refine substructure footings, excavation geometries, and rip rap.


- Attach horizontal and vertical alignments:

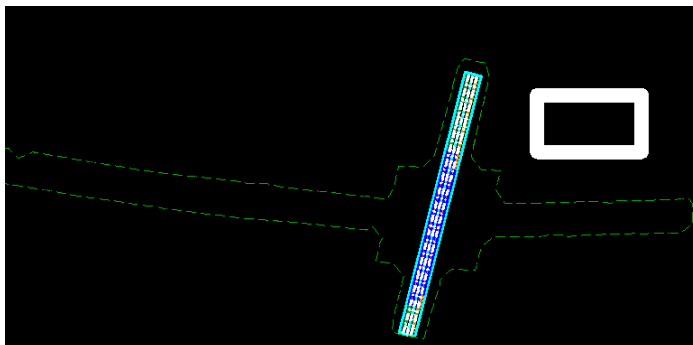
3D Corridor Modeling\Geometry\US281_GEOM.dgn

Note: As instructed by DES750, the terrain should be attached to the geometry file and made active there for the strip elevations to work, there is no need to attach the terrain as separate file.

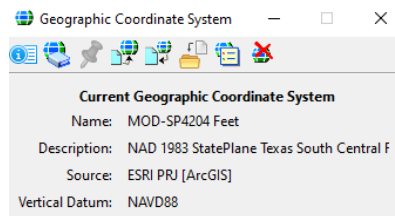
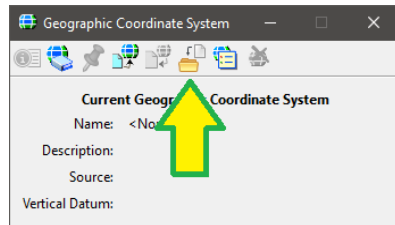
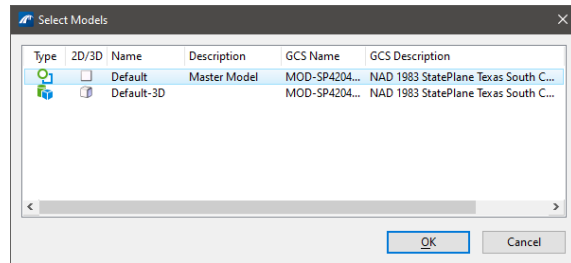
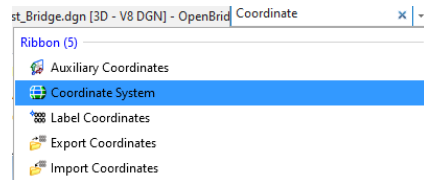
- Optional Attachment Edge of Pavements: **3D Corridor Modeling\Geometry\US281_EOP.dgn**
- Optional Attachment Superelevation shapes: **3D Corridor Modeling\Geometry\US281_SUP.dgn**
- Attachment Options:
 - Model Name: **Default**
 - Orientation: **Coincident - World**
 - Detail Scale: **Full Scale 1:1**
 - Live Nesting: **2**



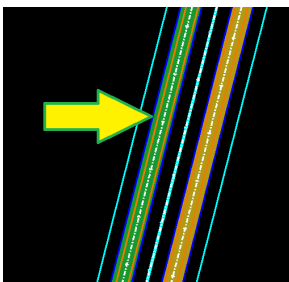
2. Once all files have been attached, press the **Fit View**  icon to fit the view around all attachments. Also, click **File > Save Settings** to automatically see the project extents when opening the file.



3. We need to set the GeoCoordinate system of the OBM file to match the GeoCoordinate definition of the reference files. To do so use the *Search Ribbon*.
 1. Key in: *Coordinate*
 2. Select from the results: *Coordinate System*
 3. In the dialog use the *From File* icon
 4. Navigate to *3D Corridor Modeling\Geometry\US281_GEOM.dgn*
 5. Select the appropriate Coordinate Systems and press OK.
 6. Once the correct Coordinate System is selected (shown below) close the window.



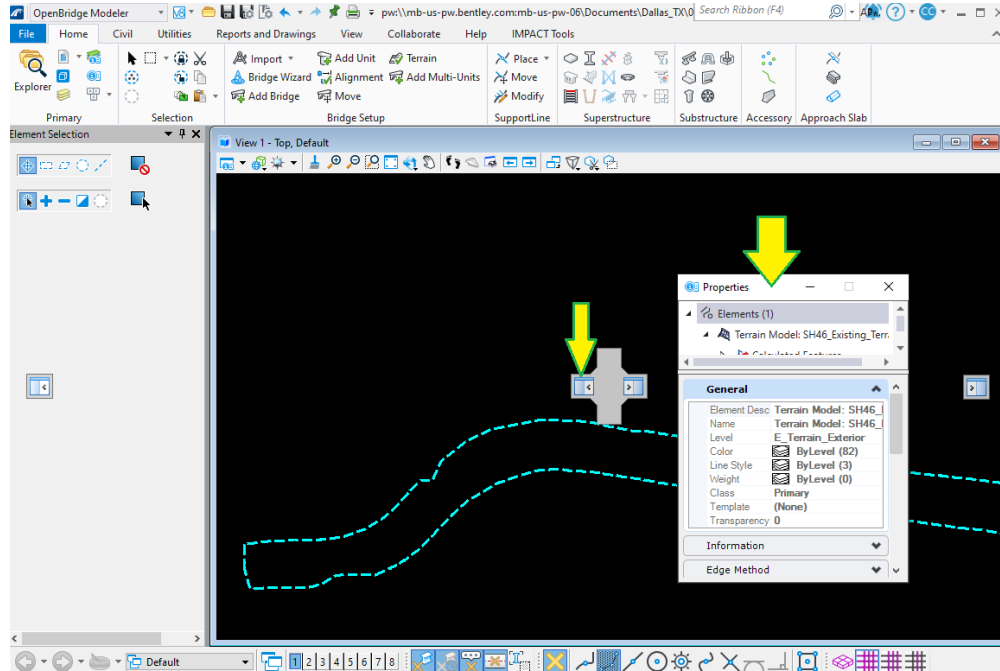
4. This dataset is used for other trainings in TxDOT, for this OBM training we will be focusing on the US281 Southbound and Northbound Main Lanes Overpass bridge.



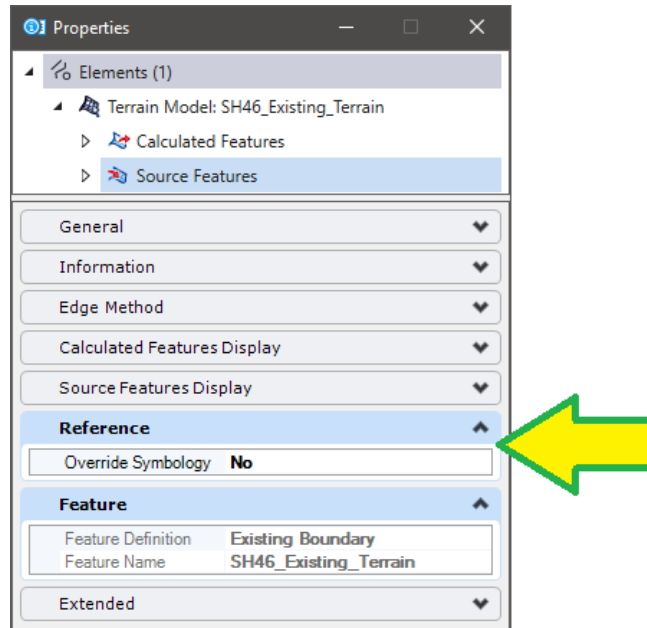
5. Enable the Terrain contours.
 - Select the green boundary of the terrain.
 - Open the properties dialog box.



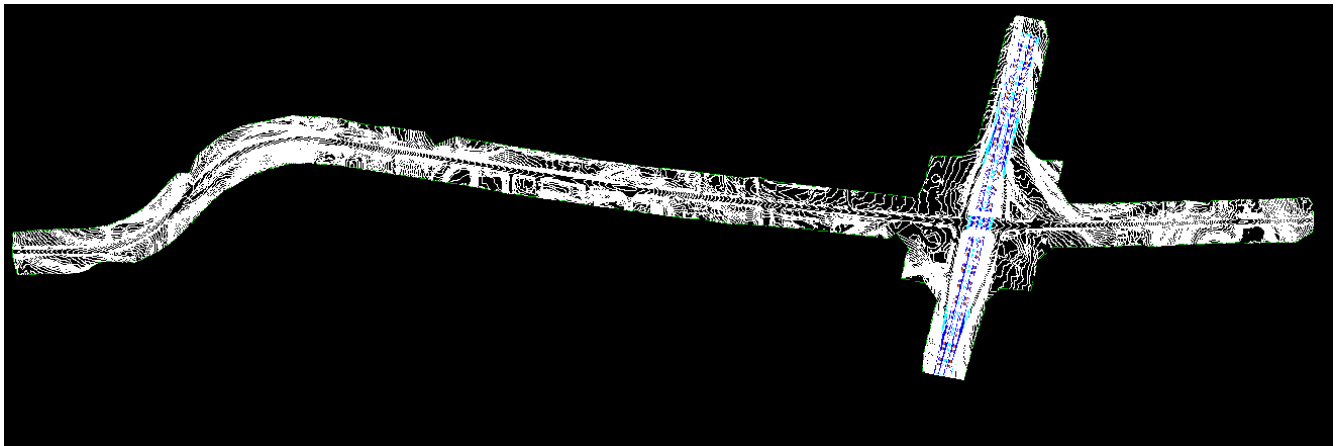
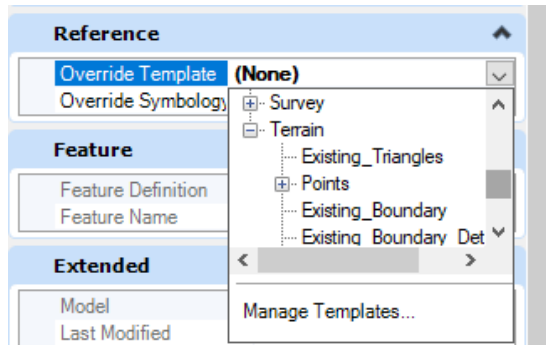
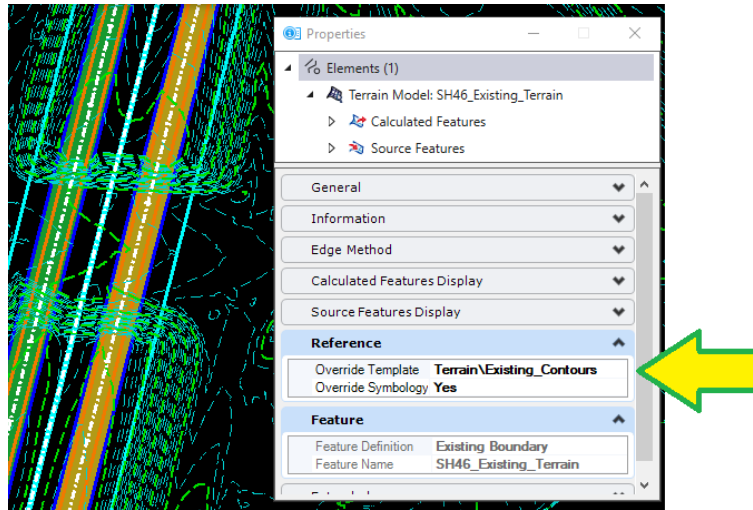
Note: The properties dialog box is used constantly in this training, it is recommended to dock the dialog box around the working area. This is done by clicking and dragging the Properties dialog, then choosing which side of the screen to dock to. This is shown below.



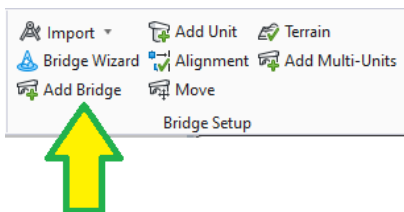
- In the properties dialog box, locate the **Reference** section.



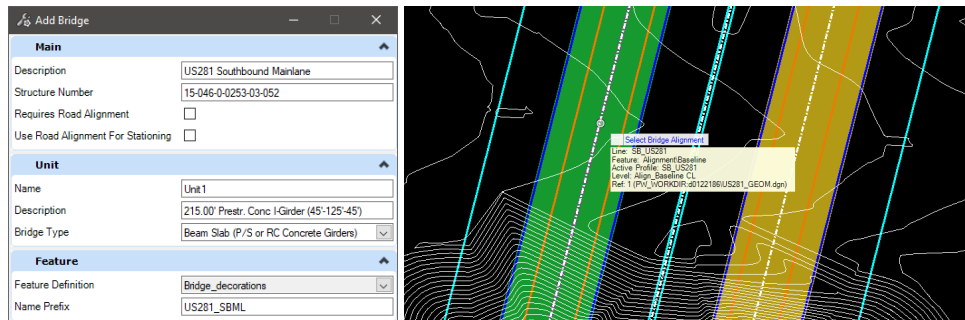
- In the Reference section, change the **Override Symbology** to **Yes** and the **Override Template** to **Terrain\Existing Contours**.



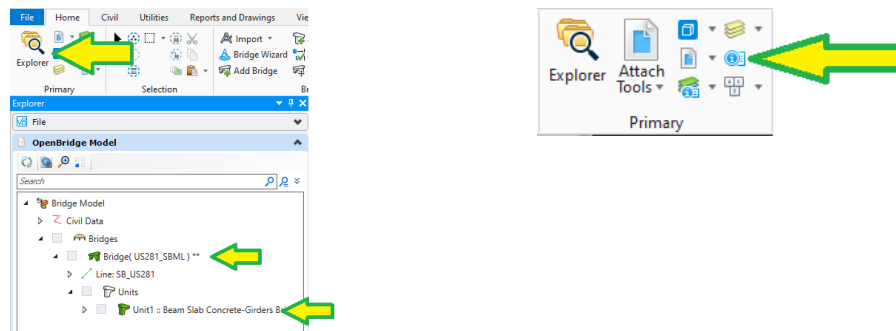
6. Create the Bridge placeholder by selecting the **Add Bridge** button.



- Description: **US281 Southbound Mainlane**
- Structure Number: **15-046-0-0253-03-052** [This is the NBI Number]
- Requires Road Alignment: **False**
- Use Road Alignment For Stationing: **False**
- Unit Name: **Unit 1**
- Unit Description: **215.00' Prestr. Conc. I-Beam Unit (45'-125'-45')**
- Unit Bridge Type: **Beam Slab (P/S or RC Concrete Girders)**
- Feature Definition: **Bridge_decorations**
- Name Prefix: **US281_SBML**
- Select the alignment for the US281 SBML, then accept by pressing the left mouse button anywhere in the screen.

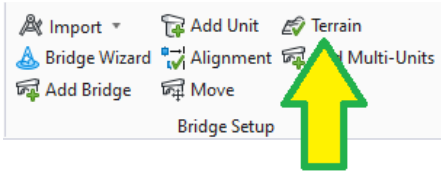


- After the bridge placeholder is created, verify it appears in the project explorer. The user can review the entered information by selecting the bridge or the unit in the explorer, the information will appear in the properties dialog box.

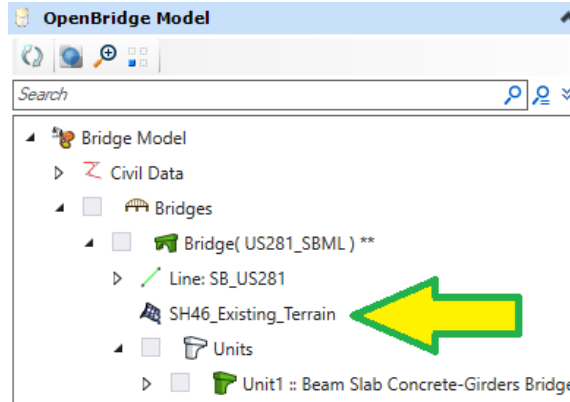


Note: To rename the bridge or unit, the user needs to right-click the element from the explorer and select **Rename**. Other information can be changed in the properties dialog box while the element is selected. When more than one unit or bridge exist in the file the user needs to make that unit or bridge active to make changes. Bridges and units can be made active by right clicking on the unit or bridge and selecting **Make Active**.

7. Set the terrain as active terrain for the bridge using the **Terrain** button.

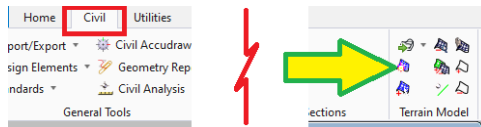


- Click on any part of the terrain boundary of the file to accept. Once the terrain has been made active it will also appear under the bridge name in the project explorer.

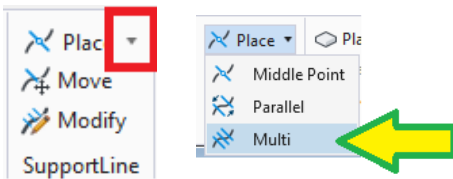


Note: If the terrain name does not appear, close and reopen the explorer to refresh the contents.

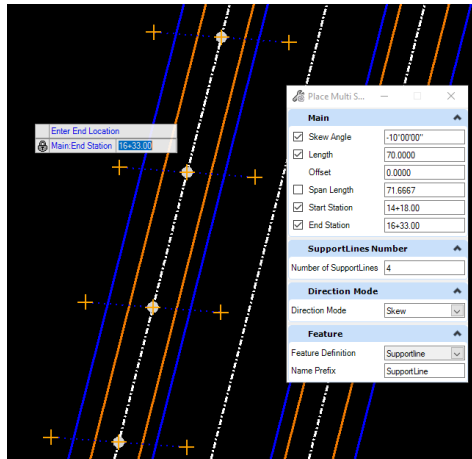
- Additionally, set the terrain active to the civil features using the available civil tools in OBM. Select the terrain boundary to accept.



8. Next, we need to add the **SupportLines**. **SupportLines** define the locations of the start/end of the bridge and the substructure abutments/bents. Return to the **Home** tab, press the down arrow next to the **Place** button in the **SupportLine** section and select the **Multi** tool.



- Skew Angle: **-10°00'00"**
- Length: **70 [this is for the support line]**
- Start Station: **14+18.00**
- End Station: **16+33.00**
- Number of SupportLines: **4**
- This will require 3 clicks, 1 for start station, 1 for skew, and 1 for end station.

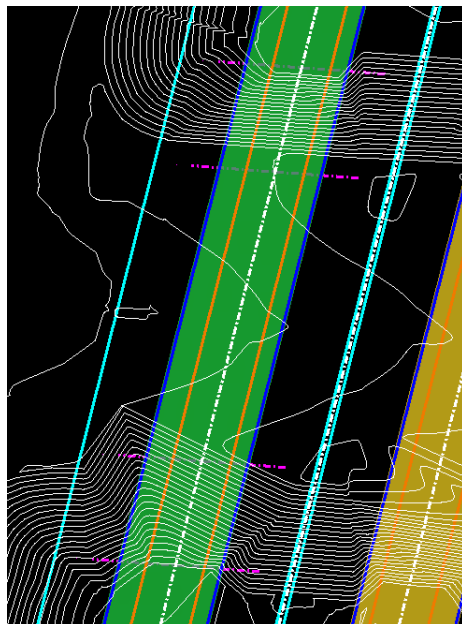


In the **Place Multi SupportLines** dialog

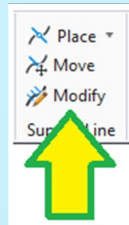
- Change the support line names to reflect the type of support (e.g. Abutment #, Bent #)
- Change the span lengths as shown in the image below
- Span 1: **45'**
- Span 2: **125'**
- Span 3: **45'**

#	Name	Station	Angle	Span Length	Length	Horizontal O...
1	Abutment1	14+18.00	-10°00'00"	0.0000	70.0000	0.0000
2	Bent2	14+63.00	-10°00'00"	45.0000	70.0000	0.0000
3	Bent3	15+88.00	-10°00'00"	125.0000	70.0000	0.0000
4	Abutment4	16+33.00	-10°00'00"	45.0000	70.0000	0.0000

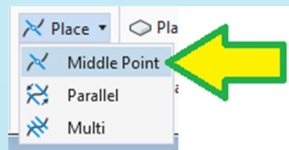
- Press **OK** once all changes are completed. Press the right button of the mouse to end the place multi support line tool.



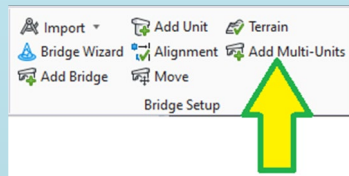
Knowledge Tip: If the support lines need to be modified, press the Modify button of the SupportLine section of the ribbon.



Knowledge Tip: If the user needs to insert a span, this can be done by adding a support line in between the existing supports lines using the Place > Middle Point tool from the SupportLine section of the ribbon.

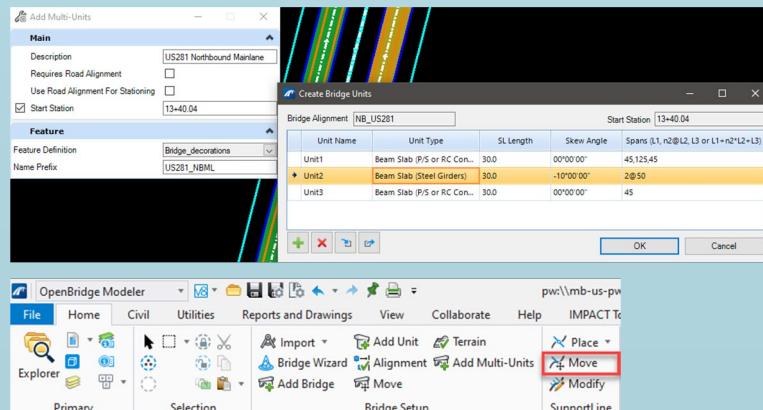


Knowledge Tip: A bridge can also be created with the Add Multi-Units button, this will allow the user to place a new bridge and define multiple types of units and spans. This tool merges the Add Bridge and Place Support lines into one.



- User needs to provide Bridge Description, Bridge Name Prefix, Start Station*
- User needs to know the span lengths, beam types, skew angles.

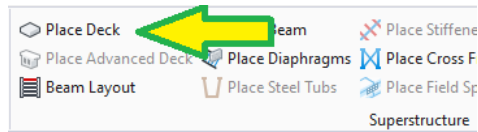
*The station input does not work. The user will have to eyeball the start station then use the Move SupportLine tool to move the bridge to the correct station.



9. Once the **SupportLines** have been placed, the next step is to place the deck.

Note: If multiple units exist in the bridge, the placement of any bridge element can only be performed on the active unit. The active unit appears with a green icon **Unit1** in the project explorer.

- Press the **Place Deck** button in the *Superstructure* section.

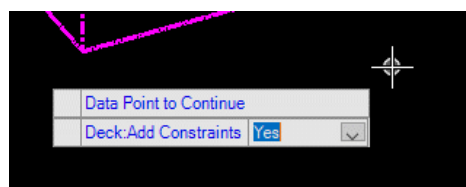
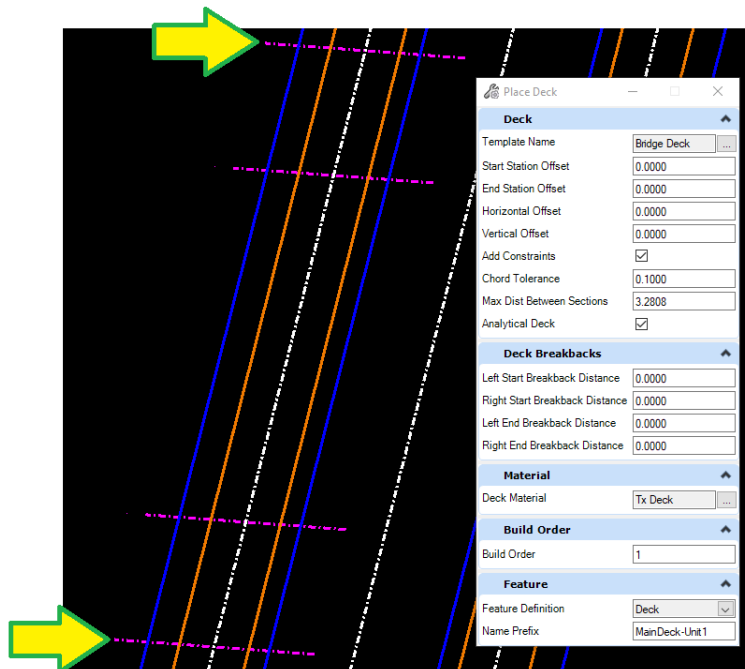


- In the *Place Deck* dialog box.

- Template Name: *Standard Templates\TxDOT Decks\Bridge Deck [...]*
- Add Constraints: *True*
- Analytical Deck: *True*
- Deck Material: *Tx Deck [...]*
- Deck Breakbacks: *0 [zero]*
- Name Prefix: *MainDeck-Unit1*

Note: Deck breakbacks are only needed for skews greater than 15° and usually the start and end values are set to 2.000.

- Select the first and last **SupportLines**, a single click per support line. Be sure that the support line gets highlighted. Click one more time to accept and the Variable Constraints window will open.



- Four columns are shown on the left side of the dialog: variable name, active, default, and errors.

Variable	Active	Default	Errors
LT_Slope_Lane1	<input checked="" type="checkbox"/>	0.0200	
LT_Width_Lane1	<input type="checkbox"/>	-13.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input type="checkbox"/>	13.0000	
Thickness	<input type="checkbox"/>	-0.7083	

- The default column shows the values that were used to create the template, these fields cannot be changed.
- To modify the template, select the variable name, then toggle the active check mark. The right side of the dialog will show a table.

Variables

Variable	Active	Default	Errors
LT_Slope_Lane1	<input checked="" type="checkbox"/>	0.0200	
LT_Width_Lane1	<input type="checkbox"/>	-13.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input type="checkbox"/>	13.0000	
Thickness	<input type="checkbox"/>	-0.7083	


14+18.00 - 16+33.00 Bridge Deck LT_Slope_Lane1 Default = 0.0200

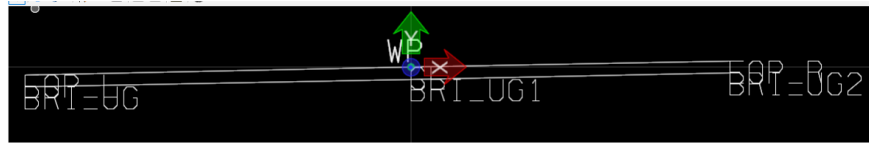
Expanded View Grid View

Add Section Mode: SupportLine 0.0000 From Abutment1 + Delete Selected

Copy To Variable

Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition

- To add rows to the table the user needs to press the green plus sign .
- Use the information below to define the following variation constraints.
 - LT_Width_Lane1: **-23 [Start to End]**
 - RT_Slope_Lane1: **+2% [0.02][Start to End]**
 - RT_Width_Lane1: **+19 [Start to End]**



Variable	Active	Default	Errors
LT_Width_Lane1	<input checked="" type="checkbox"/>	-13.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input checked="" type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input checked="" type="checkbox"/>	13.0000	
Thickness	<input type="checkbox"/>	-0.7083	

Add Section Mode: SupportLine 0.0000 From Abutment1 + Delete Selected

Copy To Variable

Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Abutment1	14+18.00	16+33.00	215.0000	-23.0000	-23.0000	Linear

Variable	Active	Default	Errors
LT_Slope_Lane1	<input type="checkbox"/>	0.0200	
LT_Width_Lane1	<input checked="" type="checkbox"/>	-13.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input checked="" type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input checked="" type="checkbox"/>	13.0000	
Thickness	<input type="checkbox"/>	-0.7083	

Add Section Mode: SupportLine 0.0000 From Abutment1 + Delete Selected

Copy To Variable

Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Abutment1	14+18.00	16+33.00	215.0000	0.0200	0.0200	Linear

Variable	Active	Default	Errors
LT_Slope_Lane1	<input type="checkbox"/>	0.0200	
LT_Width_Lane1	<input checked="" type="checkbox"/>	-13.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input checked="" type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input checked="" type="checkbox"/>	13.0000	
Thickness	<input type="checkbox"/>	-0.7083	

Expanded View Grid View

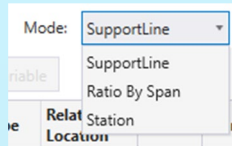
Add Section Mode: SupportLine 0.0000 From Abutment1 + Delete Selected

Copy To Variable

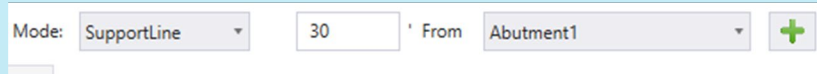
Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Abutment1	14+18.00	16+33.00	215.0000	19.0000	19.0000	Linear

Click OK to apply the changes and close the Variable Constraints window.

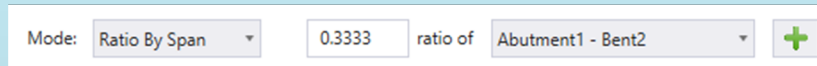
Knowledge Tip: In addition to SupportLine, the variations to the deck can also be applied by ratio and by station.



- SupportLine Mode uses the **SupportLine** selected in the **From** field as the start limit, if a value is provided where the zero is, the variation will start that far from the support selected. For example, the image below shows variable starting 30' from the Abutment1.

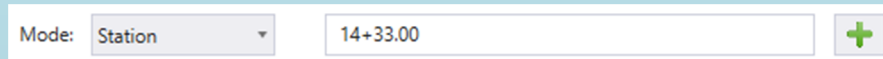


- Ratio by Span Mode uses a specific span selected as the overall span length and the value provided is a ratio of the total span. For example, the image below shows a variable applied to 15' of Span 1 [15'/45'=0.33333].



Note: This option is not recommended to be used for decks, this is usually used in Beams and Cross frames.

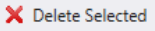

- Station Mode uses a station to determine where a section of the variation will start.

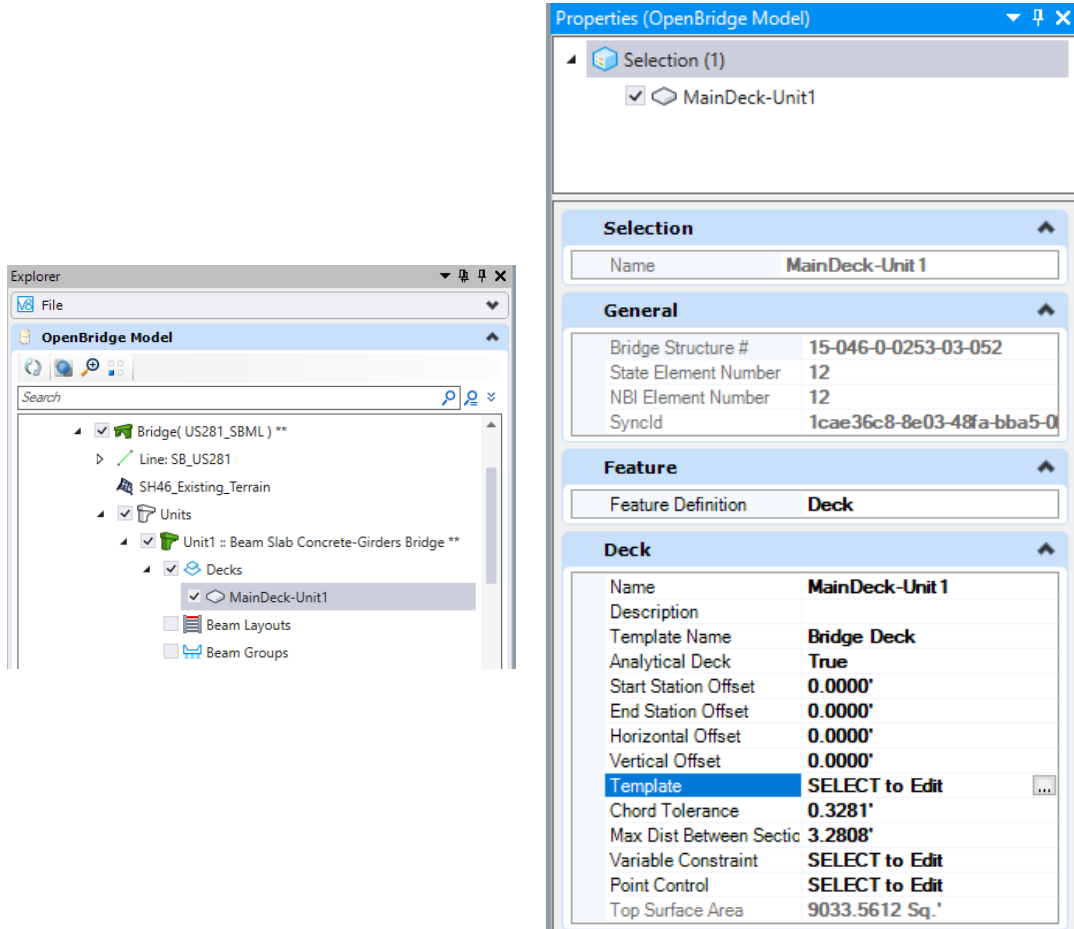


Note: Any portion of the deck before the starting station will be using the default values.

- The start and end values are the values that the user needs to provide. For example, the image below shows a slope transitioning from -2% to +2% only in Span 2 (Bent2 – Bent3).

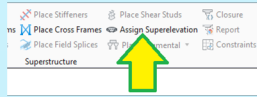
Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Abutment1	14+18.00	14+63.00	45.0000	-0.0200	-0.0200	Linear
SupportLine	0.0000	Bent2	14+63.00	15+88.00	125.0000	-2.0000	0.0200	Linear
SupportLine	0.0000	Bent3	15+88.00	16+33.00	45.0000	0.0200	0.0200	Linear

Note: If a row was added by mistake, simply select the row (highlighted in blue) and press the **Delete Selected** . If the deck variables need to be modified, select the deck and in the properties press the **SELECT to Edit** button  next to the **Variable Constraint** field.



Knowledge Tip: The cross slopes and deck width can also be applied by using the ORD elements such as edge of pavement lines and superelevation shapes when available.

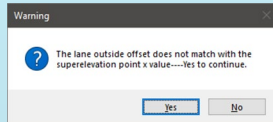
- To apply the cross slope using a superelevation shape, use the **Assign Superelevation** tool.



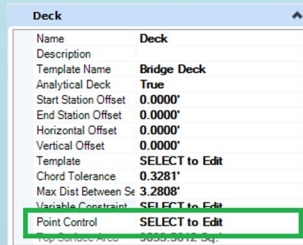
- The user will click on the cyan boundary of the superelevation shapes, then reset to accept selection. Once the superelevation shape is selected, the user will need to click on the deck element to apply it and a superelevation table will appear, press OK to accept the changes.

Lanes	Lane Detail	Offset	Pivot Point	Start Station	End Station	Start Slope	End Slope	Station & Slope Detail	Template Point
SB_EOP_L1	Station	24.0000	CL	14+18.00	16+33.00	0.0200	0.0200	Station	EOP_L
SB_EOP_R	Station	20.0000	CL	14+18.00	16+33.00	0.0200	0.0200	Station	EOP_R

- If a warning appears, simply click yes to continue.



- To apply the deck width using point controls, select the deck and in the properties, dialog locate the **Deck** section, in that section find the **Point Control** and press the button to edit [...].

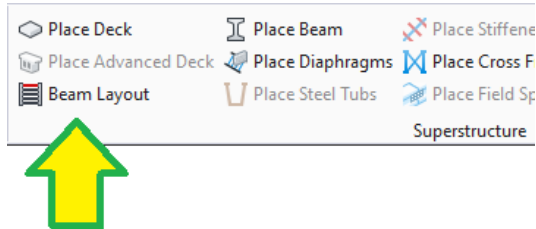


- In the point control dialog, the user can control the different points of the deck with elements created in ORD or using the civil tools in OBM. The points can be control horizontally, vertically, or both. To add a point control, select the direction from the drop-down menu, then click the **Select** button to identify the plan element in the screen. Once identified the plan element name will appear in the Path column.

Point Name	Direction	Path
CL	None	
EOP_R	Horizontal	RdEOP_SB_L1
BRL_UG2	None	
BRL_UG1	None	
BRL_UG	None	
EOP_L	None	

- When the user finishes making the selection press the **Apply** button to apply all changes and then press **Close** to close the dialog box.

10. After the deck is placed press the right-click button to end the deck placement tool, the next step is to place the beam layout. To do this press in the **Beam Layout** button, and then identify the limits of the deck using the **SupportLines**, like what was done in the step before.



Input the following values into the Beam Layout window:

- Span 1 [*Abutment1 – Bent2*]
 - Number of Beams: **6**
 - Edge Distance: **3.000**
 - Equal Edge Distance: **True**
 - Same Beam Start/End Values: **False**
 - Click Apply.
 - Beam Start - SL Offset("): **3.000**
 - Beam Start - Skew Ends: **True**
 - Beam End - SL Offset("): **-3.000**
 - Beam End - Skew Ends: **False**
- Span 2 [*Bent2 - Bent3*]
 - Number of Beams: **8**
 - Edge Distance: **3.000**
 - Equal Edge Distance: **True**
 - Same Beam Start/End Values: **False**
 - Click Apply.
 - Beam Start - SL Offset("): **3.000**
 - Beam Start - Skew Ends: **False**
 - Beam End - SL Offset("): **-3.000**
 - Beam End - Skew Ends: **False**
- Span 3 [*Bent3 – Abutment4*]
 - Number of Beams: **6**
 - Edge Distance: **3.000**
 - Equal Edge Distance: **True**
 - Same Beam Start/End Values: **False**
 - Click Apply.
 - Beam Start - SL Offset("): **3.000**
 - Beam Start - Skew Ends: **False**
 - Beam End - SL Offset("): **-3.000**
 - Beam End - Skew Ends: **True**

Spans

Default Span: Abutment1 - Bent2

Number Of Beams: 6

Edge Distance ('): 3.0000

Apply Equal Edge Distance

Set All To Default
 Show Overhang Lengths (')

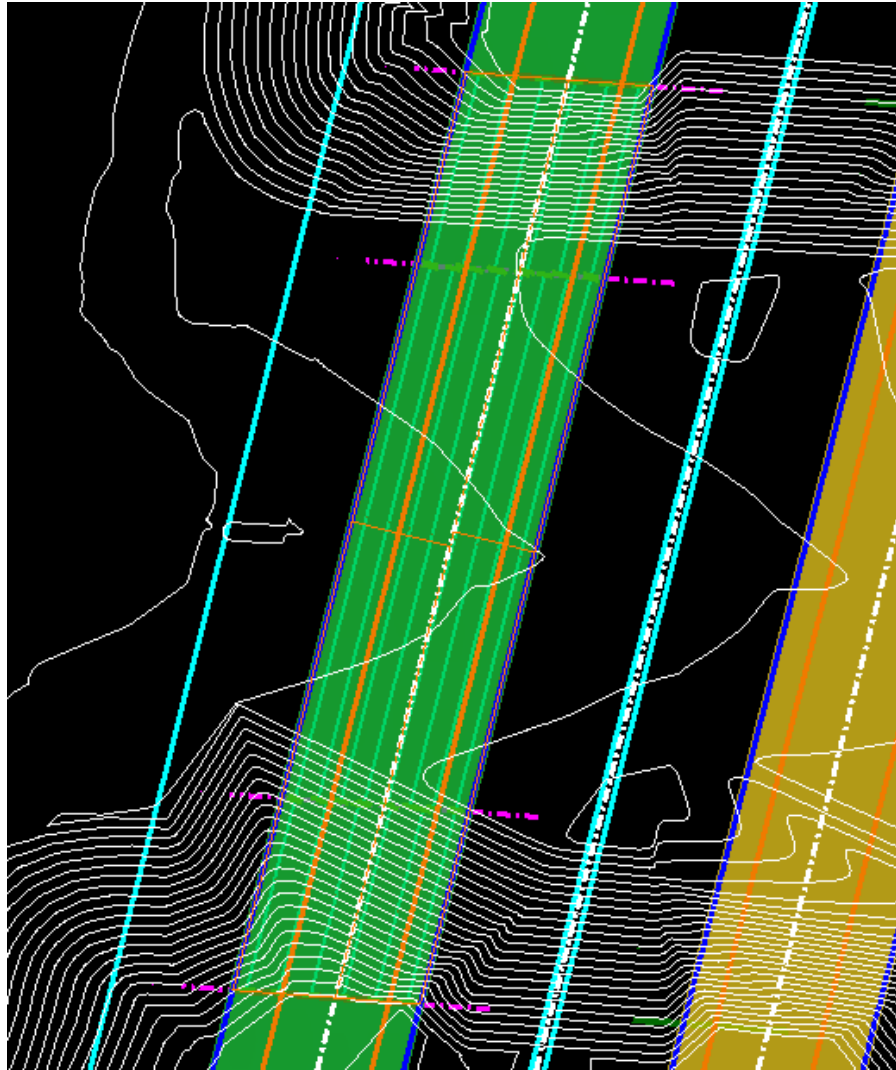
Span	Use Default
Abutment1 - Bent2	<input checked="" type="checkbox"/>
Bent2 - Bent3	<input type="checkbox"/>
Bent3 - Abutment4	<input type="checkbox"/>

Details

Same Beam Start/End Values Advanced Bearing Definition

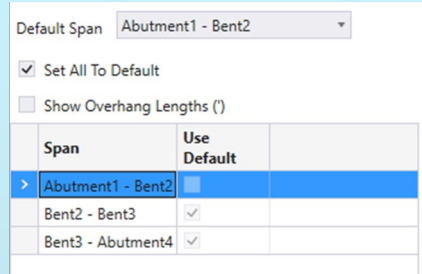
Beam #	Name	BEAM START				BEAM END				REFERENCE			
		Spacing (')	Method	Sl. Offset (')	Skew Ends	Spacing (')	Method	Sl. Offset (')	Skew Ends	Spacing Reference	Beam	Aux Alignment	Use Chord
1	Beam-L	3.0000	Normal	3.0000	<input checked="" type="checkbox"/>	3.0000	Normal	-3.0000	<input type="checkbox"/>	Left Deck Edge		<input checked="" type="checkbox"/>	44.5000
2	Beam-2	7.2000	Normal	3.0000	<input checked="" type="checkbox"/>	7.2000	Normal	-3.0000	<input type="checkbox"/>	Another Beam	1	<input checked="" type="checkbox"/>	44.5000
3	Beam-3	7.2000	Normal	3.0000	<input checked="" type="checkbox"/>	7.2000	Normal	-3.0000	<input type="checkbox"/>	Another Beam	2	<input checked="" type="checkbox"/>	44.5000
4	Beam-4	7.2000	Normal	3.0000	<input checked="" type="checkbox"/>	7.2000	Normal	-3.0000	<input type="checkbox"/>	Another Beam	3	<input checked="" type="checkbox"/>	44.5000
5	Beam-5	7.2000	Normal	3.0000	<input checked="" type="checkbox"/>	7.2000	Normal	-3.0000	<input type="checkbox"/>	Another Beam	4	<input checked="" type="checkbox"/>	44.5000
6	Beam-R	-3.0000	Normal	3.0000	<input checked="" type="checkbox"/>	-3.0000	Normal	-3.0000	<input type="checkbox"/>	Right Deck Edge		<input checked="" type="checkbox"/>	44.5000

- Once completed press **Validate** to verify the input and **Save** to save the beam layout.

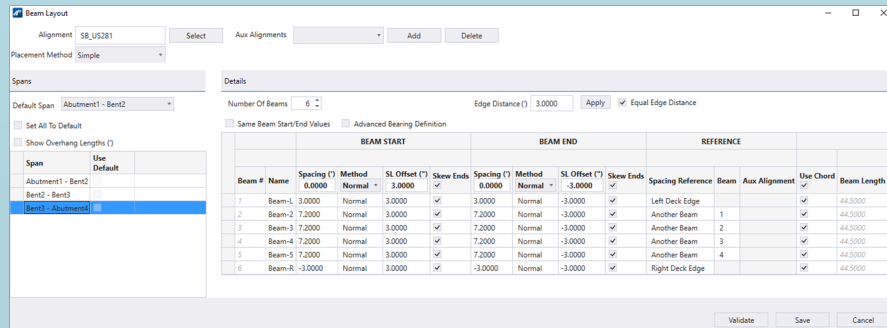
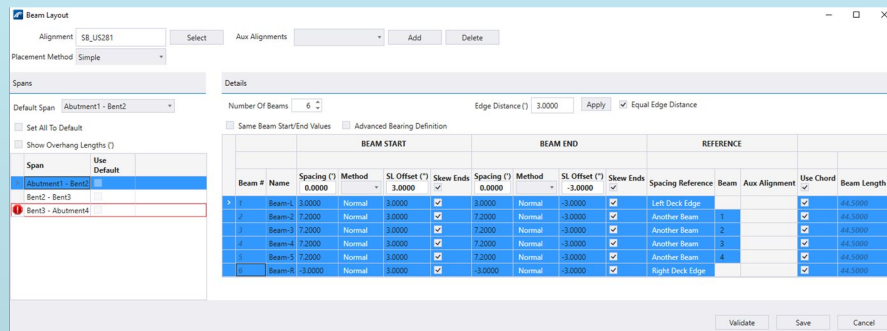


Knowledge Tip: If different spans have the same beam layout, you can save time inputting your data with two methods:

1. Define your data for one span, then set it as the Default Span using the drop down on the left of the Beam Layout window. Check on Set All To Default option to apply the default Beam Layout data to any other span with the Use Default option enabled.



2. Define your data for one span, then select all with Ctrl+right click. Copy the data with Ctrl+C, select another span, then paste the data with Ctrl+V.



Note: If you add additional beams, select the data input box for any column and press Enter to apply that value to all of the rows.

Default Span

Set All To Default

Show Overhang Lengths (')

Span	Use Default
Abutment1 - Bent2	<input type="checkbox"/>
> Bent2 - Bent3	<input checked="" type="checkbox"/>
Bent3 - Abutment4	<input type="checkbox"/>

Number Of Beams

Same Beam Start/End Values Advanced Bearing Defini

BEAM START				
Beam #	Name	Spacing (')	Method	SL Offset (")
		0.0000	Normal	3.0000
> 1	Beam-L	3.0000	Normal	3.0000
2	Beam-2	5.1429	Normal	3.0000
3	Beam-3	5.1429	Normal	3.0000
4	Beam-4	5.1429	Normal	3.0000
5	Beam-5	5.1429	Normal	3.0000
6	Beam-6	5.1429	Normal	0.0000
7	Beam-7	5.1429	Normal	0.0000
8	Beam-R	-3.0000	Normal	3.0000

Default Span

Set All To Default


Show Overhang Lengths (')

Span	Use Default
Abutment1 - Bent2	<input type="checkbox"/>
> Bent2 - Bent3	<input checked="" type="checkbox"/>
Bent3 - Abutment4	<input type="checkbox"/>

Number Of Beams

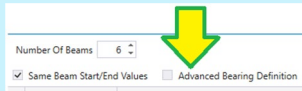
Same Beam Start/End Values Advanced Bearing Defini

BEAM START				
Beam #	Name	Spacing (')	Method	SL Offset (")
		0.0000	Normal	3.0000
> 1	Beam-L	3.0000	Normal	3.0000
2	Beam-2	5.1429	Normal	3.0000
3	Beam-3	5.1429	Normal	3.0000
4	Beam-4	5.1429	Normal	3.0000
5	Beam-5	5.1429	Normal	3.0000
6	Beam-6	5.1429	Normal	3.0000
7	Beam-7	5.1429	Normal	3.0000
8	Beam-R	-3.0000	Normal	3.0000

Note: If the beam layout needs to be modified, select the beam layout and in the properties press the **SELECT to Edit** button [] next to the **Pattern** field.

The screenshot shows the OpenBridge Designer interface. On the left is the Explorer panel with a tree view showing the project structure: Bridge Model > Civil Data > Bridges > Bridge(US281_SBML) > Line: SB_US281 > SH46_Existing_Terrain > Units > Unit1 :: Beam Slab Concrete-Girders Bridge > Decks > Beam Layouts > BeamLayout. On the right is the Properties (OpenBridge Model) panel. Under 'Selection (1)', 'BeamLayout' is selected. The 'Beam Layout' section shows: Bridge Structure # 15-046-0-0253-03-052, Name BeamLayout, and Pattern SELECT to Edit with a button icon next to it.

Knowledge Tip: For beams that require multiple bearing pads the user will need to define the multiple pads in the *Beam Layout* dialog box.



- The user will need to provide the number of bearing pads required, and the spacing in between their center lines of the pads.

BEARINGS			
Number Required	Spacing (')	Transverse Offset (')	Long Offset (')
1	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000

The user can also match the beam report generated by BGS, the user can change the *Method* to *Along Skew*, and the *Spacing Reference* for the first and last beams will be set to *Alignment*

- BGS reports the location of the first beam in relation to the alignment along the CL of the bent, regardless of skew. The user can take this value and enter it as a negative if located to the left of the alignment looking upstation or positive if located to the right of the alignment looking upstation to the beam 1 spacing field.

BENT NO. 1 (N 35 48 40.00 W)			
DISTANCE BETWEEN STATION LINE AND BEAM 1,			26.000 L
SPAN	BEAM	BEAM SPAC. (C.L. BENT)	BEAM ANGLE D M S
	1	8.000	89 45 4
	2	8.000	89 45 4
	3	8.000	89 45 4
	4	8.000	89 45 4
	5	8.000	89 45 4
	TOTAL	32.000	

Beam #	Name	Spacing (')	Method	SL Offset (')	Skew Ends	Spacing Reference
1	Beam-L	-26.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Alignment
2	Beam-2	7.2000	Normal	3.0000	<input checked="" type="checkbox"/>	Another Beam
3	Beam-3	7.2000	Normal	3.0000	<input checked="" type="checkbox"/>	Another Beam

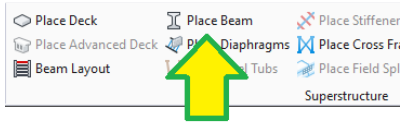
- The last beam spacing will be the **TOTAL** minus the distance to beam 1. (i.e. $32.000 - 26.000 = 6.000$) and this will be entered as a negative if located to the left of the alignment looking upstation or positive if located to the right of the alignment looking upstation.

4	Beam-4	7.9013	Normal	3.0000	<input checked="" type="checkbox"/>	Another Beam
5	Beam-R	6.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Alignment

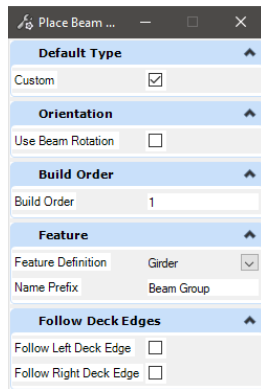
- For the rest of the beam spacings, the user can enter the spacings as reported by BGS. In OBM it only allows to enter the spacings of the interior beams, with respect to the previous beam, so the last spacing reported in BGS will be omitted.

Beam #	Name	Spacing (')	Method	SL Offset (')	Skew Ends	Spacing Reference	Beam
1	Beam-L	-26.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Alignment	
2	Beam-2	8.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Another Beam	1
3	Beam-3	8.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Another Beam	2
4	Beam-4	8.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Another Beam	3
5	Beam-R	6.0000	Along Skew	3.0000	<input checked="" type="checkbox"/>	Alignment	

11. Once the beam layout is placed the next step is to place the beams. Press the **Place Beam** button.

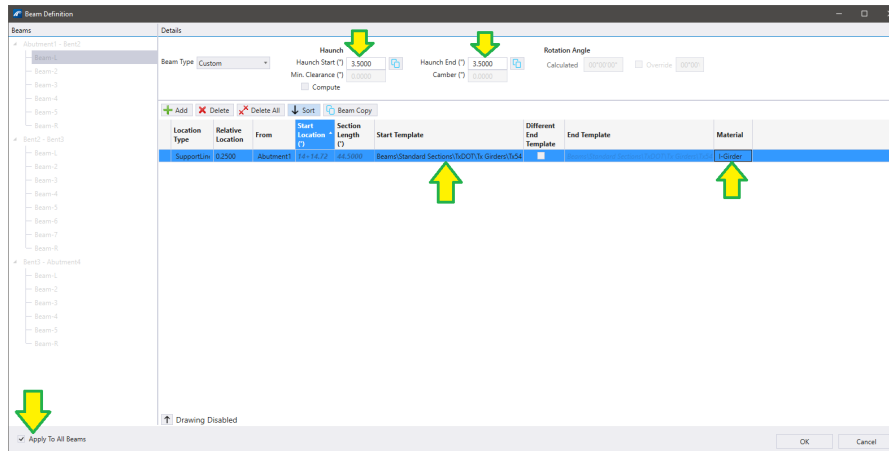



- Custom: **True**
- Use Beam Rotation: **False [Only required for non-plumb beams]**
- Click on the beam layout created in the previous step, then one more left click is required to accept the selection.

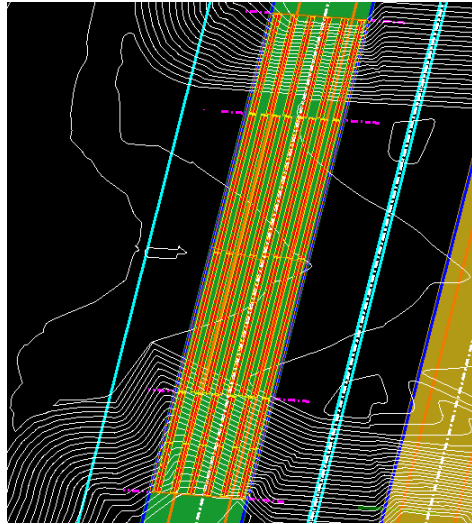


In the **Beam Definition** dialog box.

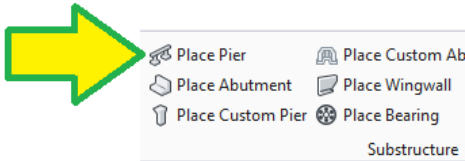
- Beam Type: **Custom**
- Haunch Start: **3.5"**
- Haunch End: **3.5"**
- Start Template: **Beams\Standard Sections\TXDOT\Tx Girders\Tx54**
- Different End Template: **False**
- Material: **Tx I-Girder**
- Apply To All Beams: **True [Located at bottom left corner of dialog]**
- Press the OK button to accept the beam definition.



Note: If the beams need to be modified or reviewed, select the beam group and in the properties press the **SELECT to Edit** button [] next to the **Beam Definition** field.



12. The next step is to place the substructure, we will start with the interior bents and then the abutments.
To start press the *Place Pier* button of the **Substructure** section.



- Template Name: *MultiColumn\TxDOT\Interior Bent for TxGirder and Similar* [...]
- Cap Length Adjustment: *Deck and Aligned*
- Cap Material: *Tx Interior Bent Cap* [...]
- Column Material: *Tx Column* [...]
- Footing Material: *Tx Drilled Shaft* [...]
- Name Prefix: *Bent2*
- Select the support line for the interior bent #2 (be sure it gets highlighted), then reset (right-click) to accept selection. An additional left click is required to accept the elevation constraint selection as “No”.

Place Pier

Solid Placement

Template Name: MultiColumn\Interior Ber [...]

Integral:

Horizontal Offset: 0.0000

Cap Length Adjustment: Deck And Aligned

Edit Elevation Constraints:

Material

Cap Material: Tx Interior Bent Cap [...]

Column Material: Tx Column [...]

Footing Material: Tx Drilled Shaft [...]

Concrete Pad Material: [...]

Pile Material: [...]

Build Order

Pier Cap Build Order: 1

Column Build Order: 1

Footing Build Order: 1

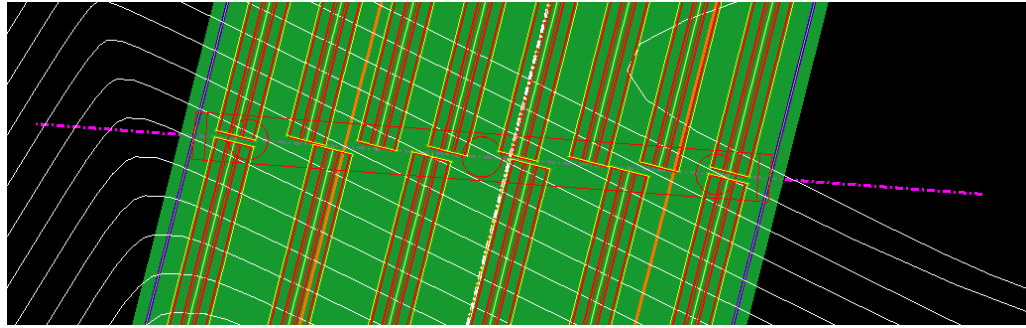
Concrete Pad Build Order: 1

Pile Build Order: 1

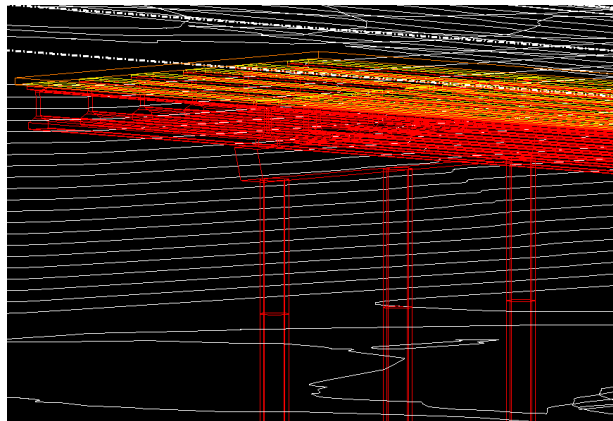
Feature



Feature Definition: Abutment_concrete_pilet

Name Prefix: Bent2



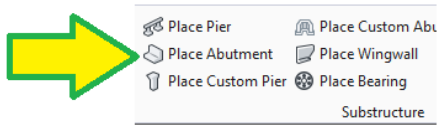
- This bent does not require additional changes, but if the deck had a crown, we would change the bent cap to match the crown.
- Repeat these steps for the Interior Bent #3, just change the name prefix to reflect the bent number.



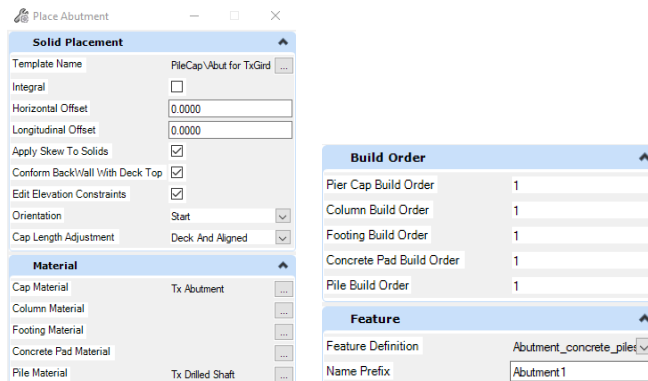
Knowledge Tip: Column lengths, drill shaft lengths, footing, ear walls, and footing piles are all controlled in the template's variable constraints. To access the variable constraints, select the bent and open the *Properties* dialog, then select the **SELECT to Edit** [] of **Substructure Template**. The user can also control the column lengths by selecting the **SELECT to Edit** [] of **Elevation Constraints**, in this section the user can also change how the top slope of the cap is drawn: level, parallel to the deck, or crowned.

One important thing to mention is that the column spacing is calculated from the nearest column when the **Auto Spacing** option is selected in the template, this works fine for 3 columns, but for anything greater than 3 columns it is recommended to manually enter the spacings in inches.

13. The next step is to add the abutments, to start press on the **Place Abutment** button of the **Substructure** section.



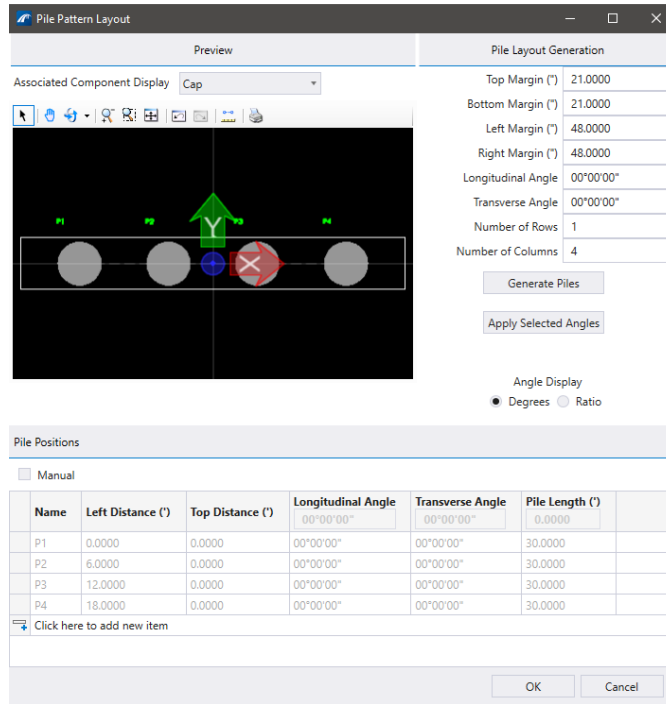
- Template Name: **PileCap\TxDOT\Abut for TxGirders and similar with DS up to 15 deg skew [...]**
- Apply Skew To Solids: **True**
- Conform BackWall With Deck Top: **True**
- Edit Elevation Constraints: **True**
- Orientation: **Start**
- Cap Length Adjustment: **Deck and Aligned**
- Cap Material: **Tx Abutment [...]**
- Pile Material: **Tx Drilled Shaft [...]**
- Name Prefix: **Abutment1**
- Select the first support line (be sure it gets highlighted), then reset (right click) to accept selection. An additional left click is required to accept the elevation constraint selection as "No".



- Once the abutment is placed select the abutment, and in the properties press the **SELECT to Edit [...]** in the **Substructure Template** field.
 - Back Wall Depth: **70" [Bearing Seat (1.25") +Pad (2.75") +Beam (54") + Haunch (3.5") +Deck (8.5")]**
 - Back Wall Vertical Offset: **70"**

Cap	
SupportLine Alignment	Abutment Cer
Cap Length (*)	26.0000
Pile Cap Depth (*)	30.0000
Pile Cap Width (*)	42.0000
Back Wall Depth (*)	70.2500
Back Wall Width (*)	12.0000
Back Wall Horizontal Offset (*)	9.0000
Back Wall Vertical Offset (*)	70.2500

- In the **Piles** tab press the **Pattern Layout** and change the number of columns to **4**, then press the **Generate Piles**, then press **OK** to accept the change.



- Press **OK** again to accept all changes to the abutment 1.

Knowledge Tip: The drilled shaft spacings are calculated based on the abutment length, when the abutment is placed on a skew, it is recommended to enter the correct abutment length to see the drilled shaft spacings in the **Pile Layout** dialog box. In addition, when the tip elevations are different per drilled shaft the user needs to toggle the **Manual** checkmark to enter the pile length of the individual piles. The Longitudinal and Transverse angles are used when the piles are battered, and the angles can be changed from degrees to ratio by changing the **Angle Display** option.

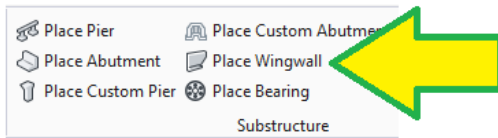
- Back to the properties section, account for an approach slab atop the abutment backwall by changing the **BackWall Vertical Offset From Deck Top** to **-.13 (13")** or **-1.08333'**.

Note: [dot dot is a shortcut to the sub units in this case inches]

Substructure Placement Rule	
Elevation Constraints	SELECT to Edit
Substructure Template	SELECT to Edit
Apply Skew To Solids	True
Conform BackWall With Deck Top	True
BackWall Vertical Offset From Deck Top	-1.0833'
Integral	False
Horizontal Offset	-2.0308'
Longitudinal Offset	0.0000'
Cap Length Adjustment	Deck And Aligned

Note: Similar as all previous bridge elements if things need to be changed the user can access all geometry and elevation constraints via the properties dialog box.


14. Next, we will place the abutment 1 wingwalls using the *Place Wingwall* button from the **Substructure** section.

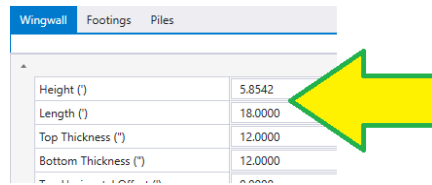


- Place Left Wingwall: *True*
- Template Name: *Wingwall\TxDOT\Wingwall with Cap and DS* [...]
- Orientation: *Normal/Skewed*
- Vertical Offset: *..70 [70" = 5.8333']*
- Align with Abutment: *False*
- Transverse Offset: *0.7500*
- Align with FFBW: *True*
- Parallel to Alignment: *True*
- Use Slope from Profile: *True*
- Place Right Wingwall: *True*
- Vertical Offset: *..78.5 [78.5" = 6.5417']*
- Align with Abutment: *False*
- Transverse Offset: *0.2700*
- Align with FFBW: *True*
- Parallel to Alignment: *True*
- Use Slope from Profile: *True*
- Wingwall Material: *Tx Abutment* [...]
- Footing Material: *Tx Abutment* [...]
- Pile Material: *Tx Drilled Shaft* [...]
- Name Prefix: *Abut1-Wingwall1*

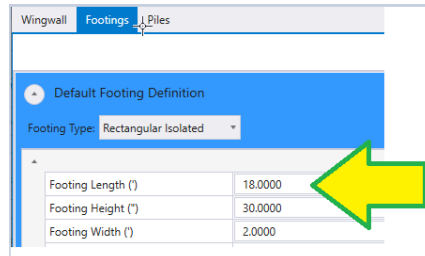
Left Wingwall Placement	Right Wingwall Placement	Material
Place Left Wingwall <input checked="" type="checkbox"/>	Place Right Wingwall <input checked="" type="checkbox"/>	Wingwall Material <input type="text" value="Tx Abutment"/>
Template Name <input type="text" value="StandardWingWall\Wir"/>	Template Name <input type="text" value="StandardWingWall\Wir"/>	Footing Material <input type="text" value="Tx Abutment"/>
Orientation <input type="text" value="Normal/Skewed"/>	Orientation <input type="text" value="Normal/Skewed"/>	Pile Material <input type="text" value="Tx Drilled Shaft"/>
Vertical Offset <input type="text" value="4.4125"/>	Vertical Offset <input type="text" value="3.4375"/>	Build Order
Align With Abutment <input type="checkbox"/>	Align With Abutment <input type="checkbox"/>	Wingwall Build Order <input type="text" value="1"/>
Transverse Offset <input type="text" value="0.7500"/>	Transverse Offset <input type="text" value="0.2700"/>	Footing Build Order <input type="text" value="1"/>
Align With FFBW <input checked="" type="checkbox"/>	Align With FFBW <input checked="" type="checkbox"/>	Pile Build Order <input type="text" value="1"/>
Parallel To Alignment <input checked="" type="checkbox"/>	Parallel To Alignment <input checked="" type="checkbox"/>	Feature
Use Slope From Profile <input checked="" type="checkbox"/>	Use Slope From Profile <input checked="" type="checkbox"/>	Feature Definition <input type="text" value="Wingwall_concrete_pile"/>
Adjust Height to Backwall <input type="checkbox"/>	Adjust Height to Backwall <input type="checkbox"/>	Name Prefix <input type="text" value="Wingwall"/>
Compute Length <input type="checkbox"/>	Compute Length <input type="checkbox"/>	

- Select Abutment 1, left click to accept and place, then right click to end operation/reset.

- Once the wingwall is placed select the wingwall, and in the properties press the **SELECT to Edit** [] in the **Wingwall Template** field.
 - In the **Wingwall** tab change the **Height** to **5.8333** or **.. 70"** and the **Length** to **18 [3 * 5.8333]**

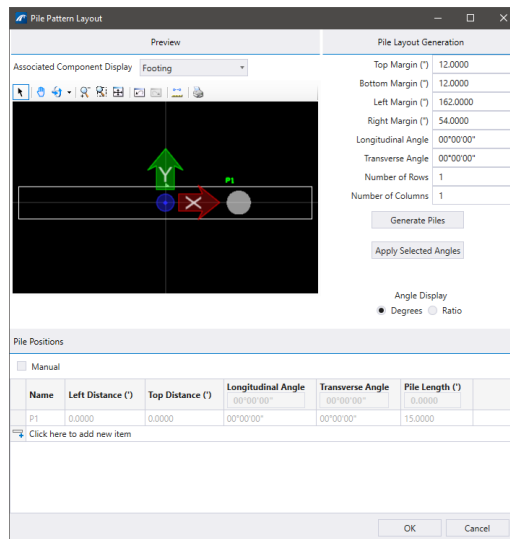


- In the **Footing** tab change the **Footing Length** to **18**.



Note: The wingwall and footing get clipped automatically to avoid overlapping with the abutment

- In the **Piles** tab press the **Pattern Layout** and change the **Left Margin** to **162 [18 x 12 x 0.75]** and the **Right Margin** to **54 [18 x 12 x 0.25]**, then press the **Generate Piles**, then press **OK** to accept the change.

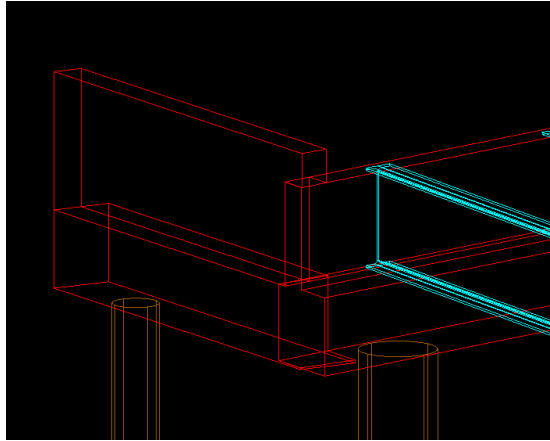


- Press **OK** to accept all changes to the wingwall.
- Repeat the steps on the other wingwall.

Knowledge Tip: Like the abutment pile layout, the piles for the wingwall can be controlled individually when the **Manual** checkmark is enabled. Everything else works the same way as in the pile layout dialog of the abutments.

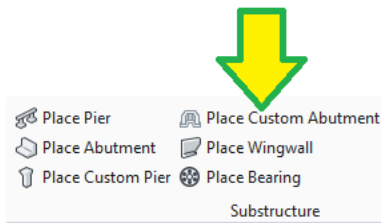
- Back to the properties section, adjust the **Transverse Offset** to a value to aligns the wingwall closer to the edge of the abutment.

Note: This offset is often miscalculated in abutments with a skew, so adjustment is required.

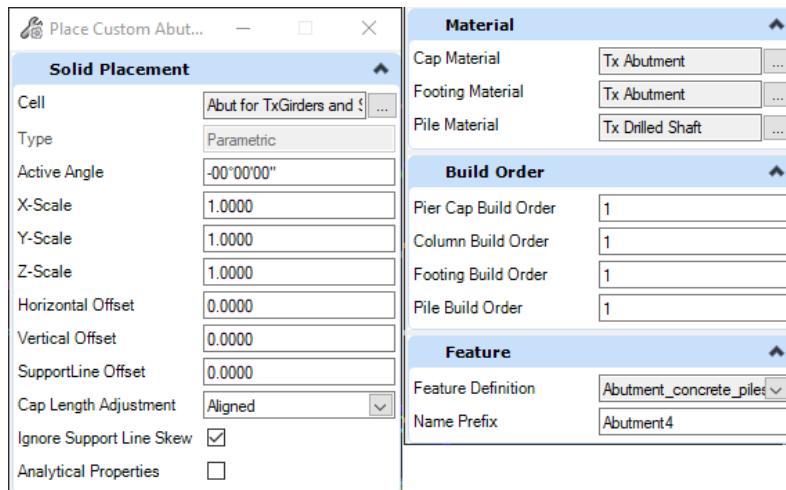


- Once done making the adjustments to the first wingwall repeat the steps on the second wingwall. Some adjustment will be required with the offset values.

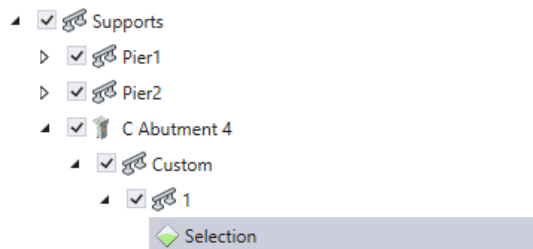
15. For abutment 4 we will use a parametric cell to illustrate the differences between using a template vs a parametric cell. To start press the **Place Custom Abutment** button in the **Substructure** section.



- Cell: **Abut for TxGirders and Similar with DS**
- Active Angle: **-00°00'00.00001"** [This slight angle defines which direction the abutment is pointing for the start or end of the bridge, Positive (+) Start, Negative (-) End]
- Cap Length Adjustment: **Aligned**
- Ignore Support Line Skew: **True**
- Cap Material: **Tx Abutment**
- Footing Material: **Tx Footings**
- Pile Material: **Tx Drilled Shaft**
- Name Prefix: **Abutment4**



- Select the support line for Abutment #4, then press once again anywhere to accept the selection and place the abutment.
- Now that the parametric cell is placed, we will adjust the geometry of the custom abutment to fit the bridge. Select the abutment, then navigate to **Selection** in the OpenBridge Model hierarchy.



- Locate the **Variables** section in the properties and modify them.
 - Skew Angle: **-10**
 - Left Cross Slope (%): **-1.5894 [using analyze point to find elevations at CL and Edge of Deck $((1167.54-1167.18)/(23*\text{Cos}(10)))*100$]**
 - Right Cross Slope (%): **1.5894**
 - Roadway Width: **40**
 - Backwall Height: **5.0074 or ..60.0888**
 - Abut DS Overhang: **3'**
 - Abut DS Qty: **4**
 - Wingwall Length: **18**
 - All other variables should remain unchanged.

Variables	
Skew Angle	-10°00'00.00"
Left Cross Slope (%)	-1.5894
Right Cross Slope (%)	1.5984
Roadway Width	40.0000'
Abutment Cap Height	2.5000'
Abutment Cap Width	3.5000'
Backwall Height	4.3922'
Backwall Thickness	1.0000'
Abut DS Overhang	2.7020'
Abut DS Diameter	3.0000'
Abut DS Length	15.0000'
Abut DS Qty	4
Approach Slab?	True
Approach Slab Thickness	1.0833'
Wingwall Length	18.0000'
Wingwall Width	1.0000'
Wingwall Cap Width	2.0000'
Wingwall DS Diameter	1.5000'
Wingwall DS Length	15.0000'
Cantilevered Wingwall?	False
Wingwall DS Qty (< 3)	1

Note: Allow a few seconds to let the parametric cells take the new changes before making another variable change. Left and Right are in relation to the front face of backwall, not the alignment.

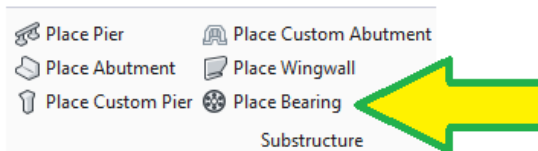
Note: If the abutment appears in the wrong direction, navigate to the custom abutment in the hierarchy of the explorer, and then go to the **Rule Property** section in the properties dialog box. Adjust the following values.

Supports

C Abutment4

- Active Angle: **180** [if necessary to correct the longitudinal abutment orientation]

16. Once the parametric cell is place, we will proceed to add the bearing pads and bearing seats. We will do this using the **Place Bearing** tool from the **Substructure** section.



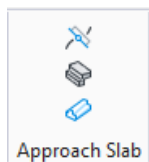
- The information used for the bearing pad and bearing seats comes from a combination of the standard drawings IGEB [Table of Bearing Pad Dimensions] and BIG-40 [Bearing Seat Details].
 - Bearing Type: **Cube**
 - Cube Width, W: **1.75 [21"]**
 - Cube Depth, D: **0.666 [8"]**
 - Cube Height: **0.2292 [2.75"]**
 - Orientation: **Girder**
 - Has Pad or Plate: **False**
 - Has Bearing Seats: **True**
 - Seat Min. Thickness: **0.095 [1.15" – Min thickness is measured at the edge of seat]**
 - Seat D1: **0.75 [fwd dimension from bearing line to edge of cap]**

- Seat D2: **1** [bk dimension from bearing line to cap cl]
 - Seat W1: **1.5** [half bearing seat width]
 - Seat W2: **1.5** [half bearing seat width]
 - Seat Orientation: **Girder**
 - Back Offset: **-1.000** [$-1 \times \cos(\text{Bent Angle})$ for Interior Bents] (0 for start abutment)
 - Ahead Offset: **1.000** [$1 \times \cos(\text{Bent Angle})$ for Interior Bents] (0 for end abutment)
- Note:** These are set both to 0 when a single seat and pad is required on the support, like is needed for continuous steel beams.
- Pad or Plate Material: **Miscellaneous > Neoprene Bearing Pads** [...]
 - Bearing Seat Material: **Tx Bearing Seat** [...]

- Once all settings have been defined the user can select all the support lines to which the settings entered apply. Press the right mouse button then the left mouse button to finish placement.

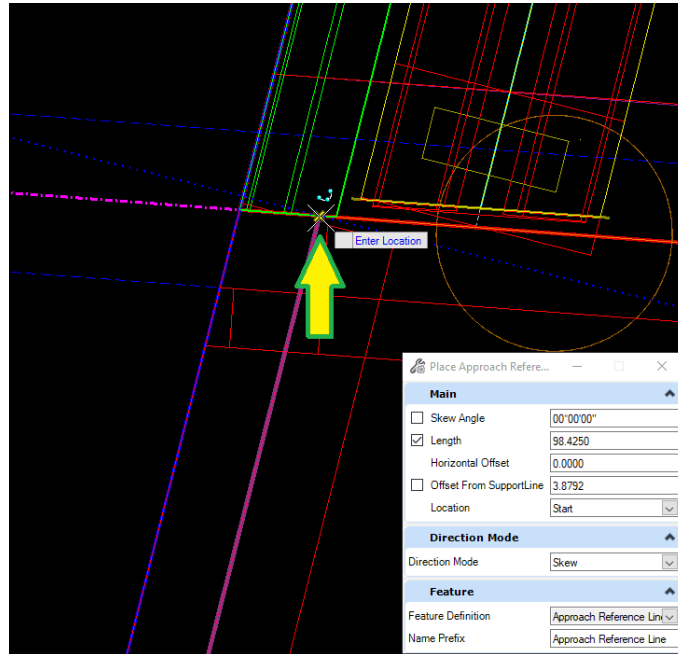
Note: The Back and Ahead offsets are different for Abutments and Bents, see the applicable Elastomeric Bearing standard for additional information.

17. Once all the abutments, bearing pads and bearing seats are in place the next step is to place the approach slabs. We will do this using the tools in the **Approach Slab** section.

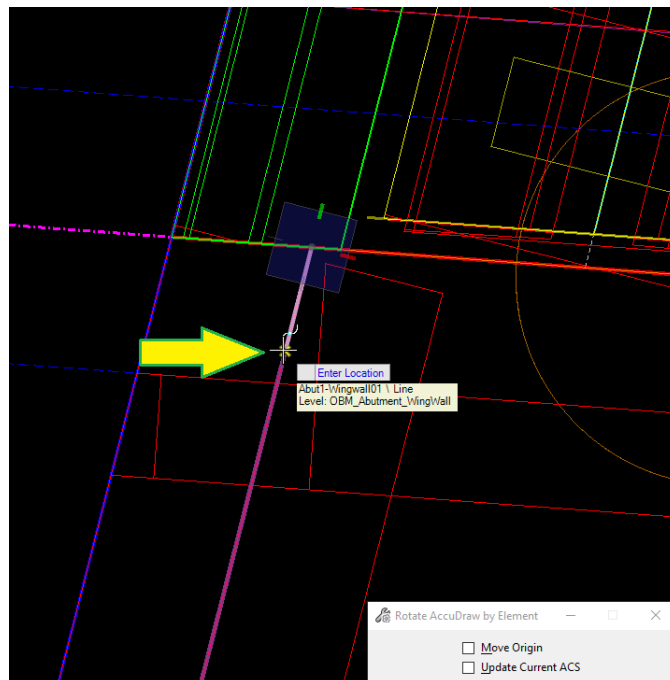


- Using the **Place Approach Ref Line** tool, we will place the reference line that indicates the end of the approach slab on both ends of the bridge. Before starting this command make sure Accu-draw is activated.
 - Skew Angle: **0**
 - Length: **100**
 - Location: **Start**

- First, click the Place Approach Ref Line tool and then hover the mouse over the snap intersection point of the inside of the wingwall and the SupportLine1 at the start of the bridge.

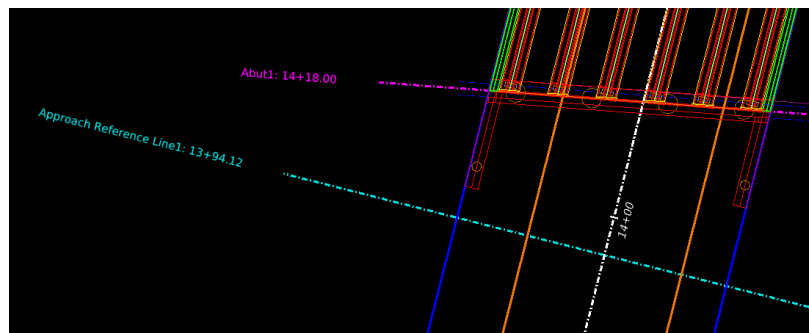
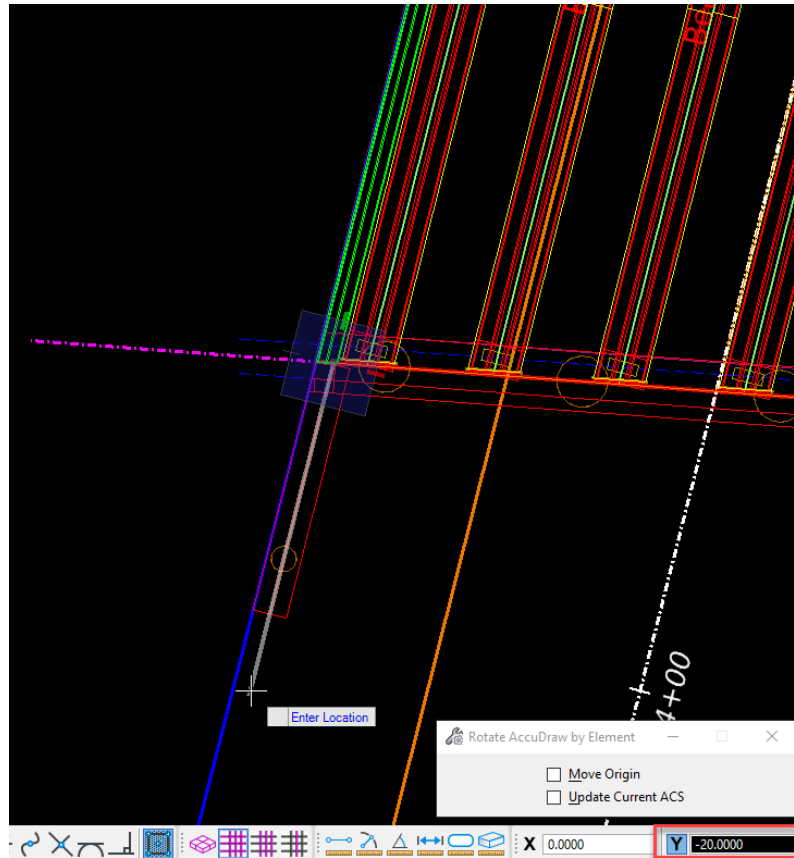


- Next press the **O** (letter) key on the keyboard to set the origin for Accu-draw. Then press **R** and then **E**. Then click a point further along the wingwall to set the angle of the Accu-draw.



- Finally, Type in -20 for the Y value in the Accu-draw menu. This is the required distance for the shorter end of a skewed approach slab per TxDOT Standards. Next

click in the window three times, once to confirm the 20' offset, once to place it, once to confirm the 100' length of the Approach Reference Line.



- Use the **Place Approach Slab** tool to place the approach slab element between the abutment support line and approach slab reference line.
 - Location: **Start**
 - Template Name: **Standard Templates\TxDOT Decks\Approach Slab [...]**
 - Add Constraints: **True**
 - Sleeper Slab: **False**
 - Approach Slab Material Name: **Tx Approach Slab**
- Optional**

- If the approach slab is placed on top of the wingwalls, the user can enable the option **Sync with Deck** and the approach slab will match the width of the deck and the breakbacks if any.
- Press anywhere in the screen to accept all inputs and to place the approach slab.

- In the **Variable Constraint** dialog box, change the Left and Right widths as indicated below:

- LT_Width_Lane1: **Start = -22; End = -22**
- RT_Width_Lane1: **Start = 18; End = 18**
- RT_Slope_Lane1: **Start = 0.02; End = 0.02**

Variable	Active	Default	Errors
LT_Slope_Lane1	<input type="checkbox"/>	0.0200	
LT_Width_Lane1	<input checked="" type="checkbox"/>	-12.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input checked="" type="checkbox"/>	12.0000	
Thickness	<input type="checkbox"/>	-1.0833	

Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Approach Reference Line	13+93.94	14+18.00	24.0561	-22.0000	-22.0000	Linear

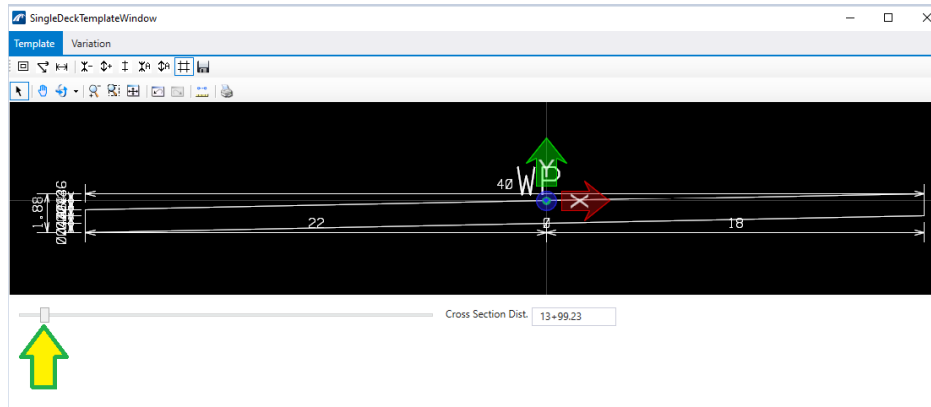
Variable	Active	Default	Errors
LT_Slope_Lane1	<input type="checkbox"/>	0.0200	
LT_Width_Lane1	<input checked="" type="checkbox"/>	-12.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input checked="" type="checkbox"/>	12.0000	
Thickness	<input type="checkbox"/>	-1.0833	

Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Approach Reference Line	13+93.94	14+18.00	24.0561	18.0000	18.0000	Linear

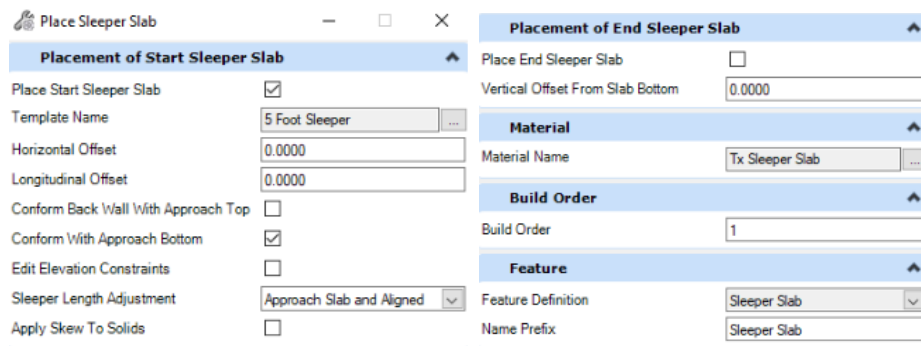
Variable	Active	Default	Errors
LT_Slope_Lane1	<input type="checkbox"/>	0.0200	
LT_Width_Lane1	<input checked="" type="checkbox"/>	-12.0000	
Rotation By Angle*	<input type="checkbox"/>	00°00'00"	
Rotation By Slope*	<input type="checkbox"/>	0.0000	
RT_Slope_Lane1	<input checked="" type="checkbox"/>	-0.0200	
RT_Width_Lane1	<input checked="" type="checkbox"/>	12.0000	
Thickness	<input type="checkbox"/>	-1.0833	

Location Type	Relative Location	From	Start Distance	End Distance	Interval Length	Start Value	End Value	Transition
SupportLine	0.0000	Approach Reference Line	13+93.94	14+18.00	24.0561	0.0200	0.0200	Linear

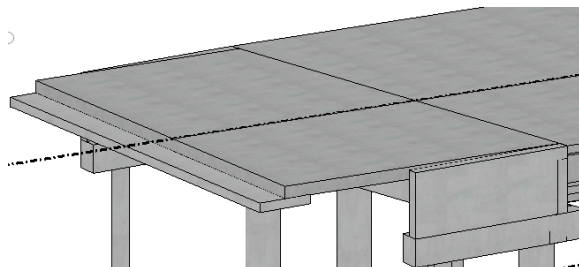
- Press **OK** to accept all changes.
- **Note:** Users can adjust the Cross Section Distance value with the slide bar at the bottom of the window. Shown below.



- Use the **Place Sleeper Slab** to place the sleeper slab under the approach slab.
 - Place Start Sleeper Slab: **True**
 - Template Name: **Sleeper Slab\TxDOT\5 Foot Sleeper [...]**
 - Conform with Approach Bottom: **True**
 - Sleeper Length Adjustment: **Approach Slab and Aligned**
 - Place End Sleeper Slab: **False**
 - Material Name: **Tx Sleeper Slab**
 - Click anywhere in the screen to accept settings, and then press again to place sleeper slab.



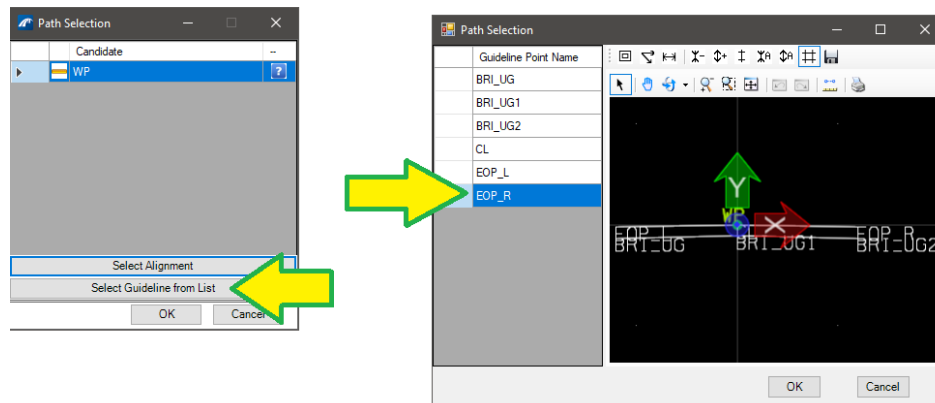
18. Repeat all steps in step 17 to place the approach slab at the end of the bridge. The approach reference line and the approach slab will both need **End** instead of **Start** in the settings boxes to be properly placed. Also, -20' offset will be positive 20' at the end of the bridge.



19. Once the approach slabs are completed, it is time to place the needed traffic barriers. We will use the **Place Barrier** button from the **Accessory** section.



- In the dialog box
 - Template Name: *Barriers\TxDOT_Rails with Solid Walls\SSTR_R [...]*
 - Barrier Material: *Miscellaneous > Traffic Barrier [...]*
 - Pay Unit: *Linear Unit*
- **Left** click on the main slab to select the deck to place the barrier, then **Right** click anywhere in the model to complete the selection, finally **Left** click to accept placement.
- In the **Path Selection** dialog box, press the **Select Guideline from List** button.
- Select the **EOP_R** from the list as the placement guide for the barrier.
- Press **OK** to accept path, then press **OK** again to finish placement.



- Repeat steps for the left side and on the other slabs using the appropriate barrier template. For approach slabs a **Horizontal Offset** of **-1** or **1** is required if the approach slab is inside the wingwalls.
- Multiple slabs within the same unit can be selected, for example the user can select the 2 approach slabs to place the left or right barriers at the same time.

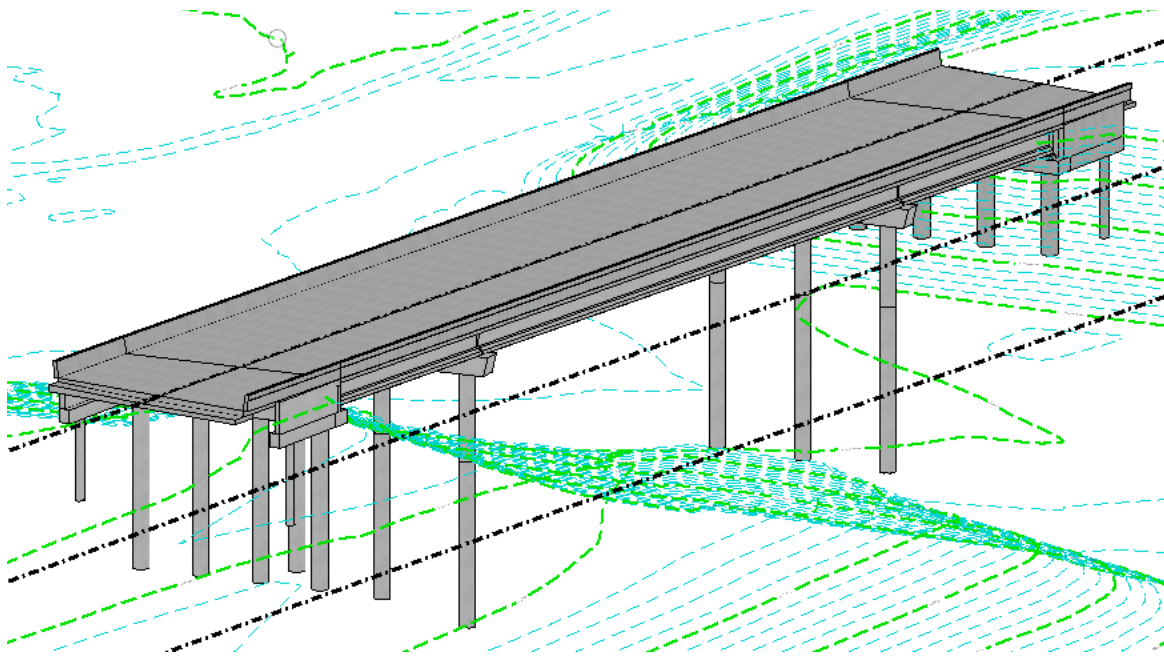
20. This concludes the creation of the Southbound bridge model with a concrete superstructure.

Some final notes:

Build Order: This variable appears on all elements placed and is used for RM Bridge to create the construction stages when the engineer plans on doing the analysis of the bridge there. There is no other purpose for it in OBM, so no Build Order values were adjusted during the previous steps of this training manual.

Materials: Like *Build Order*, the material is used when the engineer is planning to transfer the model to RM for analysis. In addition, the material is used to define the unit of measure for an element and the cost per unit of measure. When using OBM to generate reports, it is important to set the correct material to every element. More about the material creation will be covered in the libraries section of this manual.

Labels: All text labels are controlled by the annotation scale used, the annotation scale can be changed in the *Reports and Drawings* tab.



Exercise #1 - Create the Bridge model for the Northbound Main lanes.

Save a copy of the file used up to this stage. This is done by navigating to **File > Save As**, select **No Wizard** then provide the following information.

- Name: **Exercise_01.dgn**.
- Description: **Precast Concrete Exercise #1**

Using the acquired knowledge so far create the model for the Northbound Main Lanes bridge in the new file using the following information.

- Bridge Name: **US281 Northbound Mainlane**
- Bridge Type: **Beam Slab (P/S or RC Concrete Girders)**
- NBI: **15-046-0-0253-03-053**
- Start Station: **14+35.06**
- End Station: **16+50.06**
- 3 Spans: **45 - 125 - 45**
- Left Width: **-19**
- Right Width: **23**
- Left Cross Slope: **-0.02**
- Right Cross Slope: **-0.02**
- All other information is the same as the Southbound bridge.
- Once the exercise is complete return to the **Bridge_Model_01.dgn** file to continue training.

Note: It is optional to use the Edge of pavements provided and the superelevation shapes provided. Also, it is optional to use parametric cells for the abutments.

This concludes the creation of the concrete girder bridge models.


Create a Bridge with Steel Superstructure

This section will focus on the steel part of OBM, all other elements are the same as the previous section. Steps that are repeated such as the Add Bridge, Support Lines, Supports, Bearing seats, Wingwalls, etc. will not be covered in depth as it was done before, only the required information for the tool is provided in each step.

1. Continuing in the *Bridge_Model_01.dgn* file.

2. Create a new bridge with the following information.  Add Bridge

- Bridge Name: **US281 Northbound Mainlane**
- Bridge Type: **Beam Slab (Steel Girders)**
- NBI: **15-046-0-0253-03-053**
- Description: **215.00' Steel Beam Unit (45'-125'-45')**
- Name Prefix: **US281_NBML**
- Select the Northbound alignment.

3. Place the support lines with the following information.  Place ▾

- Start Station: **14+35.06**
- End Station: **16+50.06**
- Number of Support Lines: **4**
- Skew Angle: **-10**
- 3 Spans: **45 - 125 - 45**

4. Place the deck with the following information.  Place Deck

- Left Width: **-19**
- Right Width: **23**
- Left Cross Slope: **-0.02**
- Right Cross Slope: **-0.02**

Hint: Use the superelevation shapes and edge of pavement lines.

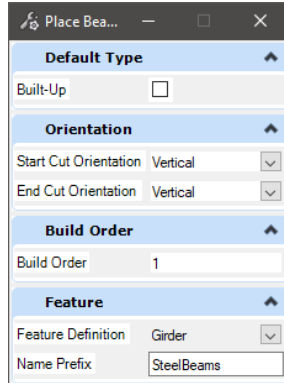
5. Place the beam layout with the following information.  Beam Layout

- Left Overhang: **3.0'**
- Right Overhang: **-3.0'**
- Number of Beams Span 1 and Span 3: **6**
- Number of Beams Span 2: **5**
- BEAM START SL Offset: **3"**
- BEAM END SL Offset: **-3"**
- Skew Ends: **Only Beam Start at Abutment and Beam End at Abutment**

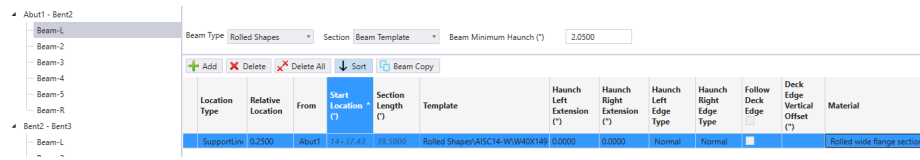
6. Place the beams on the beam layout using the following information.



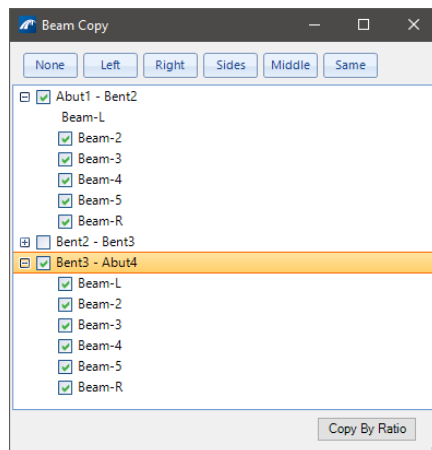
- Built-Up: **False**
- Start Cut Orientation: **Vertical**
- End Cut Orientation: **Vertical**
- Name Prefix: **SteelBeams**



- For Span 1 and Span3 we will use the same type of beam and same haunch.
 - Beam Template: ***Rolled Shapes\AISC14-W\W40X149***
 - Beam Min Haunch: ***2.05"***
 - Material: ***Rolled Wide Flange Sections***
 - Setup the first beam of the first span.



- Use the **Beam Copy** tool [] to copy the beam to the rest of the span and Span 3.



- Continuing in the **Beam Definition** dialog box, select the first beam of Span 2.
 - Beam Type: ***Built-Up***
 - Section: ***Top Flange***
 - Beam Min Haunch: ***2.0"***

- We will add 3 Rows
- Row 1:
 - Location Type: *Head*
 - Relative Location: *0*
 - Thickness: *0.75"*
 - Start Width: *14"*
 - Variation: *None*
 - Material: *Straight Plate Girders*
- Row 2:
 - Location Type: *Head*
 - Relative Location: *24.75'*
 - Thickness: *1"*
 - Start Width: *14"*
 - Variation: *None*
 - Material: *Straight Plate Girders*
- Row 3:
 - Location Type: *Tail*
 - Relative Location: *-24.75'*
 - Thickness: *0.75"*
 - Start Width: *14"*
 - Variation: *None*
 - Material: *Straight Plate Girders*

Beam Type Built-Up Section Top Flange Beam Minimum Haunch (") 2.0000

+ Add X Delete X Delete All Sort Beam Copy

Location Type	Relative Location	From	Start Location (")	End Location (")	Start Distance (")	Section Length (")	Thickness (")	Start Width (")	Variation	End Width (")	Haunch Left Extension (")	Haunch Right Extension (")	Haunch Left Edge Type	Haunch Right Edge Type	Follow Deck Edge	Deck Edge Vertical Offset (")	Material
Head	0.0000		14+77.43	15+02.18	0.0000	24.7500	0.7500	14.0000	None	14.0000	0.0000	0.0000	Normal	Normal	<input type="checkbox"/>		Straight plate girders
Head	24.7500		15+02.18	15+77.18	24.7500	75.0000	1.0000	14.0000	None	14.0000	0.0000	0.0000	Normal	Normal	<input type="checkbox"/>		Straight plate girders
Tail	-24.7500		15+77.18	16+01.93	99.7500	24.7500	0.7500	14.0000	None	14.0000	0.0000	0.0000	Normal	Normal	<input type="checkbox"/>		Straight plate girders

- Select all rows in the table created using **CTRL+A** in your keyboard and copy the table using **CTRL+C**, then change the **Section** to *Bottom Flange*.
- Select the first row and paste the table using **CTRL+V**.

Beam Type Built-Up Section Bottom Flange Beam Minimum Haunch (") 2.0000

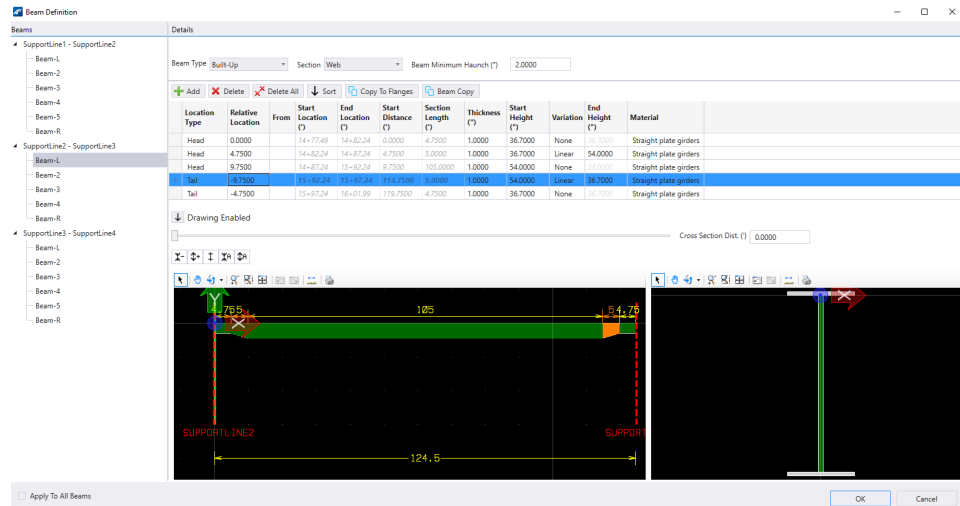
+ Add X Delete X Delete All Sort Beam Copy

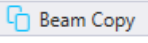
Location Type	Relative Location	From	Start Location (")	End Location (")	Start Distance (")	Section Length (")	Thickness (")	Start Width (")	Variation	End Width (")	Material
Head	0.0000		14+77.43	15+02.18	0.0000	24.7500	0.7500	14.0000	None	14.0000	Straight plate girders
Head	24.7500		15+02.18	15+77.18	24.7500	75.0000	1.0000	14.0000	None	14.0000	Straight plate girders
Tail	-24.7500		15+77.18	16+01.93	99.7500	24.7500	0.7500	14.0000	None	14.0000	Straight plate girders

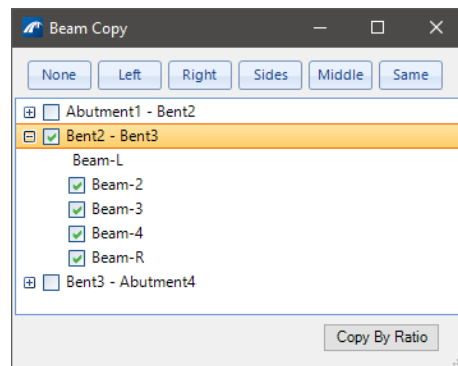
- After pasting the table, update the **Material** to be *Straight Plate Girders*.
- Once the rows get updated, change the **Section** to *Web* and create 5 total rows using the **Add** button.

- Row 1:
 - Location Type: *Head*
 - Relative Location: *0*
 - Thickness: *1"*
 - Start Height: *36.7"*
 - Variation: *None*
 - Material: *Straight Plate Girders*
- Row 2:
 - Location Type: *Head*
 - Relative Location: *4.75*
 - Thickness: *1"*
 - Start Height: *36.7"*
 - Variation: *Linear*
 - End Height: *54"*
 - Material: *Straight Plate Girders*
- Row 3:
 - Location Type: *Head*
 - Relative Location: *9.75*
 - Thickness: *1"*
 - Start Height: *54"*
 - Variation: *None*
 - Material: *Straight Plate Girders*
- Row 4:
 - Location Type: *Tail*
 - Relative Location: *-9.75*
 - Thickness: *1"*
 - Start Height: *54"*
 - Variation: *Linear*
 - End Height: *36.7"*
 - Material: *Straight Plate Girders*
- Row 5:
 - Location Type: *Tail*
 - Relative Location: *-4.75*
 - Thickness: *1"*
 - Start Height: *36.7"*
 - Variation: *None*
 - Material: *Straight Plate Girders*

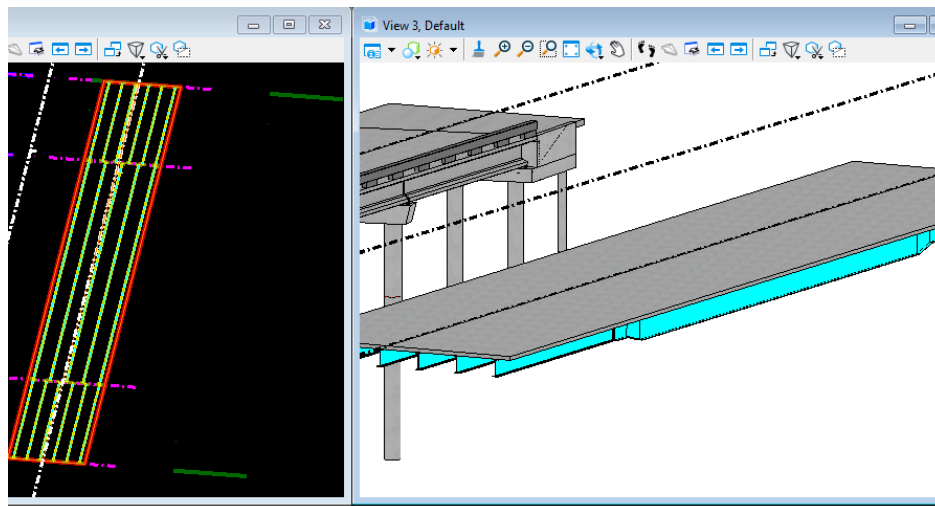
- To see the profile of the beam, press on the up arrow next to **Drawing Disabled**.



- Use the **Beam Copy** tool [ Beam Copy] to copy the beam to the rest of the span. Select the spans or beams in the dialog box and press the **Copy By Ratio** button.



- Once all the beams have been defined, press the **OK** button to accept the beam definition.



Knowledge Tip: OBM also supports cover plates for top and bottom for I-Beams. In addition, OBM can also model Tub Girders. The same process used in the Built-Up girder in the previous section is used to built-up the tub girder.

In tub girder the haunch is individually controlled at each top flange.

Min. Haunch ("): 4.0000

Left		Right	
Left Extension ("):	0.0000	Right Extension ("):	0.0000
Right Extension ("):	0.0000	Left Extension ("):	0.0000
Left Edge Type:	Normal	Right Edge Type:	Normal
Right Edge Type:	Normal	Left Edge Type:	Normal

Follow Deck Edge

Deck Edge Vertical Offset ("):

In tub girders the input is limited for Web, Top, and Bottom flanges. Bentley has not yet developed close plates, or internal diaphragms.

Haunch: Members

Member: Webs

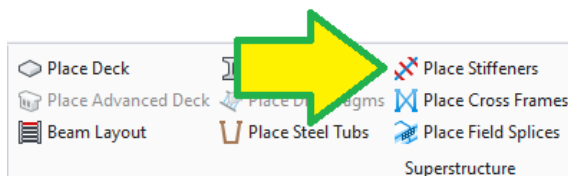
Add Section Mode: Head

Location Type	Relative Location	From	Start Location (")	End Location (")	Start Distance (")	Section Length (")	Top Offset (")	Bottom Offset (")	Thickness (")	Start Height (")	Variation	End Height (")	Material
SupportLine	0.0000	Beam2	14.736.00	78.903.00	0.0000	123.0000	89.0000	49.0000	0.6250	84.5000	Linear	84.5000	Straight box girders

Drawings

Cross Section Dist: 0.0000

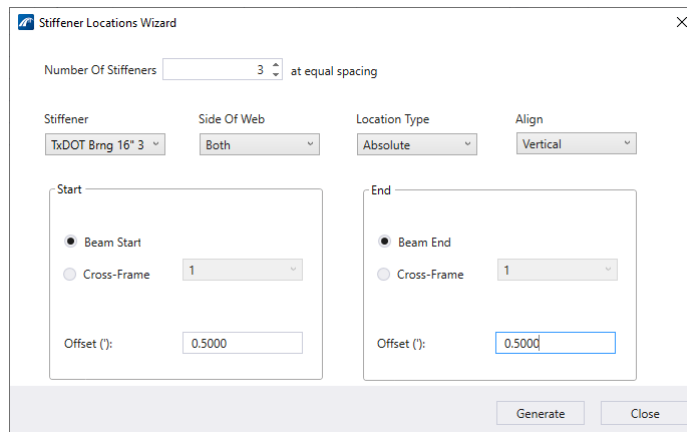
- Once the beams are in place, we will be adding stiffeners using the **Place Stiffeners** tool from the **Superstructure** section.



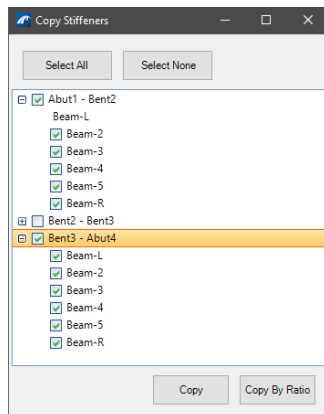
Note: The **Place Stiffeners** tool is used to place stiffeners that are not accompanied by a cross frame, or additional stiffeners at cross frame locations.

- Select the beam group placed in the previous step. And click anywhere in the model to accept the selection.
- The **Place Stiffeners** dialog box will open, then there are several tools in this dialog as described below.
 - Add** – This tool will add single row to the table.

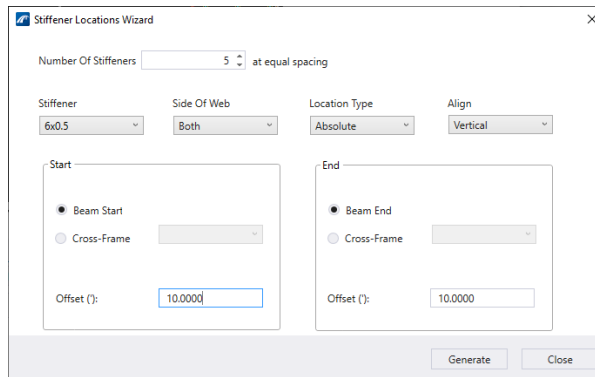
- **Insert** – This tool will insert a single row to the table in between existing rows.
 - **Delete** – This tool deletes the selected row.
 - **Delete All** – This tool will delete all rows.
 - **Wizard** – This tool creates multiple rows for stiffeners equally spaced.
 - **Copy** – Copies all the stiffeners defined in the beam to another beam.
- Using the **Wizard** place 3 equally spaced stiffeners on Span 1 and Span 3.
 - Number of Stiffeners: **3**
 - Stiffener: **TxDOT Brng 16" 3/4 x 7.5"**
 - Side of Web: **Both**
 - Start
 - Beam Start: **True**
 - Offset: **0.5**
 - End
 - Beam End: **True**
 - Offset: **0.5**



- Press the **Generate** button to create the stiffener rows, and then press **Close** to close the wizard.
- Use the **Copy** tool to copy the stiffeners to all beams in Span 1 and Span 3. Select the spans or beams in the dialog box and press the **Copy By Ratio** button.



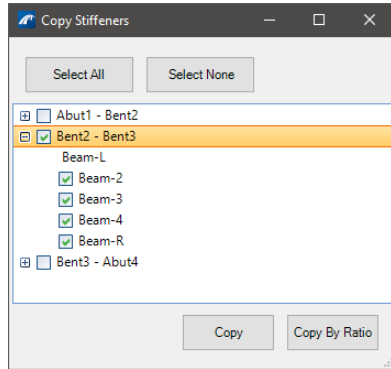
- Select the first beam on Span 2, and using the **Wizard** add 5 stiffeners.
 - Number of Stiffeners: **5**
 - Stiffener: **6 x 0.5**
 - Side of Web: **Both**
 - Start
 - Beam Start: **True**
 - Offset: **10**
 - End
 - Beam End: **True**
 - Offset: **10**



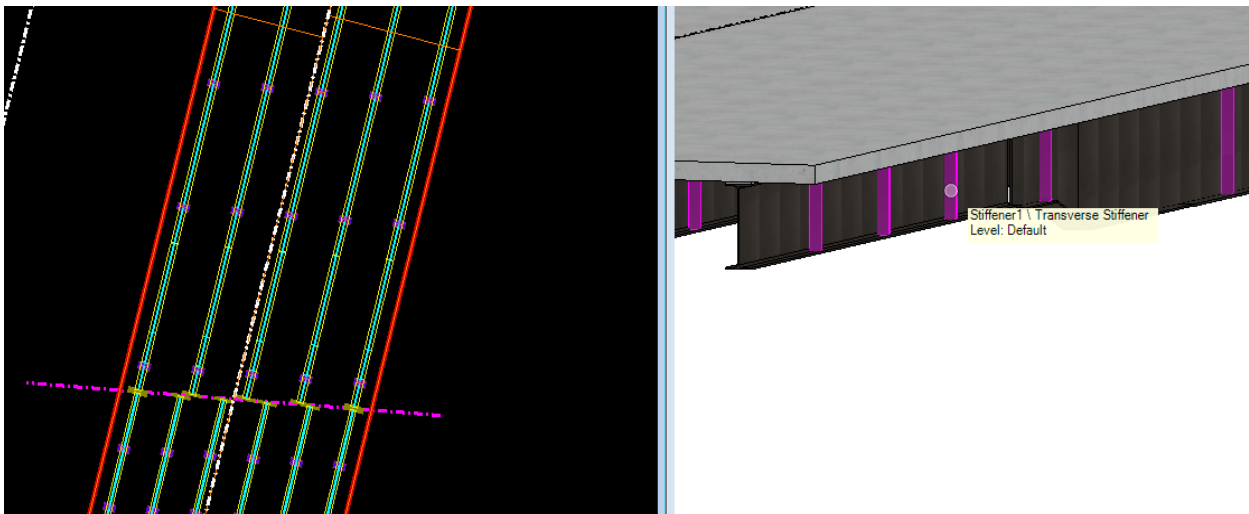
- Press the **Generate** button to create the stiffener rows, and then press **Close** to close the wizard.
- Using the **Add** and **Insert** tools, add single stiffeners at the start and at the end of the beam.
 - Select the first row and press **Insert** two times.
 - Modify the first two rows as follows.
 - Start Location or Ratio: **4'**
 - Side Of Web: **One Left and One Right**
 - Stiffener: **TxDOT Brng 16" 3/4 x 7.5"**
 - Select the last row and press **Add** two times.
 - Modify the last two rows as follows.
 - Start Location or Ratio: **120'**
 - Side Of Web: **One Left and One Right**
 - Stiffener: **TxDOT Brng 16" 3/4 x 7.5"**

#	Location Type	Start Location or Ratio (')	Side Of Web	Distance From Top (")	Align	Stiffener	Distance From Bottom (")	Cross-Frame
1	Absolute	4.0000	Left	0.0000	Vertical	TxDOT Brng 16" 3/4 x 7.5	0.0000	
2	Absolute	4.0000	Right	0.0000	Vertical	TxDOT Brng 16" 3/4 x 7.5	0.0000	
3	Absolute	27.4167	Left	0.0000	Vertical	6x0.5	0.0000	
4	Absolute	27.4167	Right	0.0000	Vertical	6x0.5	0.0000	
5	Absolute	44.8333	Left	0.0000	Vertical	6x0.5	0.0000	
6	Absolute	44.8333	Right	0.0000	Vertical	6x0.5	0.0000	
7	Absolute	62.2500	Left	0.0000	Vertical	6x0.5	0.0000	
8	Absolute	62.2500	Right	0.0000	Vertical	6x0.5	0.0000	
9	Absolute	79.6667	Left	0.0000	Vertical	6x0.5	0.0000	
10	Absolute	79.6667	Right	0.0000	Vertical	6x0.5	0.0000	
11	Absolute	97.0833	Left	0.0000	Vertical	6x0.5	0.0000	
12	Absolute	97.0833	Right	0.0000	Vertical	6x0.5	0.0000	
13	Absolute	120.0000	Left	0.0000	Vertical	TxDOT Brng 16" 3/4 x 7.5	0.0000	
14	Absolute	120.0000	Right	0.0000	Vertical	TxDOT Brng 16" 3/4 x 7.5	0.0000	

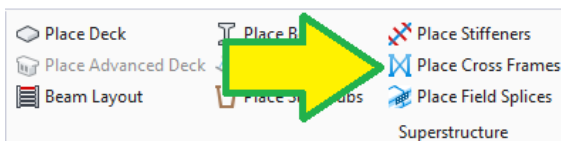
- Once all stiffeners have been added use the **Copy** tool to copy the stiffeners to all beams in span 2. Select the spans or beams in the dialog box and press the **Copy By Ratio** button.
Note: Copy By Ratio button does not carry over the Stiffener type. That will need to be updated after copying.



- Press the **Validate** button to preview the stiffener locations, and press **SAVE** to accept all and place the stiffeners.



8. Next, we will add the cross frames using the **Place Cross Frames** tool from the **Superstructure** section.



- Click on the beam group to start the placement of the cross frames. Then click anywhere in the screen.
- Like the stiffeners, the tools available can add or delete individual rows or add or delete multiple rows.
- Using the **Wizard**, we will add the cross frames to the beam bays in all spans.

- The cross-frame wizard provides more options for placement. The user can place **One-by-One** or by **Bulk Locations**.

Note: In the **One-By-One** tab the user can enter a distance, and a location from where the distance is being measured.

Note: In the **Bulk Locations** tab, the user can provide the number of locations, or use spacings to identify the locations.

- If the user chooses to just select the number of locations, the cross frames will be equally spaced.
 - If the user wants more control on the spacing, use the spacing option. The spacings can be grouped and can be spaced delimited.
 - e.g. 2@10' 3@5' 10' 2@2.5'
 - Unlike the stiffeners, the cross-frame wizard allows the placement of the cross frames to the selected bay or to all bays.
- Use the **Bulk Locations** tab in the Place Cross Frames tool to populate the cross frames.
 - For the locations use:
 - Number of Locations: **4**
 - Apply to: **All Bays**.

Number Of Locations
 Spacing (')
 Apply To:
 Current Bay
 All Bays

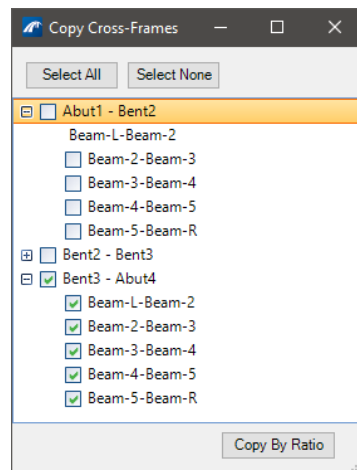
- The user needs to provide the start and end location for the placement.
- For start and end information use:
 - From SupportLine: **Abut1**
 - From Offset: **1.00'**
 - To SupportLine: **Bent2**
 - To Offset: **-1.00**

<p>From</p> <hr/> <p>SupportLine: <input type="text" value="Abut1"/></p> <p>Offset ('): <input type="text" value="1.0000"/></p>	<p>To</p> <hr/> <p>SupportLine: <input type="text" value="Bent2"/></p> <p>Offset ('): <input type="text" value="-1.0000"/></p>
---	--

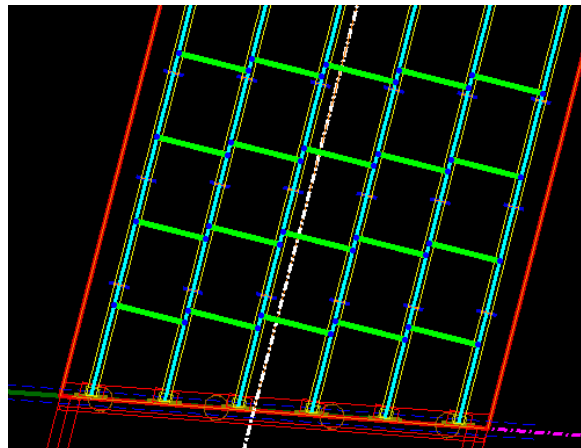
- For the cross-frame information:
 - Position Lock: *Normal to Left Beam*
 - Align: *Vertical*
 - Direction: *Upstation*
 - Left Stiffener: *TxDOT Brng 16" 3/4 x 7.5"*
 - Cross-Frame: *TxDOT W40*
 - Right Stiffener: *TxDOT Brng 16" 3/4 x 7.5"*

Position Lock	Align	Direction
Normal To Left Beam	Vertical	Upstation
Left Stiffener	Cross-Frame	Right Stiffener
TxDOT Brng 16" 3/4 x 7.5	TxDOT W40	TxDOT Brng 16" 3/4 x 7.5

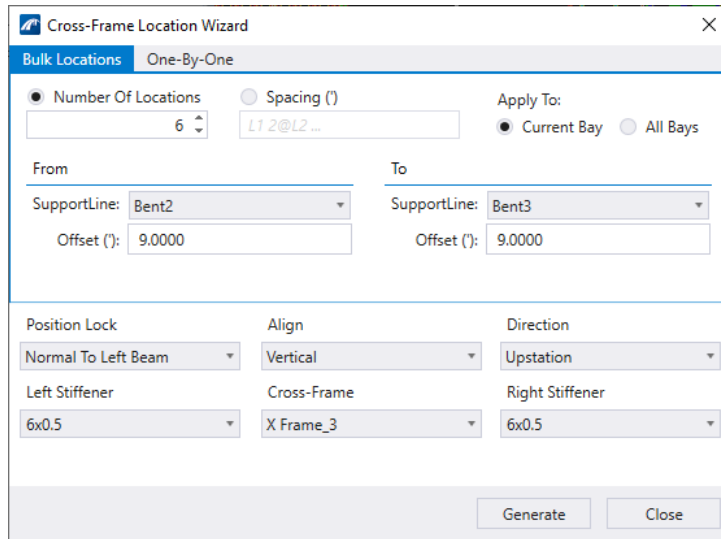
- Press the **Generate** button to create the cross-frame rows, and then press **Close** to close the wizard.
- Verify that all bays in Span 1 got the cross-frames.
- Use the **Copy** tool, to copy the cross-frames to all bays in span 3. Select the spans or beams in the dialog box and press the **Copy By Ratio** button.



- Use the **Validate** button to preview the locations in the drawing. This will also check for conflicts with previously placed cross-frames or stiffeners.



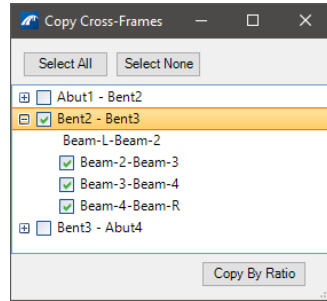
- Open the **Cross-Frame Placement** dialog box then select the first bay of the second span.
- Use the wizard to place the cross-frames:
 - Placement method: **Bulk Location**
 - Number of Locations: **6**
 - Apply to: **Current Bay**
 - From SupportLine: **Bent2**
 - From Offset: **9**
 - To SupportLine: **Bent3**
 - To Offset: **9**
 - Position Lock: **Normal to Left Beam**
 - Align: **Vertical**
 - Direction: **Upstation**
 - Left Stiffener: **6 x 0.5**
 - Cross-Frame: **X Frame_3**
 - Right Stiffener: **6 x 0.5**



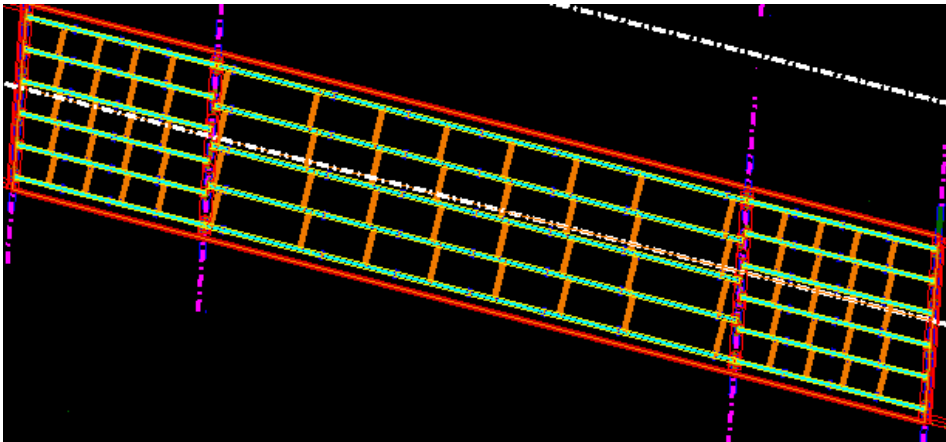
- Press the **Generate** button to create the cross-frame rows, and then press **Close** to close the wizard.
- Add 2 frames manually using the **Add** button. The frame will be added at the end of the table.
 - Position Lock: **Normal to Left Beam**
 - Left Location: **3 AND 122**
 - Cross-Frame: **TxDOT W40**
 - Orientation: **Upstation**
 - Align: **Vertical**
 - Left Stiffener: **TxDOT Brng 16" 3/4 x 7.5"**
 - Right Stiffener: **TxDOT Brng 16" 3/4 x 7.5"**

1	Normal To Left Beam	3.0000		TxDOT W40	Upstation	Vertical	TxDOT Brng 16" 3/4 x 7.5	TxDOT Brng 16" 3/4 x 7.5
2	Normal To Left Beam	122.0000		TxDOT W40	Upstation	Vertical	TxDOT Brng 16" 3/4 x 7.5	TxDOT Brng 16" 3/4 x 7.5

- Use the **Copy** tool to copy the cross-frames to all bays of Span 2. Select the spans or beams in the dialog box and press the **Copy By Ratio** button.

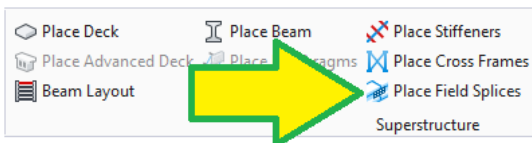


- Use the **Validate** button to preview the locations in the drawing. This will also check for conflicts with previously placed cross-frames or stiffeners. Then press **Save** to accept all cross-frame locations.



Note: If the user wants more control over where the cross-frames are placed, the distances can be changed after creating the rows with the bulk locations of the wizard or create one-by-one using the wizard. The bulk locations and the one-by-one in the wizard cannot be used in combination, it is either one or the other.

9. We will now place field splices only in the longer span using the **Place Field Splices** tool from the **Superstructure** section. Splices are usually controlled by length and weight of the segments. The engineer should consider transportation restrictions to determine if splices are needed.



- Click on the beam group to start the placement of the cross frames. Then click anywhere in the screen.
- In the **Place Field Splices** dialog box, select the first beam of the Span 2.

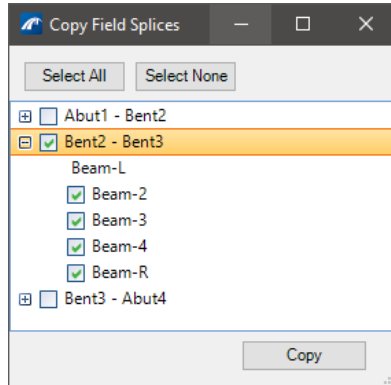
- Input the following values:
 - Template: *Field Splice_0*
 - Mode: *SupportLine*
 - Type *65.5'* in the text input
 - From: *Bent2*
 - Press the *Add* button to add the new splice

Add Section Template: **Field Splice_0** Mode: **SupportLine** **65.5** ' From **Bent2** **+ Add**

+ Add At Beam Breaks **✗ Delete Selected** **✗ Delete All** **Copy**

Location Type	Relative Location	From	Start Distance	Field Splice Pattern
SupportLine	65.5000	Bent2	15+42.67	Field Splice_0

- Use the *Copy* tool to copy the cross-frames to all beams of Span 2. Select the spans or beams in the dialog box and press the *Copy* button.



- Use the *Validate* button to preview the locations in the drawing, then press *Save* to accept all field splice locations.



Note: If more than one splice is needed the user can enter spaces similar to how spaces are entered for the Cross-Frames, but in splices the user cannot use the “@” command to group spacing. The spacing entered must be in relation to the mode selected.

Add Section Template: **Field Splice_0** Mode: **SupportLine** **15 60 115** ' From **Bent2** **+ Add**

+ Add At Beam Breaks **✗ Delete Selected** **✗ Delete All** **Copy**

Location Type	Relative Location	From	Start Distance	Field Splice Pattern
SupportLine	15.0000	Bent2	14+98.53	Field Splice_0
SupportLine	60.0000	Bent2	15+43.53	Field Splice_0
SupportLine	115.0000	Bent2	15+98.53	Field Splice_0

Note: Field splice used for this exercise is too large for our beam, we will cover how to create new splice plates in the library section, for now just ignore the issue. When we update the template used, the drawing will also update.



10. Finally, we will place the shear studs using the **Place Shear Studs** located in the **Superstructure** section.



- Click on the beam group to start the placement of the shear studs, then click anywhere in the screen.
- In the **Shear Studs Placement** dialog box, select the first beam of the Span 1.
- Press the **Add** button to add a new row to define the shear stud placement.
 - Location Type: **Distance**
 - Start Location: **1**
 - End Location: **3**
 - Longitudinal Spacing: **0.5**
 - Shear Stud: **H4L - 0.25 x 2.67"**
 - Number per Row: **3**
 - Transverse Spacing: **3.5**

#	Location Type	Start Location (') or Ratio	End Location (') or Ratio	Longitudinal Spacing (')	Shear Stud	Number per Row	Transverse Spacing (')
1	Distance	1.0000	3.0000	0.5000	H4L - 0.25x2.67"	3	3.5000

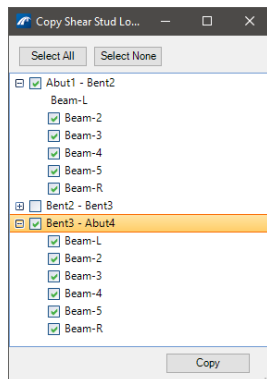
- Press the **Add** button to add a new row to define the shear stud placement.
 - Location Type: **Distance**
 - Start Location: **3.5**
 - End Location: **40.5**
 - Longitudinal Spacing: **1.5**
 - Shear Stud: **H4L - 0.25 x 2.67"**
 - Number per Row: **3**
 - Transverse Spacing: **3.5**

#	Location Type	Start Location (") or Ratio	End Location (") or Ratio	Longitudinal Spacing (")	Shear Stud	Number per Row	Transverse Spacing (")
1	Distance	1.0000	3.0000	0.5000	H4L - 0.25x2.67 "	3	3.5000
2	Distance	3.5000	36.5000	1.5000	H4L - 0.25x2.67 "	3	3.5000

- Press the **Add** button to add a new row to define the shear stud placement.
 - Location Type: **Distance**
 - Start Location: **41**
 - End Location: **44**
 - Longitudinal Spacing: **0.5**
 - Shear Stud: **H4L - 0.25 x 2.67"**
 - Number per Row: **3**
 - Transverse Spacing: **3.5**

#	Location Type	Start Location (") or Ratio	End Location (") or Ratio	Longitudinal Spacing (")	Shear Stud	Number per Row	Transverse Spacing (")
1	Distance	1.0000	3.0000	0.5000	H4L - 0.25x2.67 "	3	3.5000
2	Distance	3.5000	36.5000	1.5000	H4L - 0.25x2.67 "	3	3.5000
3	Distance	37.0000	39.0000	0.5000	H4L - 0.25x2.67 "	3	3.5000

- Use the **Copy** tool to copy the shear studs to all beams of Span 1 and Span 3. Select the spans or beams in the dialog box and press the **Copy** button.



- In the **Shear Studs Placement** dialog box, select the first beam of Span 2.
- Press the **Add** button to add a new row to define the shear stud placement.
 - Location Type: **Distance**
 - Start Location: **1**
 - End Location: **3.5**
 - Longitudinal Spacing: **0.5**
 - Shear Stud: **H4L - 0.25 x 2.67"**
 - Number per Row: **3**
 - Transverse Spacing: **3.5**

#	Location Type	Start Location (") or Ratio	End Location (") or Ratio	Longitudinal Spacing (")	Shear Stud	Number per Row	Transverse Spacing (")
1	Distance	1.0000	3.5000	0.5000	H4L - 0.25x2.67 "	3	3.5000

- Press the **Add** button to add a new row to define the shear stud placement.
 - Location Type: **Distance**
 - Start Location: **4**
 - End Location: **121**
 - Longitudinal Spacing: **1.5**

- Shear Stud: ***H4L - 0.25 x 2.67"***
- Number per Row: ***3***
- Transverse Spacing: ***3.5***

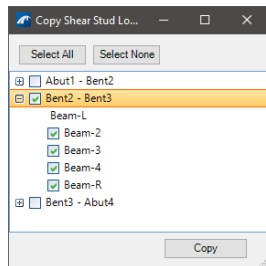
#	Location Type	Start Location (") or Ratio	End Location (") or Ratio	Longitudinal Spacing (")	Shear Stud	Number per Row	Transverse Spacing (")
1	Distance	1.0000	3.5000	0.5000	H4L - 0.25x2.67 "	3	3.5000
2	Distance	4.0000	121.0000	1.5000	H4L - 0.25x2.67 "	3	3.5000

- Press the ***Add*** button to add a new row to define the shear stud placement.

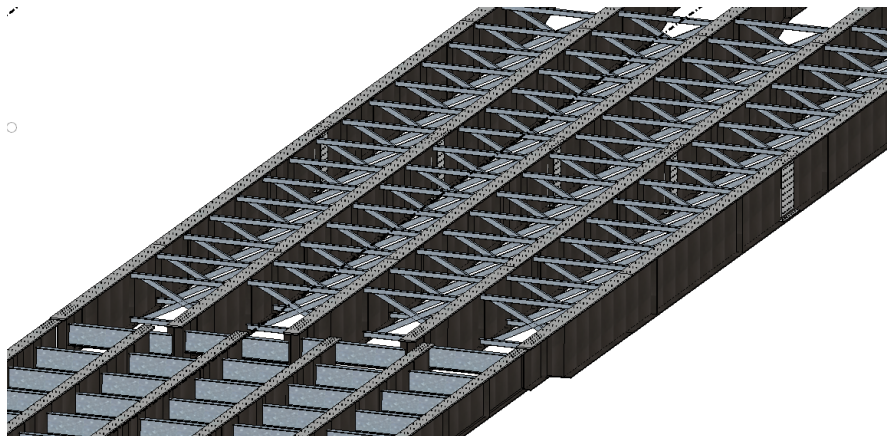
- Location Type: ***Distance***
- Start Location: ***121.5***
- End Location: ***123.5***
- Longitudinal Spacing: ***0.5***
- Shear Stud: ***H4L - 0.25 x 2.67"***
- Number per Row: ***3***
- Transverse Spacing: ***3.5***

#	Location Type	Start Location (") or Ratio	End Location (") or Ratio	Longitudinal Spacing (")	Shear Stud	Number per Row	Transverse Spacing (")
1	Distance	1.0000	3.5000	0.5000	H4L - 0.25x2.67 "	3	3.5000
2	Distance	4.0000	121.0000	1.5000	H4L - 0.25x2.67 "	3	3.5000
3	Distance	121.5000	123.5000	0.5000	H4L - 0.25x2.67 "	3	3.5000

- Use the ***Copy*** tool to copy the shear studs to all beams of Span 2. Select the spans or beams in the dialog box and press the ***Copy*** button.








- Use the ***Validate*** button to preview the locations in the drawing. Then press ***Save*** to accept all shear stud locations.
- To see the shear studs in the 3D view the user will need to turn off the deck either using the level display or using the explorer.






- After placing all steel elements, everything left to do is repeated from the previous section.


11. Place Interior Bents.  Place Pier




- Template Name: *MultiColumn\TxDOT\Interior Bent for Steel Beams* 
- Cap Length Adjustment: *Deck and Aligned*
- Cap Material: *Tx Interior Bent Cap* 
- Column Material: *Tx Column* 
- Footing Material: *Tx Drilled Shaft* 
- Name Prefix for SupportLine2: *Bent2*
- Name Prefix for SupportLine3: *Bent 3*

12. Place Abutments at both ends of the bridge.  Place Abutment

- Template Name: *PileCap\TxDOT\Abut for Steel Beams with DS up to 15 deg skew* 
- Apply Skew To Solids: *True*
- Conform BackWall With Deck Top: *True*
- Orientation: *Start*
- Cap Length Adjustment: *Deck and Aligned*
- Cap Material: *Tx Abutment* 
- Pile Material: *Tx Drilled Shaft* 
- Name Prefix for SupportLine1: *Abutment1*
- Name Prefix for SupportLine4: *Abutment4*


Note: Update the Backwall Vertical Offset from Deck top in the properties to be 13", also update the Backwall Depth and Backwall Vertical Offset to be 48.95" in the Template settings as it was done before.

13. Place wingwalls on the left and right of each abutment and make the needed adjustments to align them correctly.  Place Wingwall

- Template Name: *Wingwall\TxDOT\Wingwall with Cap and DS* 
- Orientation: *Normal/Skewed*
- Vertical Offset: *4.0725 [Left], 3.1025 [Right] (Swap values for Abutment 4)*
- Align with Abutment: *False*
- Transverse Offset: *0.75 [Left], 0.27 [Right] (Swap values for Abutment 4)*
- Align with FFBW: *True*
- Parallel to Alignment: *True*
- Use Slope from Profile: *True*
- Place Right Wingwall: *True [Use the exact same settings as above]*
- Wingwall Material: *Tx Abutment* 
- Footing Material: *Tx Abutment* 

- Pile Material: *Tx Drilled Shaft* [...]
- Name Prefix for SupportLine1: *Abut1-Wingwall1*
- Name Prefix for SupportLine4: *Abut4-Wingwall1*

Note: Since left and right wingwalls were enabled, the software will automatically number them *Abut1-Wingwall1* & *Abut-Wingwall2*. Adjust the template to have a wingwall height of 4.0725'.

14. Place bearing pads and bearing seats. Select each SupportLine.  Place Bearing

- Bearing Type: *Cube*
- Cube Width, W: *1.333 [16"]*
- Cube Depth, D: *0.666 [8"]*
- Cube Height: *0.2292 [2.75"]*
- Orientation: *Girder*
- Has Bearing Seats: *True*
- Seat Min. Thickness: *0.095 [1.15" - Min thickness is measured at the edge of seat]*
- Seat D1: *0.6666 [fwd dimension from bearing line to edge of cap]*
- Seat D2: *0.7083 [bk dimension from bearing line to cap cl]*
- Seat W1: *1.166 [half bearing seat width]*
- Seat W2: *1.166 [half bearing seat width]*
- Seat Orientation: *Girder*
- Back Offset: *-0.7083*
- Ahead Offset: *0.7083*
- Pad or Plate Material: *Miscellaneous > Neoprene Bearing Pads* [...]
- Bearing Seat Material: *Tx Bearing Seat* [...]

15. Place approach slabs, and sleeper slabs (see step 17 in previous section)

16. Finally, place the traffic barrier. See step 19 of previous section and use the templates below for left and right barriers.

- Template Name: *Barriers\TxDOT\Rails with Posts (Use for Typ Sections) \C223_R* [...]
- Template Name: *Barriers\TxDOT\Rails with Posts (Use for Typ Sections) \C223_L* [...]

17. This concludes the creation of the bridge with a steel superstructure. Practice creating this same bridge on your own in the **Exercise_01.dgn**.

18. Close all open sessions of OpenBridge Modeler, but keep OpenBridge Designer open if it is being used.

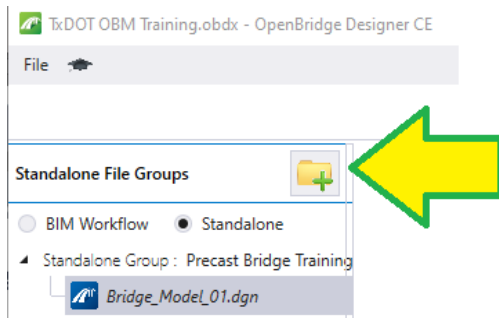
Creating a Precast Bridge Model – Using the Bridge Wizard

This section will repeat several steps from the previous section, this is mostly to setup a new standalone group for a new bridge model that will be created using the Bridge Wizard in OBM. After completing exercise one, the user can close OBM and return to the OBD folder page.

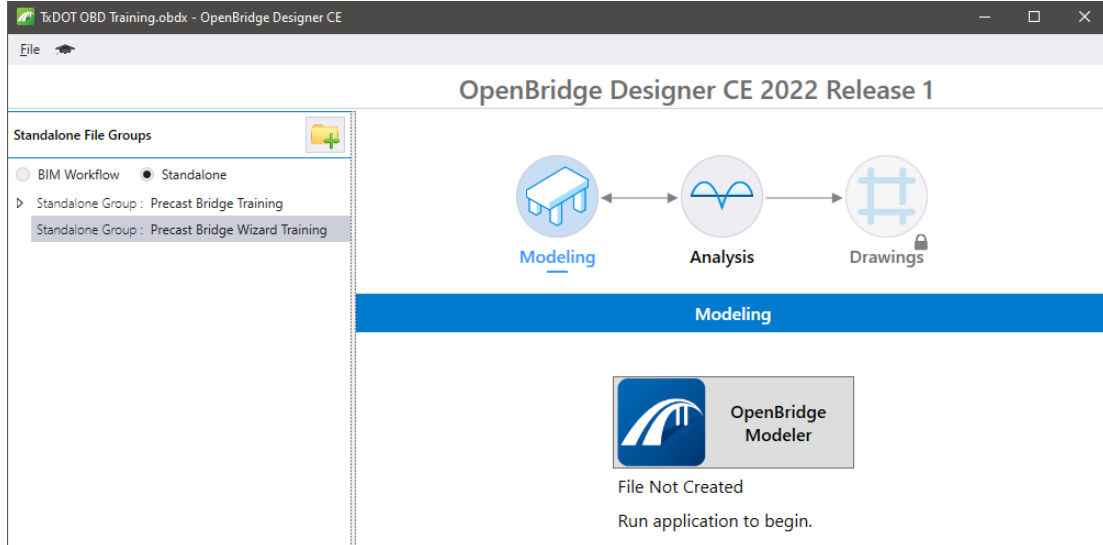
Create a New OpenBridge Designer file.

If OpenBridge Designer is not getting used, please skip to page 78 to start with OpenBridge Modeler.

1. With **OpenBridge Designer** still open and with the **Standalone** option selected, select the **Add Standalone Group** icon.



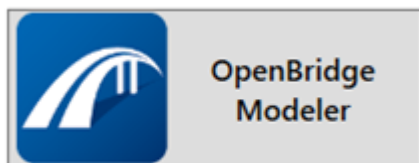
2. Use a name that describes the type of work that is going to be stored in the group. For this training use **Precast Bridge Wizard Training**.



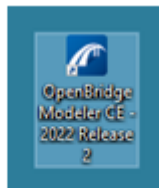
Create a New OpenBridge Modeler file.

OBM will ask the user again to login to ProjectWise as it did before, and the same steps as before will be used to create a new dgn file.

1. Open **OpenBridge Modeler** either by pressing the **OpenBridge Modeler** button in OBD or by pressing the **OpenBridge Modeler** icon in the desktop or start menu.

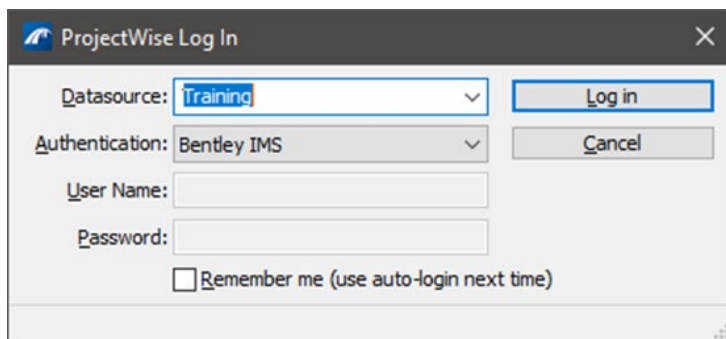


Icon in OpenBridge Designer

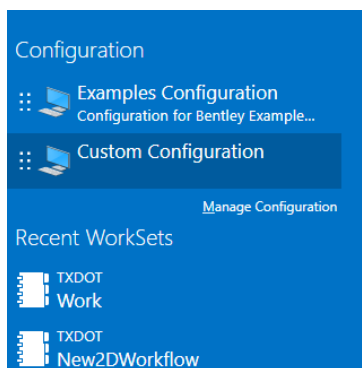


Icon in Desktop (Standalone OBM)

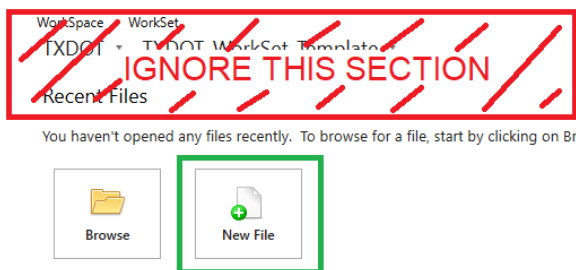
2. When prompted, login to ProjectWise again using the same datasource and authentication used in OBD.



3. Once OBM is loaded, ignore the *WorkSpace* and the *WorkSet* area. Press the **New File** to create a new OBM file.

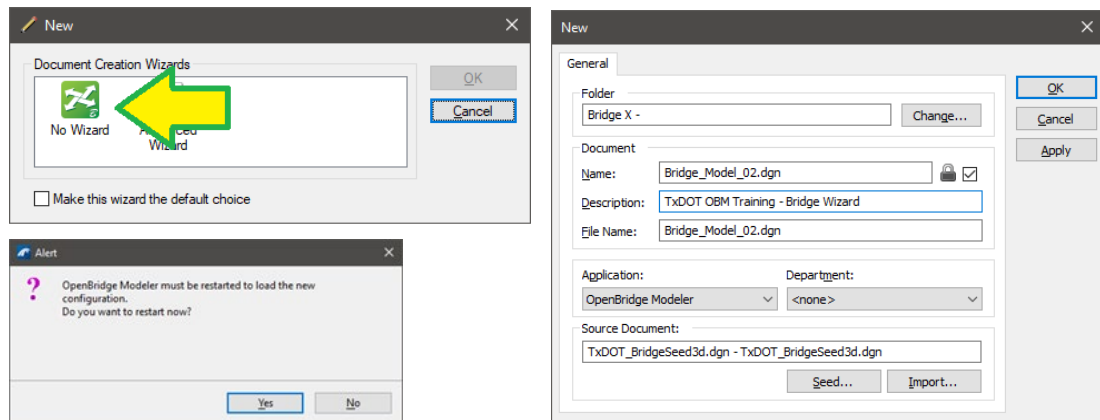


OpenBridge Modeler CE




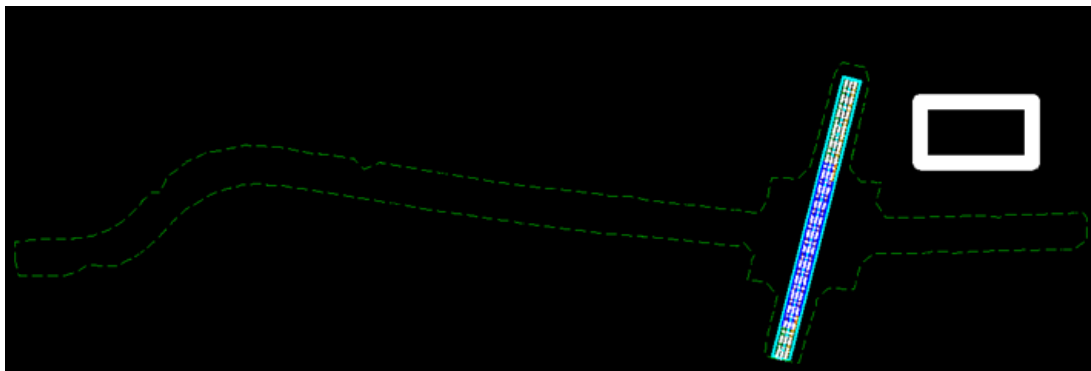
4. During the file creation verify that the seed file selected is correct and save the file to the correct path as shown below.
 - File creation method: **No Wizard**

- Browse to *Documents\14 - AUS\Design Projects\025303035(US281)_Bridge_XX\4 - Design\Bridge\Bridge X*
Note: The XX in the project name will be replaced by the user's initials.
- Verify that the Seed is *Documents_Standards\Configuration\Organization-Civil\TXDOT_Bridge\OpenBridge Modeler\Seed\TxDOT_BridgeSeed3d.dgn*
- Key-in the new file name *Bridge_Model_02.dgn*.
- Set the application to *OpenBridge Modeler*
- When prompted accept the reload of the workspace.



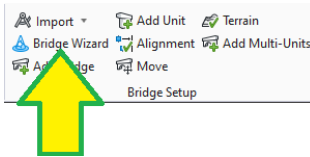
Creating a Bridge with Concrete Superstructure – Using the Bridge Wizard

1. Once the file is created, proceed to attach the geometry files as it was done in the previous section.
2. Once all files have been attached. Press the *Fit View*  icon to fit the view around all attachments.



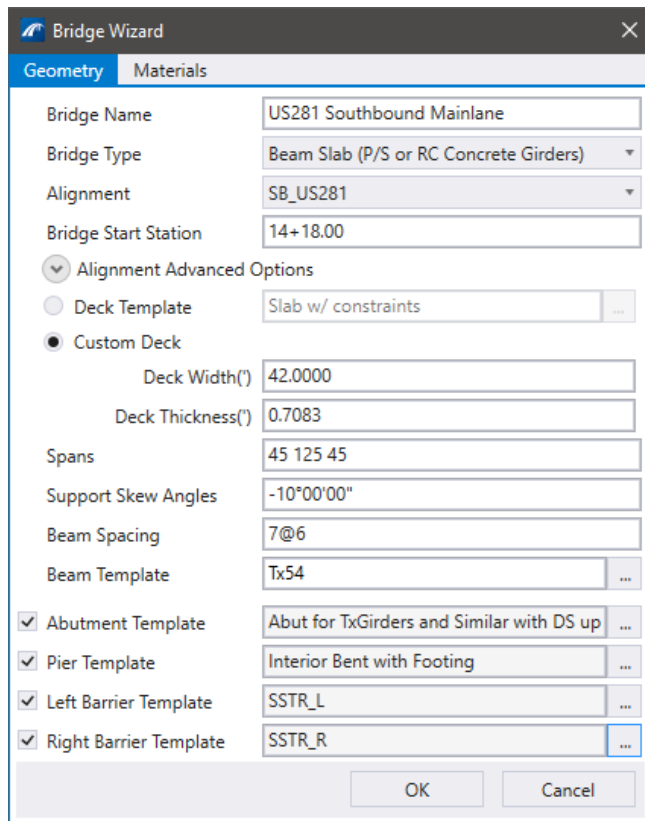
3. We need to set the GeoCoordinate system of the OBM file to match the GeoCoordinate definition of the reference files as it was done in the previous section.
4. This dataset is used for other trainings in TxDOT, we will use the Southbound main lane as in the previous section.


5. Once the file has been setup with all the references and the contours, we are ready to create the new bridge using the **Bridge Wizard** tool located in the **Bridge Setup** section.



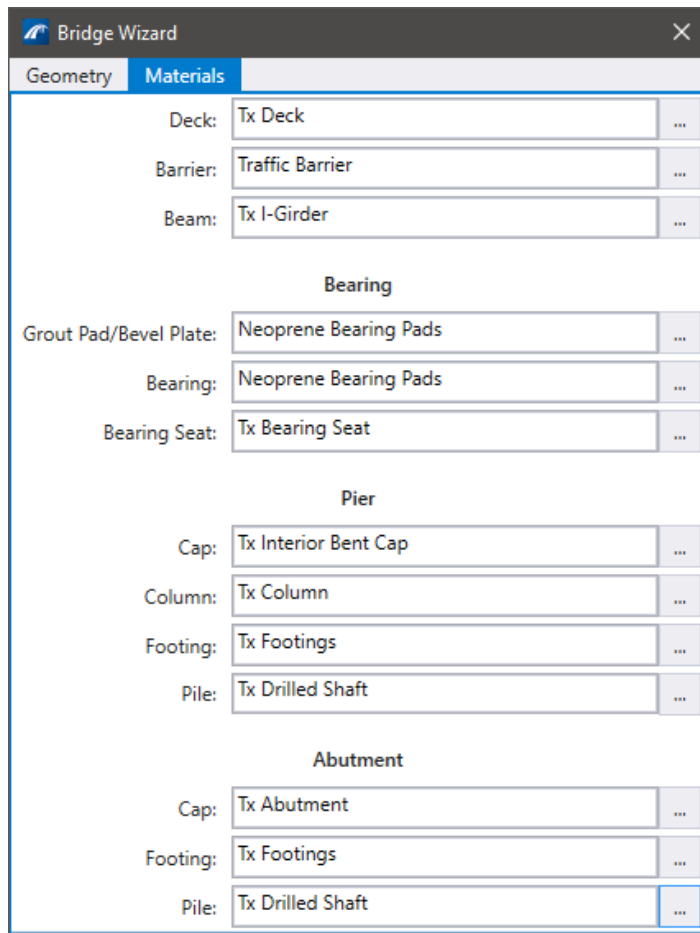
Note: Very important, **DO NOT PRESS ENTER** while using the wizard, **PRESS TAB**.

- Click on the alignment once to identify the alignment to be used, then click again to select a random station. Once a random station is selected use the keyboard to enter the information below.
- Bridge Name: **US281 Southbound Mainlane**
- Bridge Type: **Beam Slab (P/S or RC Concrete Girders)**
- Alignment: **SB_US281**
- Bridge Start Station: **14+18.00**
- Custom Deck
- Deck Width: **42'**
- Deck Thickness: **8.5" (0.7083')**
- Spans: **45 125 45**
- Support Skew Angles: **-10 degrees**
- Beam Spacing: **7@6'**
- Beam Template: **Beams\Standard Sections\TxDOT\Tx Girders\Tx54 [...]**
- Abutment Template: **Pile Cap\TxDOT\Abut for TxGirders and Similar with DS up to 15 deg skew [...]**
- Pier Template: **Multi Column\TxDOT\ Interior Bent with Footing [...]**
- Left Barrier Template: **TxDOT_Rails with Solid Walls\SSTR_L [...]**
- Right Barrier Template: **TxDOT_Rails with Solid Walls\SSTR_R [...]**




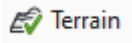
Note: As mentioned before, entering the materials is important when generating reports, click on the **Materials** tab, and set them as follows. []

- Deck: **Concrete\Tx Deck**
- Barrier: **Miscellaneous\Traffic Barrier**
- Beam: **Concrete\Tx I-Girder**
- Grout Pad/Bevel Plate: **Miscellaneous\Neoprene Bearing Pads**
- Bearing: **Miscellaneous\Neoprene Bearing Pads**
- Bearing Seat: **Concrete\Tx Bearing Seat**
- Cap: **Concrete\Tx Interior Bent Cap**
- Column: **Concrete\Tx Column**
- Footing: **Concrete\Tx Footings**
- Pile: **Concrete\Tx Drilled Shafts**
- Cap: **Concrete\Tx Abutment**
- Footing: **Concrete\Tx Footings**
- Pile: **Concrete\Tx Drilled Shaft**



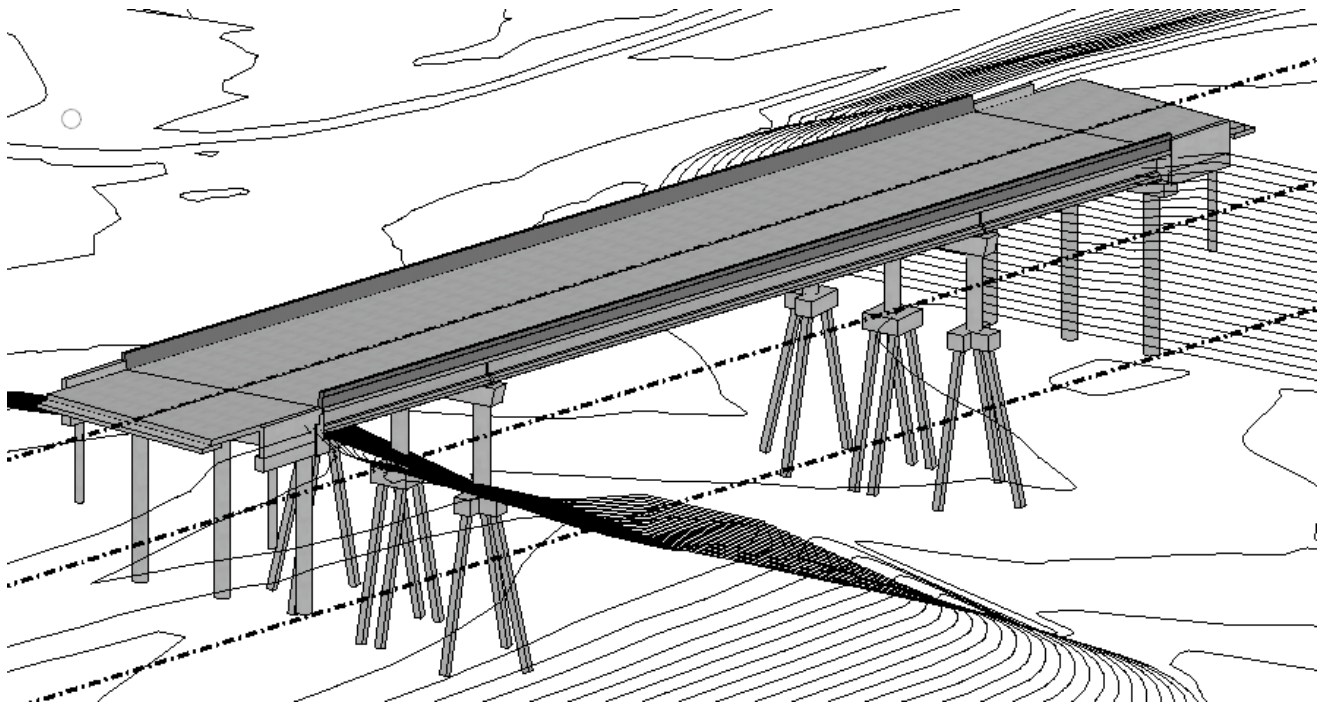
6. Once all bridge variables are defined and the optional materials are defined, the user can now press **Enter**, or **OK** in the dialog box.

Note: Give some time for OBM to create the Bridge, the greater number of beams the longer the wizard can take.

7. Once the bridge model has been created the following items need to be revised. Refer to the previous sections of this manual for detailed instructions and input values.
 - Make the Terrain Active.
 - Civil Tab > Terrain Model > Set Active Terrain 
 - Home Tab > Bridge Setup > Terrain 
 - Deck adjustments.
 - Change the deck name to **MainDeck-Unit1**.
 - Use **Point Control** to change the left and right edge of the deck to match the edge of pavement lines (blue lines).
 - Use **Assign Superelevation** to apply cross slope to the deck.

- Beam and Beam Layout adjustments.
 - Apply Beam skew ends.
 - Change the Beam haunch to 3.5”.
- Support Lines
 - Change the names of the support lines to reflect the name of the support (e.g. Abutment1, Bent2, etc).
- Supports
 - Rename the supports as needed to reflect the correct support name (e.g. Abutment1, Bent2, etc).
 - Apply Skew to solids for both Abutments.
 - Conform backwall with deck top Offset on both Abutments.
- Bearing Pad and Bearing Seat adjustments.
 - Pad Size and orientation
 - Seat size and orientation
- Wingwalls need to be placed.
- Approach Slabs need to be placed.

This concludes the creation of the concrete Southbound bridge model using the Bridge Wizard.

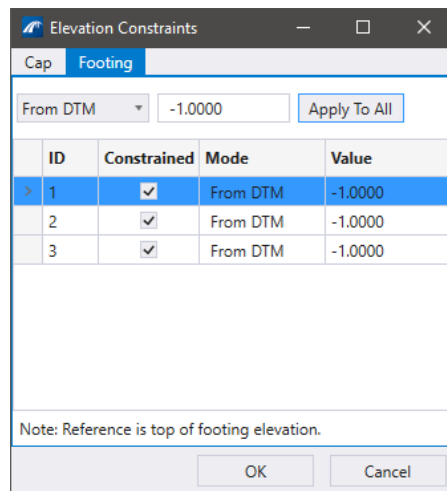


Placing excavation around footings

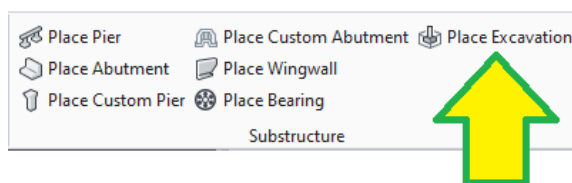
This section will guide the user on how to place excavation models on footings, this tool can be used on Interior Bents and Abutments that contain sub-elements classified as footing. This section will also guide the user on how to obtain the quantities for the excavation volume.

1. Update the elevation constraints of the Interior Bents so that the footing starts 1' below the active terrain. To do so, select both bents in the **Explorer** and in the **Properties** select **Elevation Constraints**. In the **Elevation Constraints** dialog select the **Footing** tab and use the following information.

- **From DTM**
- Value: **-1.0** [This is measured at the CL of column, it needs to be adjusted to ensure square footings are at least 1 ft below ground on all corners]
- Click **Apply to All**
- Click **OK** to close the dialog box.

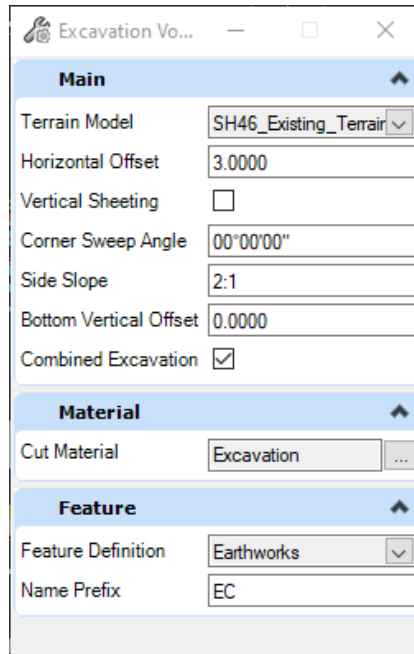


2. Use the **Place Excavation** tool from the **Home > Substructure** section.

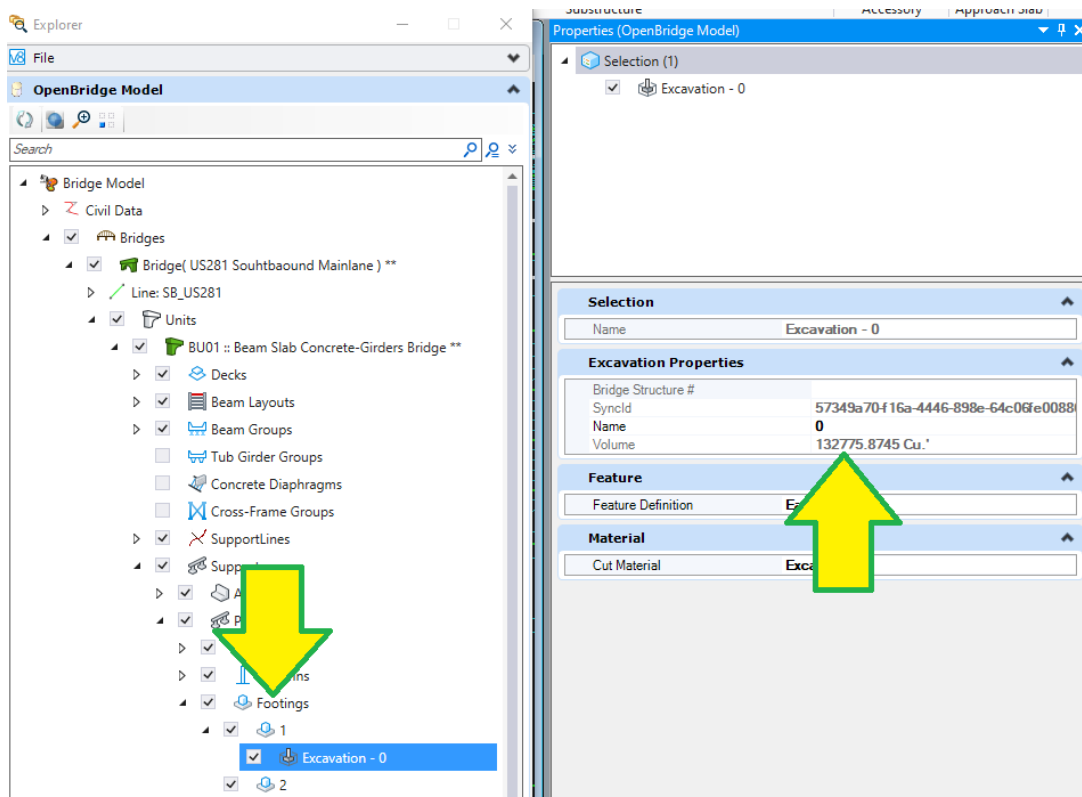


- Terrain Model: **SH46_Existing_Terrain** [Select from drop down]
- Horizontal Offset: **3'**
- Vertical Sheeting: **False**
- Corner Sweep Angle: **5 degrees**
- Side Slope: **2:1**
- Bottom Vertical offset: **1'**
- Combined Excavation: **True** [To combine excavation of all footings in one bent]
- Cut Material: **Miscellaneous\Excavation** [...]

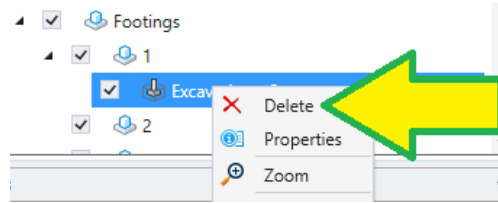
- Click on the Interior Bent #2 and Interior Bent #3 then click reset (Right Click) to accept the selection, finally click anywhere to start processing the excavation.



- The excavation details can be seen using the combination of explorer and the properties dialog. The user will find the excavation details in the 1st footing of the support element.



- The user cannot make changes of the parameters once the excavation is created. If the excavation is not what the user expected, it will need to be deleted and created again.
- To delete the excavation the user can right click on the excavation in the explorer dialog and click delete.



Exercise #2 – Create the Northbound Main Lane using the Wizard.

Save this file as **Exercise_02.dgn** and using the acquired knowledge use the bridge wizard to create the model for the Northbound Main Lanes bridge with the following information.

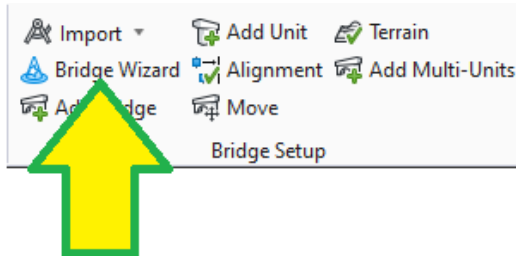
- Bridge Name: **US281 Northbound Mainlane**
- Bridge Type: **Beam Slab (P/S or RC Concrete Girders)**
- Alignment: **NB_US281**
- Start Station: **14+36.00**
- End Station: **16+51.00**
- All other information is the same as the Southbound bridge.
- Once completed return to the **Bridge_Model_02.dgn**.

This concludes the creation of the concrete girder bridge models using the Bridge Wizard.

Creating a Bridge with Steel Superstructure – Using the Bridge Wizard

This section will focus on the steel part of OBM, all other elements are the same as the previous section. Steps will be repeated for the Bridge, Support Lines, Supports, Bearing seats, Wingwalls, etc.

1. Continuing in the *Bridge_Model_02.dgn* file.
2. We will now create a steel superstructure bridge using the *Bridge Wizard* tool located in the **Bridge Setup** section.



Note: Very important, DO NOT PRESS ENTER while using the wizard, PRESS TAB.

- Click on the alignment once to identify the alignment to be used, then click again to select a random station. Once a random station is selected use the keyboard to enter the information below.
- Bridge Name: *US281 Northbound Mainlane*
- Bridge Type: *Beam Slab (Steel Girders)*
- Alignment: *NB_US281*
- Bridge Start Station: *14+36.00*
- Custom Deck
- Deck Width: *42'*
- Deck Thickness: *8.5" (0.7083')*
- Spans: *45 125 45*
- Support Skew Angles: *-10 degrees*
- Beam Spacing: *7@6'*
- Built-up Beam: *Enable*
- Depth: *54"*
- Thickness (Web): *1"*
- Width: *14"*
- Thickness (Flanges): *0.75"*

Note: In the bridge wizard the user cannot add variations to the built-up beam as it was done in the previous steel bridge.

- Abutment Template: *Pile Cap\TxDOT\Abut for Steel Beams with DS up to 15 deg skew* [...]
- Pier Template: *Multi Column\TxDOT\ Interior Bent for Steel Beams* [...]
- Left Barrier Template: *TxDOT\Rails with Posts (Use for Typ Sections) \C223_L* [...]
- Right Barrier Template: *TxDOT\Rails with Posts (Use for Typ Sections) \C223_R* [...]

Bridge Wizard

Geometry | **Materials**

Bridge Name: US281 Northbound Mainline

Bridge Type: Beam Slab (Steel Girders)

Alignment: NB_US281

Bridge Start Station: 14+36.00

Alignment Advanced Options

Deck Template: Slab w/ constraints

Custom Deck

Deck Width(ft): 42.0000

Deck Thickness(ft): 0.7083

Spans: 45 125 45

Support Skew Angles: -10°00'00"

Beam Spacing: 7@6

Beam Template

Built-up Beam

Web: Depth 54.0000, Thickness 1.0000

Flanges: Width 14.0000, Thickness 0.7500

Abutment Template: Abut for Steel Beams with DS up to 15 deg ...

Pier Template: Interior Bent for Steel Beams ...

Left Barrier Template: C223_L ...

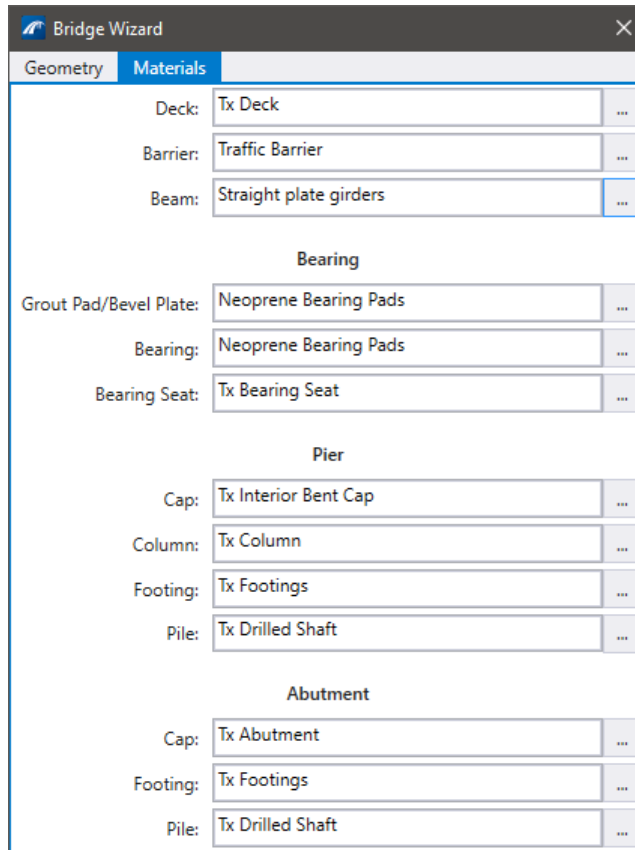
Right Barrier Template: C223_R ...

OK Cancel

Note: As mentioned before, entering materials is important when generating reports, click on the **Materials** tab, and set them as follows. [...]


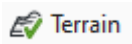
- Deck: **Concrete\Tx Deck**
- Barrier: **Miscellaneous\Traffic Barrier**
- Beam: **Steel\Straight Plate Girder**
- Grout Pad/Bevel Plate: **Miscellaneous\Neoprene Bearing Pads**
- Bearing: **Miscellaneous\Neoprene Bearing Pads**
- Bearing Seat: **Concrete\Tx Bearing Seat**
- Cap: **Concrete\Tx Interior Bent Cap**
- Column: **Concrete\Tx Column**

- Footing: *Concrete\Tx Footings*
- Pile: *Concrete\Tx Drilled Shafts*
- Cap: *Concrete\Tx Abutment*
- Footing: *Concrete\Tx Footings*
- Pile: *Concrete\Tx Drilled Shaft*

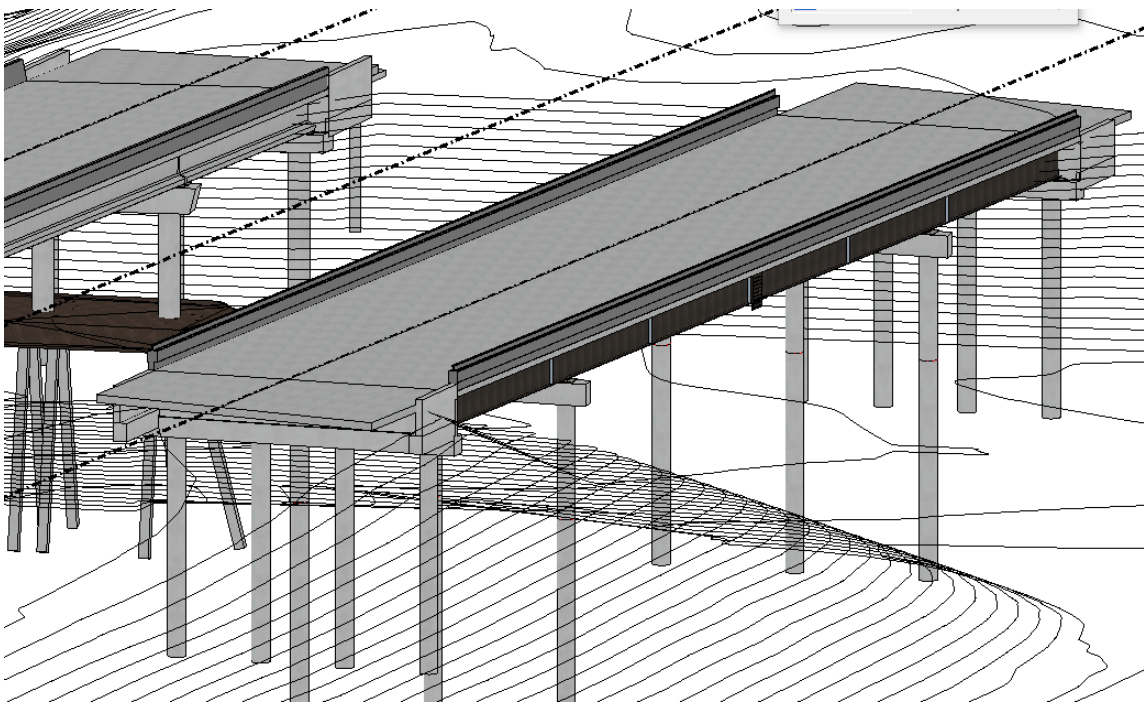


3. Once all bridge variables are defined and the optional materials are defined, the user can now return to the geometry tab and click **Enter**, or **OK** in the dialog box.

Note: Give some time for OBM to create the Bridge, the greater number of beams the longer the wizard can take.

4. Once the bridge model has been created the following items need to be revised, using the previous section as guidance the user can complete the needed adjustments.
 - Make the Terrain Active.
 - Civil Tab > Terrain Model > Set Active Terrain 
 - Home Tab > Bridge Setup > Terrain 
 - Deck adjustments.

- Change the deck name to **MainDeck-Unit1**.
- Use **Point Control** to change the left and right edge of the deck to match the edge of pavement lines (blue lines).
- Use **Assign Superelevation** to apply cross slope to the deck.
- Stiffeners, Shear Studs, Cross-Frames, and Field splices need to be added.
- Beam and Beam Layout adjustments.
 - Apply Beam skew ends.
 - Change the Beam haunch to 3.5".
- Support Lines
 - Change the names of the support lines to reflect the name of the support (e.g. Abutment1, Bent2, etc).
- Supports
 - Rename the supports as needed to reflect the correct support name (e.g. Abutment1, Bent2, etc).
 - Apply Skew to solids for both Abutments.
 - Conform backwall with deck top Offset on both Abutments.
- Bearing Pad and Bearing Seat adjustments.
 - Pad Size and orientation
 - Seat size and orientation
- Wingwalls need to be placed.
- Approach Slabs need to be placed.



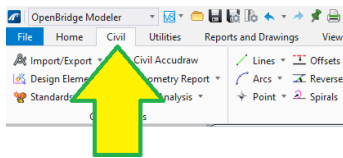
This concludes the creation of the steel bridge model using the Bridge Wizard.

Placing Linear Templates in OBM

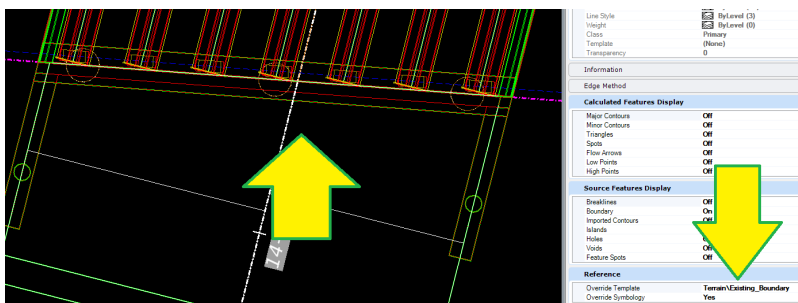
This section of the training will cover how to apply linear templates created in ORD Template Library. The process of placing Linear Templates in OBM is the same as in ORD, the only difference is that geometry (e.g. Horizontal and Vertical alignments) created in OBM cannot be modified in ORD. While this section only covers the linear templates for RipRap, the concept is the same for retaining walls. This section will only place RipRap on a single abutment, however, the steps can be applied to connect two abutments with a single RipRap.

Placing Riprap in OBM

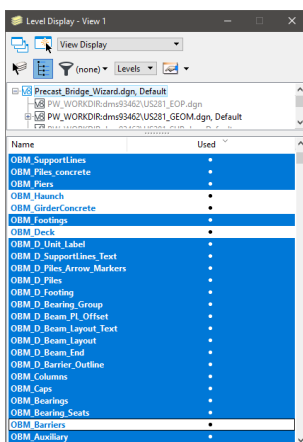
In this section we will be creating the riprap around one bridge abutment using the tools located in the *Civil* tab.



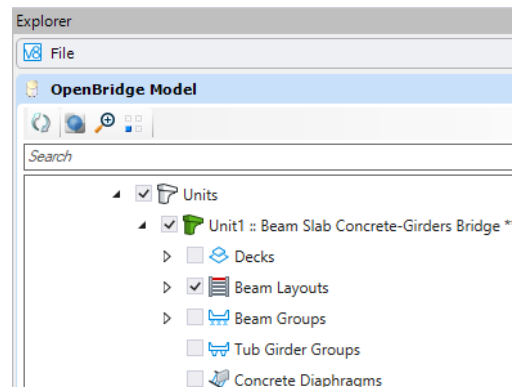
1. Open the **Bridge_Model_01.dgn** file. (Via OBD or Standalone OBM)
2. To begin, zoom in near the abutment. Turn off references as needed, select a contour line, and set the terrain override symbology to **No**, or change override template to **Existing Boundary** if needed.



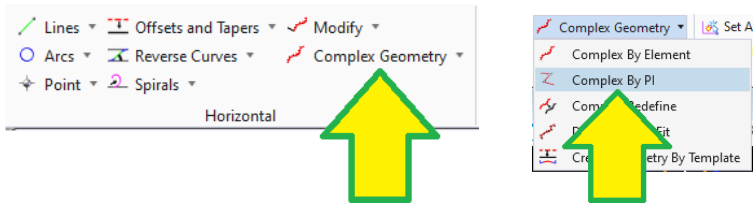
Note: The user may need to turn off the deck and the beams to better access the abutment, this can be done in the **Level Display** dialog by turning off levels **OBM_Deck**, **OBM_Haunch**, **OBM_Barriers** and **OBM_GirderConcrete**. Alternatively, the display of individual bridge elements can also be turned off by unchecking the item in the **OpenBridge Model** tab of the **Explorer** window.



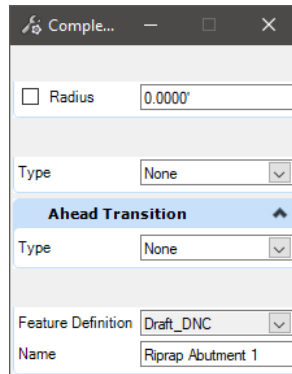
OR



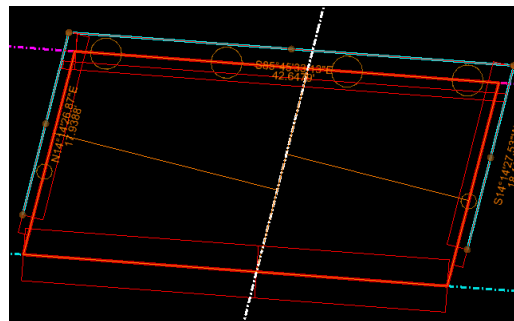
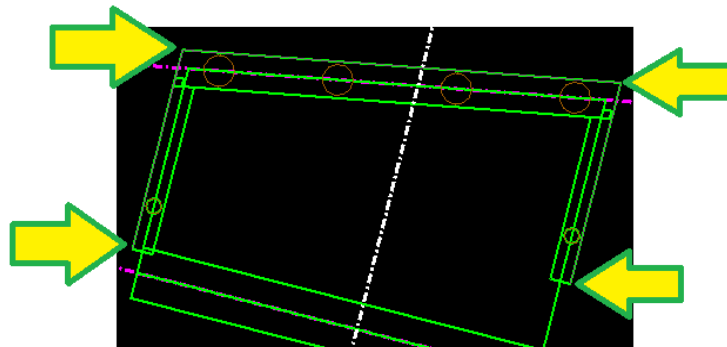
- Using the civil tools, place a line tracing the front of the abutment cap. Use **Complex By PI** tool located in the **Civil > Horizontal > Complex Geometry** section.



- Set the parameters of the civil line as follows
 - Radius: **0'**
 - Back Transition Type: **None**
 - Ahead Transition Type: **None**
 - Feature Definition: **Linear/Miscellaneous/Draft DNC**
 - Name: **Riprap Abutment <Number>**

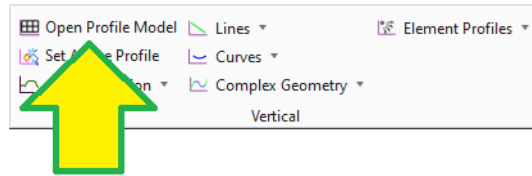


- Place the civil line tracing around the outside edge of the abutment cap and wingwalls.

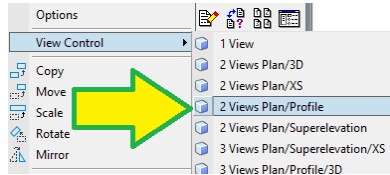


4. Now we will create a profile along this line that will help us define the riprap edge.

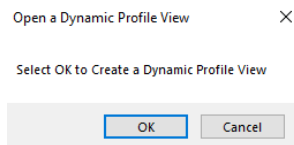
- Open a new view window for the profile by selecting the plan element, then either:
 - Select the **Open Profile Model**/tool located in the **Vertical** section.



- Or click and hold the right mouse button anywhere in the screen, then select **View Control > 2 Views Plan/Profile** from the pop-up menu.

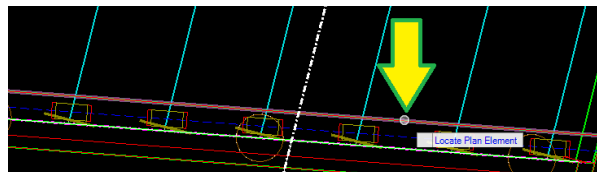


3. Select **OK** to Create a Dynamic Profile View.

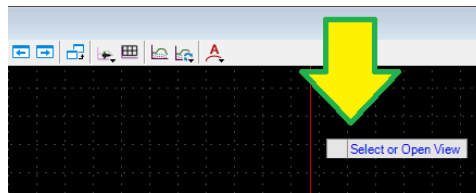


4. Follow the prompts to click on the line created, then click in the view other than the plan view.

- Click on Plan Element

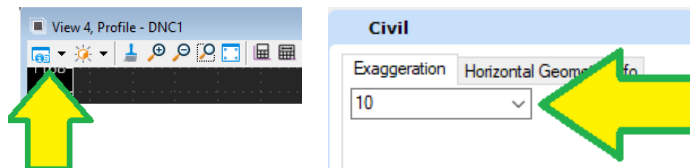


- Click on View

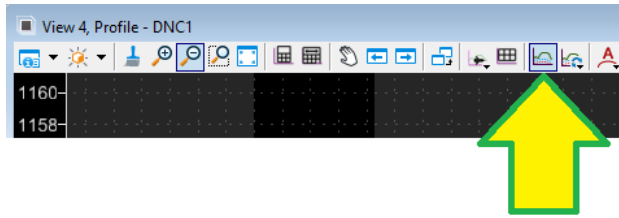


5. The view will fit and will show the active terrain. We must now create a 3D cut to display the abutment in the profile view.

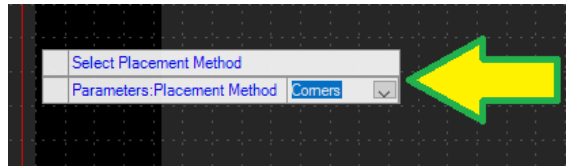
- The default exaggeration of all profile views is always set to 10, the user can change the exaggeration in the view attributes tab of the view used for the profile. For this exercise we will set it to 1.



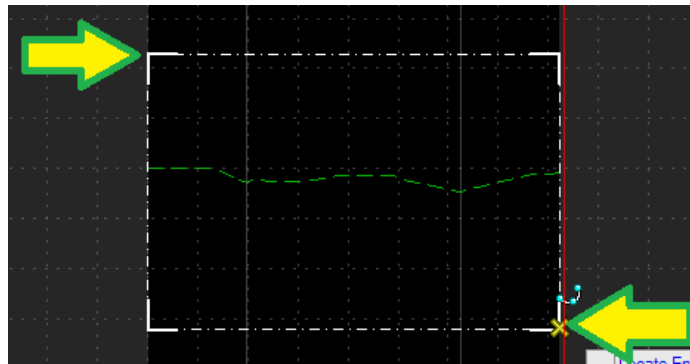
- Turn all levels back ON, then use the **Create 3D Cut** tool to create a clip of the profile.



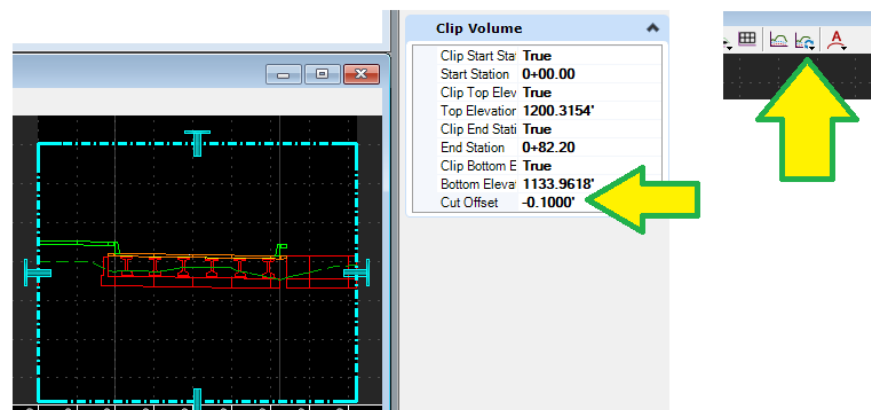
- Click in the profile view once to accept method of clipping.



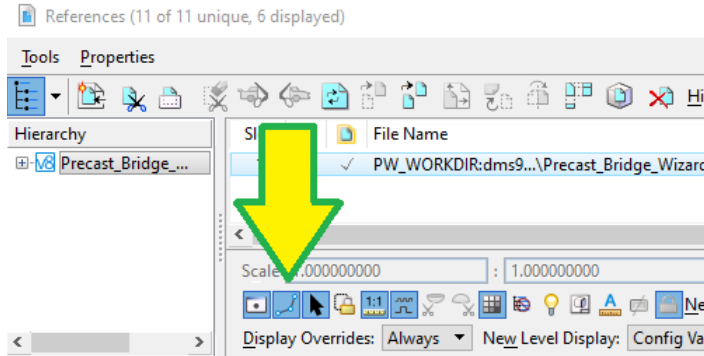
- Create a box around the existing ground, large enough to fit the abutment height.



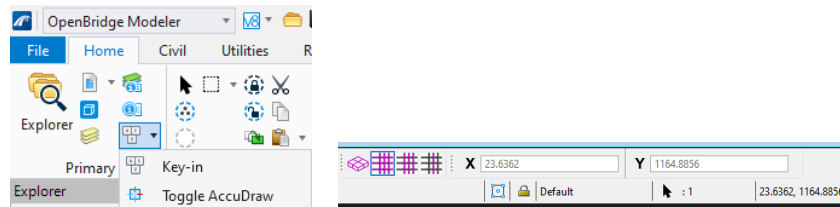
- If all the elements of the abutment and wingwall do not show up, change the horizontal offset of the 3D clip from the line in the properties dialog. Select the box border, change the offset to ± 0.1 , then click the **Refresh 3D Cut** button to update the profile view. Adjust the offset until both ends of the wingwall are displayed.



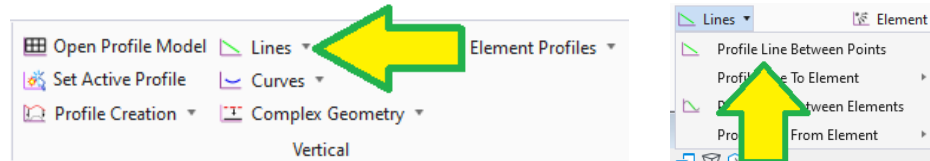
6. Now we will draw a profile line to define the top edge of the riprap.
 - Based on the TxDOT CADD standard drawings CRR and SRR, the riprap starts 9" below the cap for beam/slab type of bridges and 1'-6" for slab span, box beams or slab beams. For this exercise, draw the line 9" below from each end of the cap.
 - To snap to the abutment, the user needs to enable snaps in the reference.



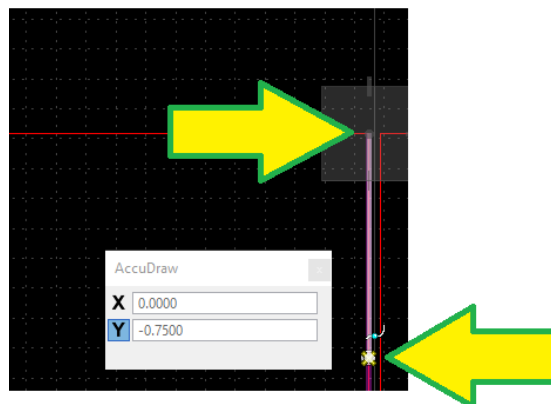
- If Accu-draw is not already active, turn it on by pressing **F11** on your keyboard or navigating to **Home > Primary** and selecting **Toggle Accu-draw** to turn on XY coordinate-based drafting tools. You can dock the XY input boxes to the bottom of your window.



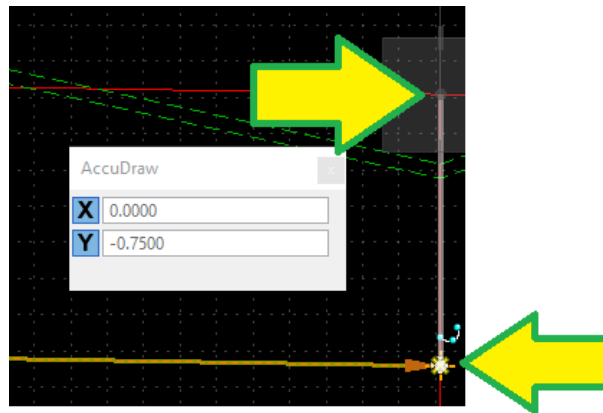
- Place a line across the front of the abutment cap using the **Profile Line Between Points** located in the **Civil > Vertical** section.



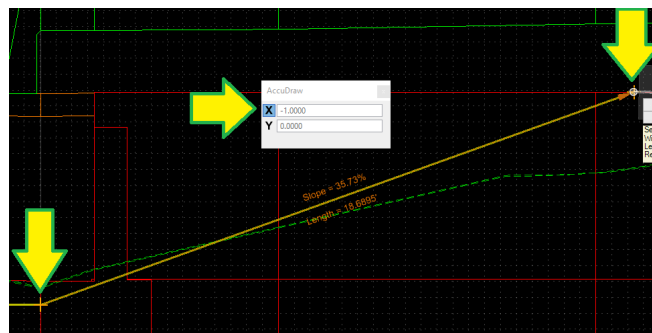
- Snap on the top left corner of the abutment in the profile view. Press **O** in the keyboard to set the origin, then type **0.75** in the Y field and **0** in the X field of Accu-draw. Press the left button on the mouse to place the start of the line.



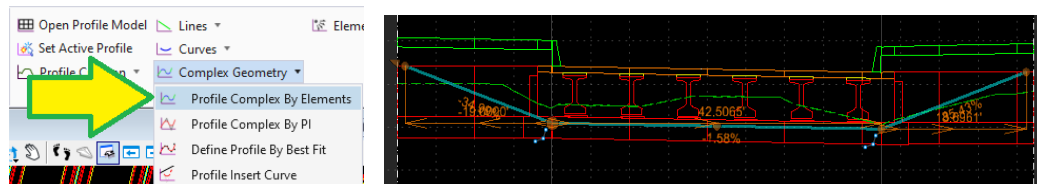
- Repeat the same snapping process to end the line 9" below the right corner of the abutment; Press **O** in the keyboard to set the origin, then **V** to rotate Accu-draw to match the view, then type **0.75** in the Y field and **0** in the X field of Accu-draw. Press the left button on the mouse to place the end of the line.
- **Note:** If the end 9" offset isn't entering into Accu-draw correctly, Snap the end of the line to the top right corner of the abutment then use the **Element Selection** tool under **Home > Selection** to click on the line end and move it down by Y = -0.75.



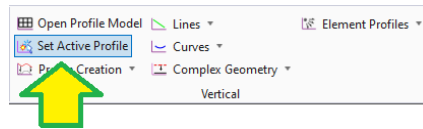
- Once the line below the abutment cap is in place, we will draw the lines along the wingwalls using the previously created line as our start point and ending at 1 foot before the end of the wingwall at the top.



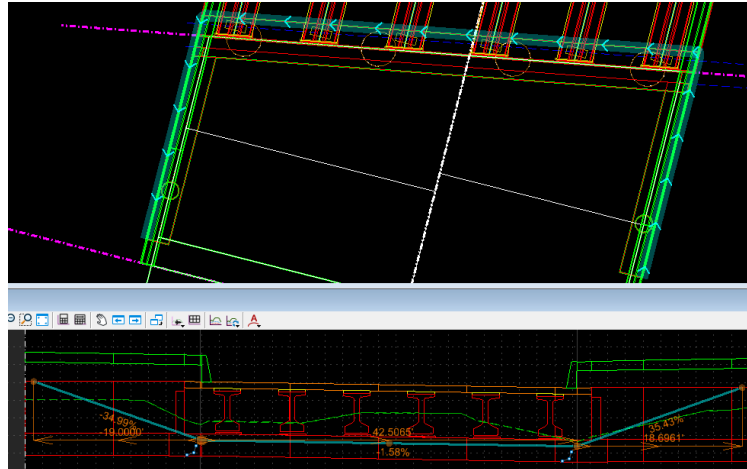
- **Note:** Use the Accu-draw shortcuts previously used.
 - Repeat the same steps on the other side, at the other wingwall, drawing the lines from left to right.
7. Once all 3 lines have been created, use the **Profile Complex by Elements** tool located in the **Vertical** section to join the 3 lines as a single profile. Left click on each line, left click in the view, then right click to complete.



- Once the profile line is created, set it as the active profile using the **Set Active Profile** tool in the **Vertical** section



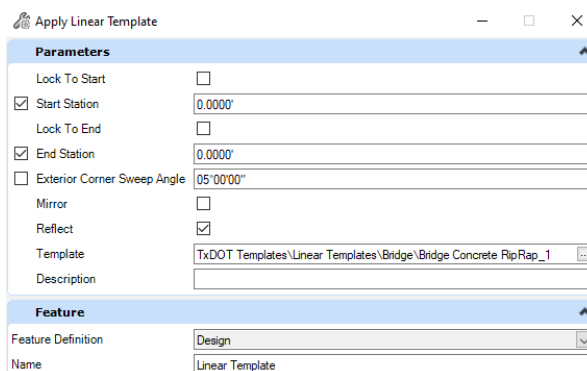
- Click on the plan element first, then on the profile element.



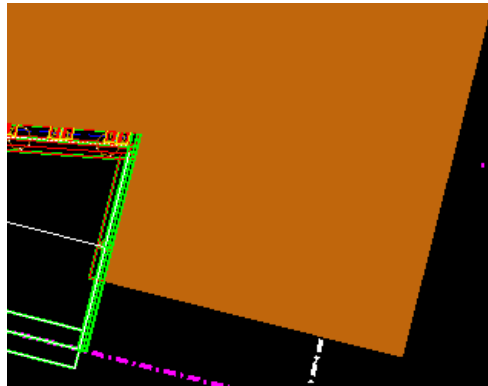
5. Once the profile is created, the user can close the profile view and we can start creating the riprap using an ORD Linear template. Select the **Apply Linear Template** tool located in the **Template** section.



- Lock To Start: **True**
- Lock to End: **True**
- Mirror: **False**
- Template: **TxDOT Templates\Linear Templates\Bridge\Bridge Concrete RipRap_1 [...]**
- All other settings can be changed if desired or leave as they are.

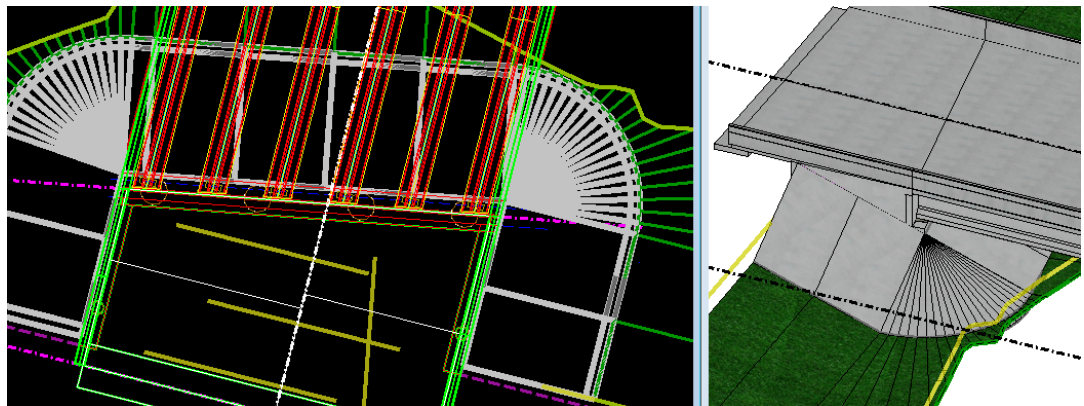


- Click on the line and profile created in the previous steps. This line represents the top of riprap.
- Click through the tentative menus to accept the inputs. Be sure the location of the riprap is in the correct direction, not overlapping approach slab.

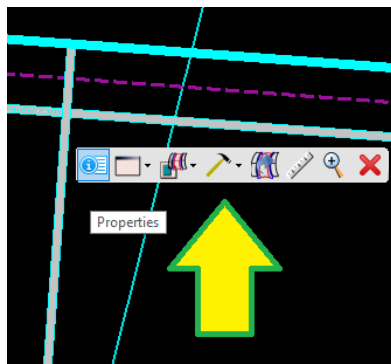


Note: A rounded corner will be automatically created at the abutment cap. The radius of the corner is controlled by the riprap length, which can be defined with parametric constraints or point controls.

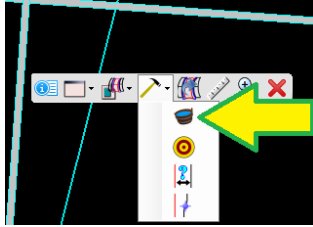
- Once all parameters are accepted the riprap will be drawn.



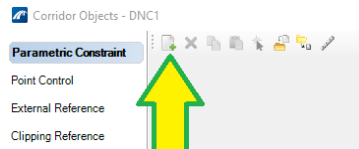
6. Once the riprap is placed, we can change different variables to adjust the riprap geometry as needed.
 - Select the riprap on the left or right and hover over the element for a second to reveal the tentative menu.



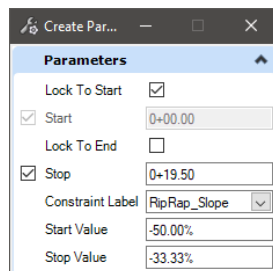
- From the tentative menu select the *Corridor Object* tools.



- In the **Corridor Objects** dialog box, under the *Parametric Constraints* section, click the **Add New** to add a new constraint.



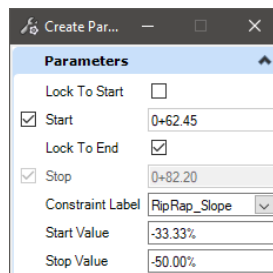
- Lock To Start: **True**
- Lock To End: **False**
- Stop (End Station): **0+19.50**
- Constraint Label: **RipRap_Slope**
- Start Value: **-50%**
- End Value: **-33.33%**



- Press multiple times in the screen to accept all parameters.

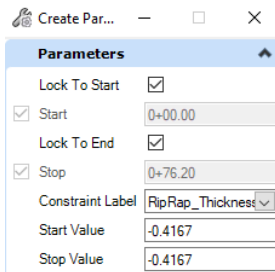
- In the **Corridor Objects** dialog box, add another constraint to change the slope on the other side of the abutment.

- Start Station: **0+62.45**
- Lock To End: **True**
- Constraint Label: **RipRap_Slope**
- Start Value: **-33.33%**
- End Value: **-50%**



- Press multiple times in the screen to accept all parameters.

- In the **Corridor Objects** dialog box, add another constraint to change the thickness of the Riprap to 5".
 - Lock To Start: *True*
 - Lock To End: *True*
 - Constraint Label: *RipRap_Thickness*
 - Start Value: *-0.4167*
 - End Value: *-0.4167*

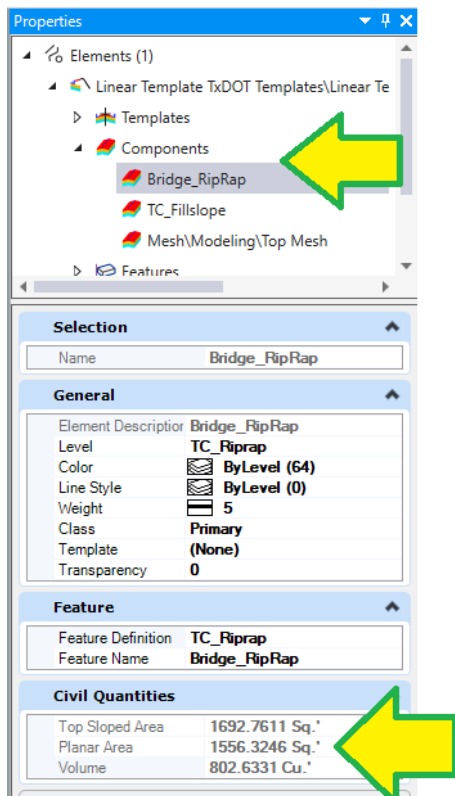


- Press multiple times in the screen to accept all parameters.

Corridor Objects - Riprap_Abument1_SB

Constraint Label	Enabled	Start Value	Stop Value	Start Slope	Stop Slope	Start Angle	Stop Angle	Start Station	End Station
RipRap_Slope	True			-50.00%	-33.33%			0+00.00	0+19.50
RipRap_Slope	True			-33.33%	-50.00%			0+62.45	0+82.23
RipRap_Thickness	True	-0.4167	-0.4167					0+00.00	0+82.23

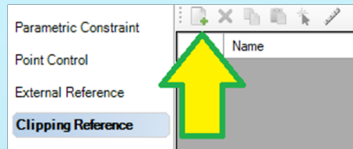
7. The RipRap quantities can be obtained, by selecting the riprap corridor and then navigating to **Components/Bridge_Riprap** in the properties dialog.



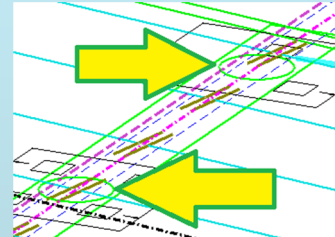
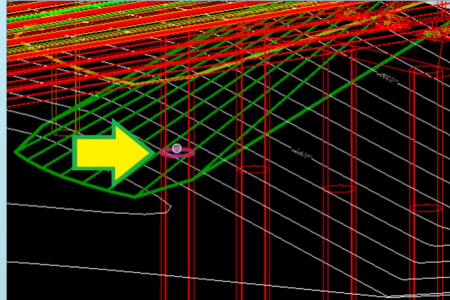
This Concludes the placement of linear templates in OBM (placing riprap).

Knowledge Tip: If the riprap conflicts with other elements, we can exclude them from the riprap. In the **Corridor Objects** dialog box, we can add clipping references.

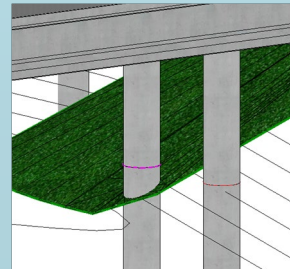
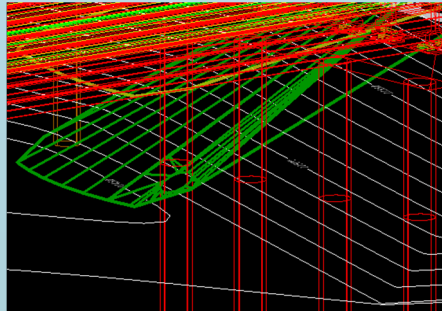
- Press the **Clipping References** and click the **Add New**.



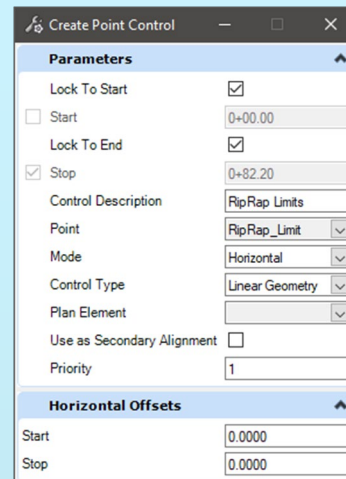
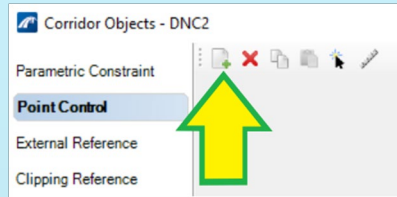
- Select the circular shape that represents the conflicting column bottom in the 3D view or by zooming into the 2D elements at elevation 0.



- Right click to accept the selection and complete the corridor clip.

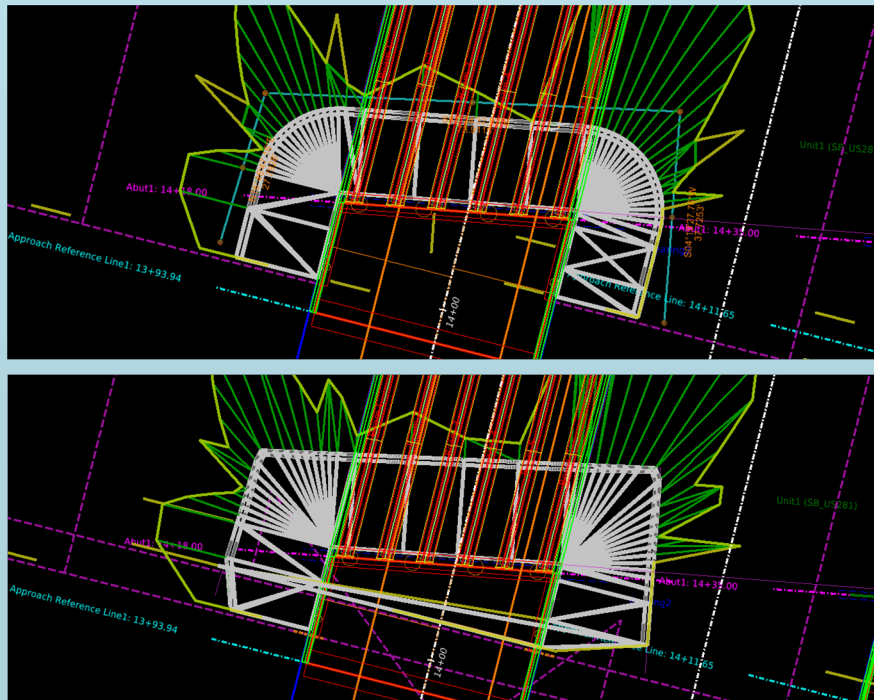


Users can also define the edge of a riprap template by drawing a shape with a civil line. To extend the riprap to this line, add a point control.



After defining the parameters for the point control, press multiple times in the screen to accept all parameters, and when prompted to **Locate Plan or Profile Element**, select the civil line representing the riprap limit and the riprap edge will update to follow that line. All riprap templates have the point named **RipRap_Limit** and can be used for point control.

Example of riprap before and after defining a point control for the **RipRap_Limit** (for information only):



Exercise #3 – Place the Riprap on Abutment #4

Repeat the steps above to place riprap on Abutment 4, using the following input:

- Riprap Thickness: **5"**
- Riprap Slope: **3:1 [-33.33% perpendicular to abutment] and 2:1 [-50% perpendicular to wingwalls]**
- All other information needs to be determined during placement. Use the plan and 3D view to see where the riprap limits need to be placed.

This concludes the creation of riprap on the bridge model.

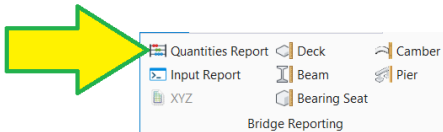
Generating Reports using the Bridge Model

In this section we will be generating different reports using the buttons located in the **Reports and Drawings** tab in the **Bridge Reporting** section. For this section the user can be in any of the files created so far.

Generating the Quantities Report

The quantity report will use the elements to create a cost and quantities report, the user can hide the cost if that part is not needed in the report. This report will not include any civil template placed in the model, such as the Riprap quantities. All tables created in these reports can be copied to paste them into excel.

1. Start the report creation by pressing the **Quantities Report** button located in the **Bridge Reporting** section in the **Reports and Drawings** tab.



- Select the Bridge, Unit and enable or disable the cost data.

Parameters

Selected Bridge: Active

Selected Unit: Active

Hide Unit/Cost Data

- Press **Submit** to generate the report.

Bridge Name: US281 Southbound Mainlane
Bridge Unit: BU01 :: Beam Slab Concrete-Girders Bridge

Materials Quantity Report

Superstructure Quantities

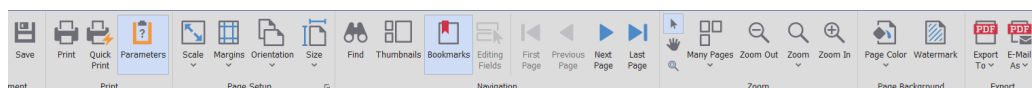
Component Name	Component Type	Material Name	Material Type	Pay Unit	Unit Price	Quantity	Cost
Deck1	Deck (Slab)	Slab	Concrete	Cubic Yard	0.00	225 884	0.00
	Haunch	Slab	Concrete	Cubic Yard	0.00	26 403	0.00
BeamSegment1	Beam (Tx54)	I-Girder	Concrete	LF	0.00	1424 500	0.00
						Total	0.00

Substructure Quantities

Component Name	Component Type	Material Name	Material Type	Pay Unit	Unit Price	Quantity	Cost
Abutment1	Cap	Abutment	Concrete	Cubic Yard	0.00	22 269	0.00
	Piles	Drilled Shaft	Concrete	LF	0.00	90 000	0.00
	Bearing Seat	Interior Bent Cap	Concrete	Cubic Yard	0.00	0 298	0.00
Pier1	Cap	Interior Bent Cap	Concrete	Cubic Yard	0.00	18 953	0.00
	Columns	Column	Concrete	Cubic Yard	0.00	19 635	0.00
	Footings	Footings	Concrete	Cubic Yard	0.00	19 286	0.00

Note: The cost unit comes from the material definition, the user has to modify the material and add a cost per unit.

- Use the tools available to print, change the orientation, add watermarks, and export the report.

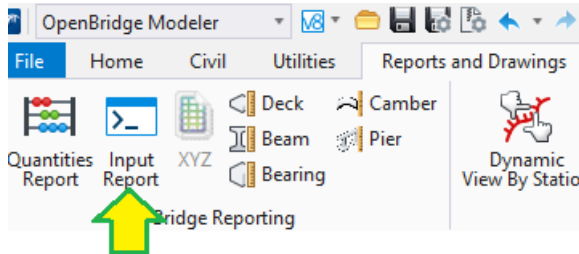


- When done, click **Close** button to exit the report tool.

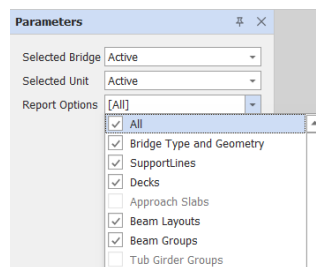
Generating the Input Report

The input report is a great report that can be used to do a QA/QC of all the inputs used while creating the Bridge Model. The report can be separated by units and create one report per unit or combine all units and have a single report for one bridge. The report can also combine all bridges available in the file.

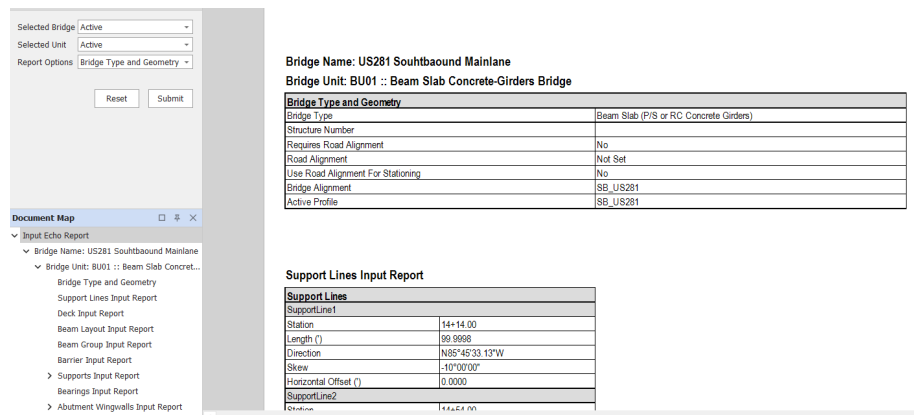
1. Start the report creation by pressing the **Input Report** button located in the **Bridge Reporting** section.



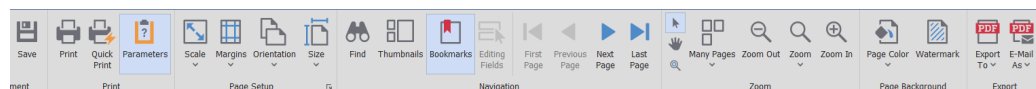
- Select the Bridge, Unit and Elements to report.



- Press **Submit** to generate the report.



- Use the tools available to print, change the orientation, add watermarks, and export the report.

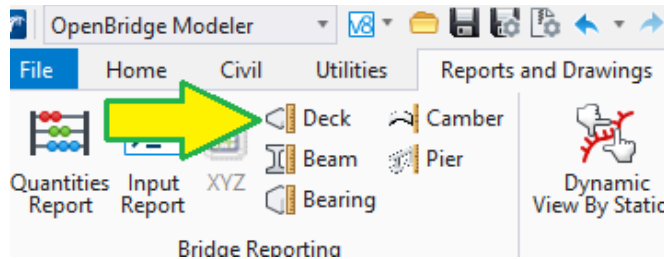


- When done, click **Close** button to exit the report tool.

Generating the Deck Elevation Report

The deck elevation report provides elevations on the deck based on the barriers, beams, or individual paths parallel to the alignment. The deck elevation reports can be saved for later use, so the user can create several different configurations to get the different elevation reports as needed.

1. Start the report creation by pressing the **Deck Report** button located in the **Bridge Reporting** section.



- Click on the start and the end support lines to create the report, for this example select the abutments support lines.
- In the **Deck Elevation Report** select the following
 - Report Name: **Elevation Report**
 - Report Type: **Consolidated**
 - Points Per Span: **11**
 - Add checkmarks to:
 - **Left Deck Edge**
 - **Right Deck Edge**
 - **Beam Path**

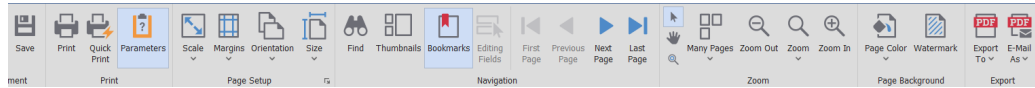
Include	Type	Name	Offset(°)
<input type="checkbox"/>	Alignment	NB_US281	0.0000
<input checked="" type="checkbox"/>	Left Deck Edge	Deck1	0.0000
<input checked="" type="checkbox"/>	Right Deck Edge	Deck1	0.0000
<input type="checkbox"/>	Left Edge	Barrier1	0.0000
<input type="checkbox"/>	Right Edge	Barrier1	0.0000
<input type="checkbox"/>	Left Edge	Barrier2	0.0000
<input type="checkbox"/>	Right Edge	Barrier2	0.0000
<input checked="" type="checkbox"/>	Beam Path	BeamLayout	0.0000

- Press the **Generate** button to create the report, press the **Save and Close** to just save the report for later access.

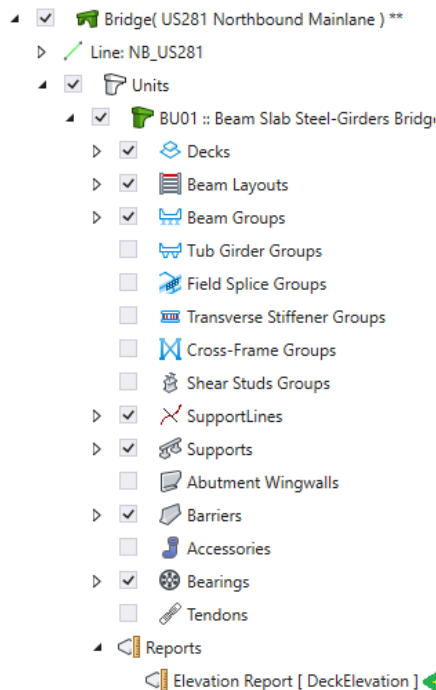
Deck Elevation Report
(Parallel to start support)

Location	Span 1 (')											End Bearing Line	End Support Line		
	Start Support Line	Start Bearing Line	1	2	3	4	5	6	7	8	9			10	11
Left Deck Edge with offset = 0.0000 (Deck1) P_5	1170.0980	1170.0836	1170.0980	1170.0211	1169.9441	1169.8672	1169.7902	1169.7132	1169.6363	1169.5593	1169.4824	1169.4054	1169.3285	1169.3285	1169.3285
Beam Path with offset = 0.0000 (Deck1) Beam-L	1170.1479	1170.1334	1170.1479	1170.0709	1169.9939	1169.9170	1169.8400	1169.7631	1169.6861	1169.6092	1169.5322	1169.4552	1169.3783	1169.3783	1169.3783

- Use the tools available to print, change the orientation, add watermarks, and export the report.



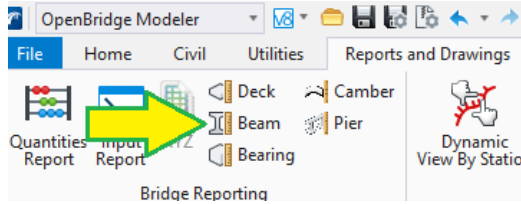
- When done, click **Close** button to exit the report tool.
- The saved report is in **Explorer**.



Generating the Beam Report

The beam report works like the beam report from BGS. The report provides beam grade, beam direction, true and projected lengths, and beam length between bearings. In addition, the report provides haunch thickness, haunch elevations, and beam elevations at top and bottom flanges.

1. Start the report creation by pressing the **Beam Report** button located in the **Bridge Reporting** section.



- The report will get created instantly. The user can select the number of points at where the elevations are reported. Our default value is 11, which provides 10 elevation points.

Bridge Unit: BU01 :: Beam Slab Concrete-Girders Bridge

Beam Report

Span	Beam	True Length (')	Projected Length (')	Bearing to Bearing (°)	Beam Grade (%)	Direction	Rotation
SupportLine1 - SupportLine2	Beam-L	39.5065	39.5000	38.4769	-1.8150	75°45'33.13"	00°00'00"
	Beam-2	39.5065	39.5000	38.4769	-1.8203	75°45'33.13"	00°00'00"
	Beam-3	39.5066	39.5000	38.4769	-1.8256	75°45'33.13"	00°00'00"
	Beam-4	39.5066	39.5000	38.4769	-1.8309	75°45'33.13"	00°00'00"
	Beam-5	39.5067	39.5000	38.4769	-1.8362	75°45'33.13"	00°00'00"
	Beam-6	39.5067	39.5000	38.4769	-1.8415	75°45'33.13"	00°00'00"
SupportLine2 - SupportLine3	Beam-R	39.5067	39.5000	38.4769	-1.8468	75°45'33.13"	00°00'00"
	Beam-L	124.5248	124.5000	123.4769	-1.9947	75°45'33.13"	00°00'00"
	Beam-2	124.5248	124.5000	123.4769	-1.9953	75°45'33.13"	00°00'00"
	Beam-3	124.5248	124.5000	123.4769	-1.9960	75°45'33.13"	00°00'00"
	Beam-4	124.5248	124.5000	123.4769	-1.9965	75°45'33.13"	00°00'00"
Beam-5	124.5248	124.5000	123.4769	-1.9971	75°45'33.13"	00°00'00"	

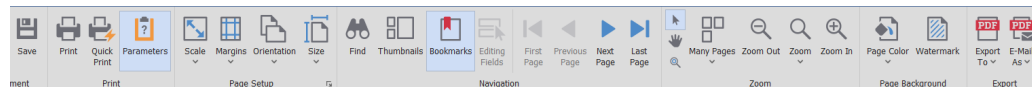
Beam Elevations

Span SupportLine1 - SupportLine2											
Locations/ Beam Elevations Along Beam CL											
Beam Name /Reference	0/10L	1/10L	2/10L	3/10L	4/10L	5/10L	6/10L	7/10L	8/10L	9/10L	10/10L
Beam-L	0.0000	3.8477	7.6954	11.5431	15.3907	19.2384	23.0861	26.9338	30.7815	34.6292	38.4769
Beam Top	1170.5253	1170.4555	1170.3857	1170.3158	1170.2460	1170.1761	1170.1063	1170.0365	1169.9666	1169.8968	1169.8270
Beam Bottom	1166.0246	1165.9548	1165.8849	1165.8151	1165.7452	1165.6754	1165.6056	1165.5357	1165.4659	1165.3961	1165.3262
Beam-2	0.0000	3.8477	7.6954	11.5431	15.3907	19.2384	23.0861	26.9338	30.7815	34.6292	38.4769
Beam Top	1170.6271	1170.5571	1170.4870	1170.4170	1170.3470	1170.2769	1170.2069	1170.1368	1170.0668	1169.9968	1169.9267
Beam Bottom	1166.1264	1166.0563	1165.9863	1165.9163	1165.8462	1165.7762	1165.7061	1165.6361	1165.5661	1165.4960	1165.4260
Beam-3	0.0000	3.8477	7.6954	11.5431	15.3907	19.2384	23.0861	26.9338	30.7815	34.6292	38.4769

Haunch Thickness

Span SupportLine1 - SupportLine2											
Locations/ Haunch Thickness Along Beam											
Beam Name /Reference	0/10L	1/10L	2/10L	3/10L	4/10L	5/10L	6/10L	7/10L	8/10L	9/10L	10/10L
Beam-L	0.0000	3.8477	7.6954	11.5431	15.3907	19.2384	23.0861	26.9338	30.7815	34.6292	38.4769
Left	1.6396	1.6793	1.7103	1.7326	1.7462	1.7499	1.7461	1.7322	1.7103	1.6793	1.6396
Beam CL	1.9996	2.0393	2.0703	2.0926	2.1062	2.1099	2.1061	2.0922	2.0703	2.0393	1.9996
Right	2.3596	2.3993	2.4303	2.4526	2.4662	2.4699	2.4661	2.4522	2.4303	2.3993	2.3596
Beam-2	0.0000	3.8477	7.6954	11.5431	15.3907	19.2384	23.0861	26.9338	30.7815	34.6292	38.4769

- Use the tools available to print, change the orientation, add watermarks, and export the report.

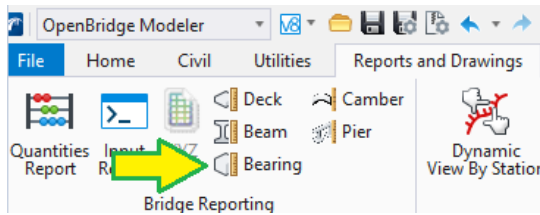


- When done, click **Close** button to exit the report tool.

Generating the Bearing Seat Report

Like the bearing seat elevation report from BGS, this report will create a report with elevations at the centerline of bearing seat. In addition, the report will provide thickness of the seat at each corner and the center.

1. Start the report creation by pressing the **Bearing Seat Report** button located in the **Bridge Reporting** section.



- The report will get created instantly.

Bearing Seats and Grout Pads or Bevel Plates Report

US281 Southbound Mainlane

Bearing Seats

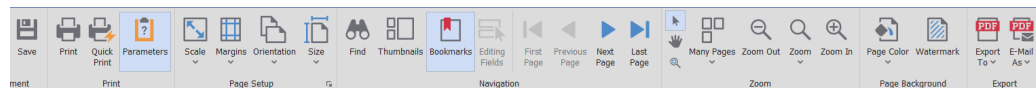
Elevation

Support Line Name	Bearing Line	Girder1(°)	Girder2(°)	Girder3(°)	Girder4(°)	Girder5(°)	Girder6(°)	Girder7(°)
Abutment1	Ahead	Beam-L	Beam-2	Beam-3	Beam-4	Beam-5	Beam-6	Beam-R
		1165.7746	1165.8764	1165.9781	1166.0798	1166.1814	1166.2829	1166.3845
Pier1	Back	Beam-L	Beam-2	Beam-3	Beam-4	Beam-5	Beam-6	Beam-R
		1165.0762	1165.1760	1165.2757	1165.3753	1165.4749	1165.5744	1165.6739
	Ahead	Beam-L	Beam-2	Beam-3	Beam-4	Beam-5	Beam-6	Beam-R
		1165.0469	1165.1466	1165.2462	1165.3458	1165.4453	1165.5447	1165.6441

Bearing Seats and Grout Pads or Bevel Plates Report

		D1W2	0.2500	0.2502	0.2503	0.2503	0.2502	0.2501	0.2500
		D2W1	0.2918	0.2919	0.2920	0.2920	0.2919	0.2919	0.2917
		D2W2	0.2500	0.2502	0.2503	0.2503	0.2502	0.2501	0.2500
Pier1	Back		Beam-L	Beam-2	Beam-3	Beam-4	Beam-5	Beam-6	Beam-R
		D1W1	0.2841	0.2843	0.2843	0.2844	0.2843	0.2842	0.2841
		D1W2	0.3250	0.3251	0.3252	0.3252	0.3252	0.3251	0.3250
		D2W1	0.2841	0.2843	0.2843	0.2844	0.2843	0.2842	0.2841
		D2W2	0.3250	0.3251	0.3252	0.3252	0.3252	0.3251	0.3250
	Ahead		Beam-L	Beam-2	Beam-3	Beam-4	Beam-5	Beam-6	Beam-R

- Use the tools available to print, change the orientation, add watermarks, and export the report.

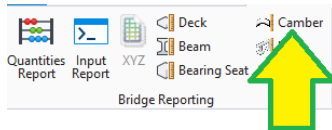


- When done, click **Close** button to exit the report tool.

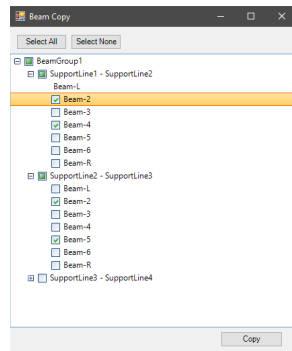
Generating the Camber Report

OBM is not a design application, so the camber values need to come from an analysis application. The user can copy the values from PGSuper and paste them into OBM. The camber report is very similar to the one generated by PGSuper. TxDOT prefers the use of PGSuper for Camber reports.

1. Start the report creation by pressing the **Camber Report** button located in the **Bridge Reporting** section.



- In the **Beam Camber and Deflections** dialog box, the user needs to enter the camber and deflection information.
- Once the data is entered, the user can use the **Copy Beam** to copy the information of one beam to all beams or individual beams.



- Press **Save** to save the camber and deflection information entered. Press **Generate** to create the camber report.
- In the report view the user can filter the report by span, beams, and number of points per beam. Once configured press the **Submit** button to create the report.

The image shows the 'Parameters' dialog box on the left and the resulting report on the right. The parameters are:

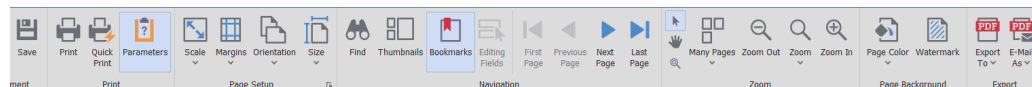
- Beam Group: BeamGroup1
- Span: SupportLine1 - SupportL
- Beam: Beam-L, Beam-2, Beam-
- Points Per Span: 11

 The report text is:

Bridge: US281 Southbound Mainlane
 Bridge Unit: BU01 :: Beam Slab Concrete-Girders Bridge
 Group: BeamGroup1
 Span: SupportLine1 - SupportLine2
 Beam: Beam-L
 Input Camber = 0.2510 * Self Defl = 0.1520 * Add1 Defl = 0.0750 *

Check Point	Dist. Along CL WPT-WPT (')	Final Deck Elevation (')	Screed Elevation (')	Girder Top Elevation (Erected) (')	Screed Ht. Above Girder (')
1	0.0000	1171.5210	1171.5210	1170.5346	0.9864
2	3.9500	1171.4528	1171.4460	1170.4704	0.9755
3	7.9000	1171.3838	1171.3717	1170.4046	0.9671
4	11.8500	1171.3141	1171.2982	1170.3371	0.9611
5	15.8000	1171.2436	1171.2254	1170.2679	0.9575
6	19.7500	1171.1723	1171.1534	1170.1971	0.9563

- Use the tools available to print, change the orientation, add watermarks, and export the report.

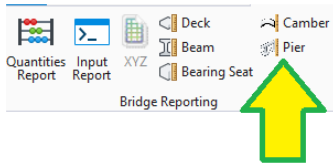


- When done, click **Close** button to exit the report tool.

Generating the Pier Report

The pier report provides elevations at top of cap at the edges of the cap, cap lengths, drilled shafts top and bottom elevations, drilled shaft lengths, column top and bottom elevations, and column lengths. This report is limited to OBM Templates and will not include pier information for parametric cells.

1. Start the report creation by pressing the **Pier Report** button located in the **Bridge Reporting** section.



- In the report view the user can filter the report by bridges, units, and piers. Once configured press the **Submit** button to create the report.

The screenshot shows the 'Parameters' dialog box on the left and the generated report on the right. The dialog box has fields for 'Selected Bridge' (Active), 'Selected Unit' (Active), and 'Selected Pier' (US281 Souhtbaound Mai), along with 'Reset' and 'Submit' buttons. The report output includes the following sections:

Bridge Name: US281 Souhtbaound Mainlane
Bridge Unit: BU01 :: Beam Slab Concrete-Girders Bridge
Abutment Abutment1

Cap	
Station	14+14.00
Cap Elevation Left (')	1165.4507
Cap Elevation Right (')	1166.1622
Cap Length (')	42.6479

Piles

Pile #	Top Elevation (')	Bottom Elevation (')	Length (')
1	1163.0171	1133.0171	30.0000
2	1163.3061	1133.3061	30.0000
3	1163.5951	1133.5951	30.0000

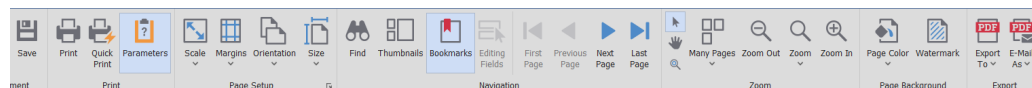
Pier Pier1

Cap	
Station	14+54.00
Cap Elevation Left (')	1164.7240
Cap Elevation Right (')	1165.4213
Cap Length (')	42.6479

Column #1

Top Left Elevation (')	1161.2787
Top Center Elevation (')	1161.3033
Top Right Elevation (')	1161.3278
Bottom Elevation (')	1136.2787
Length (')	25.0245

- Use the tools available to print, change the orientation, add watermarks, and export the report.



- When done, click **Close** button to exit the report tool.

This concludes the bridge report generation section.

Creating and Manipulating Bridge Templates

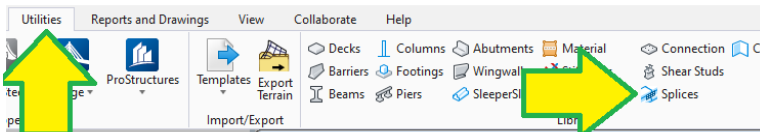
Review of the available Libraries

TxDOT has created several template libraries, and material libraries that include elements to model a standard bridge. However, these libraries do not cover all possible cases and will need to be modified. The user can modify the templates once they have been placed, and any changes will remain within the Bridge Model file. Some libraries are dependent on other libraries like the Cross-Frame library depends on the Connection Plate library when the user wants to use connection plates in the cross frame.

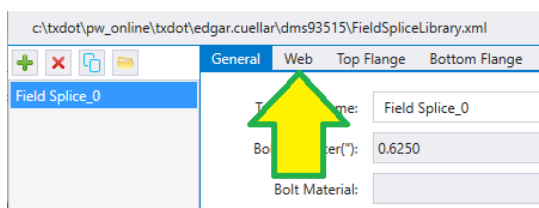
Knowledge Tip: Currently the Template dialog boxes to open existing libraries or to save new libraries is not integrated with ProjectWise, so when creating new templates, it is recommended to copy all the template libraries located in **99 - Project Standards\Bridge Templates** to somewhere in the network drive to share the library with others that can use it.

The material library needs to be updated per project per beam design. Create or copy beam materials so that the material reflects the f'c and f'ci for the design.

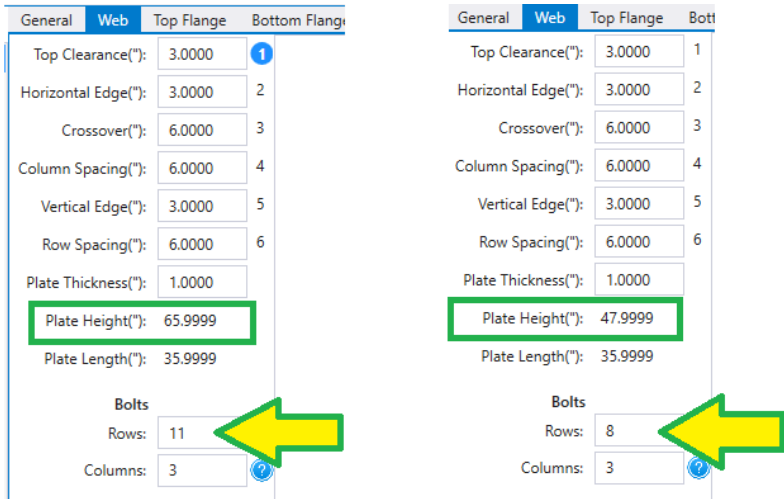
1. This example will modify the field splice template used in the steel bridge exercise. Make the US281_NBML bridge the active bridge before starting.
2. Open the field splice library by clicking on the **Splices** button located in the **Libraries** section of the **Utilities** tab.



3. In the **Field Splice Library** dialog box, select the **Web** tab.



4. In the **Web** tab, note that there is no input for the plate dimension, instead, the plate is built by the offsets, spacings, and number of bolts provided.
5. Recall from section 2 that our web height for the beam was 54", the current number of rows makes the plate 66" tall, change the **Bolts Rows** from **11** to **8** and the plate size will be updated.



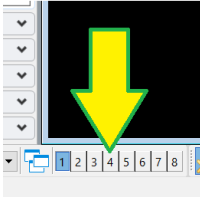
- When the changes are complete press the **Save** button to close the dialog and accept all changes.
- Because we modified the existing template, the bridge will be updated. If we look at the plate now, we will see that it now fits perfectly.



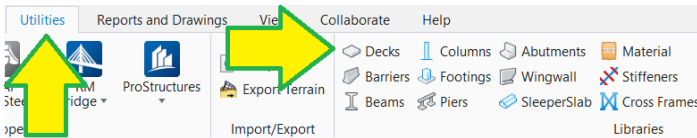
Creating a Deck Template

In this section we will be creating a deck meant to be used in phased construction or divided highway. The control point will be located outside the deck limits and the deck will be offset to the left or right.

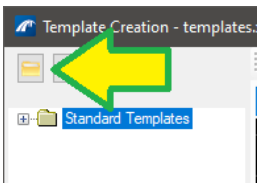
1. Open **View 4** in the view control tool bar.



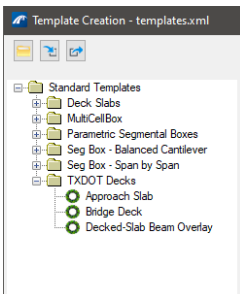
2. Press on the **Decks** button located in the **Libraries** in the **Utilities** tab.



3. In the **Template Creation** dialog box, press the **Open** button to load the library store in your Network drive. (Libraries stored in ProjectWise cannot be modified at this moment).

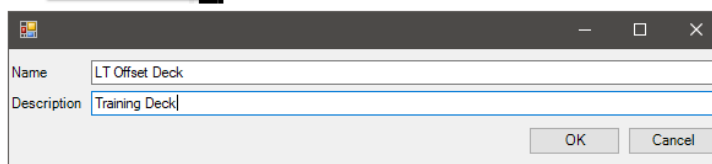
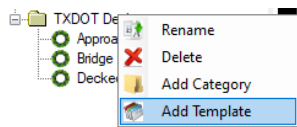


4. Once the library is loaded, navigate to the **TxDOT Decks** folder.

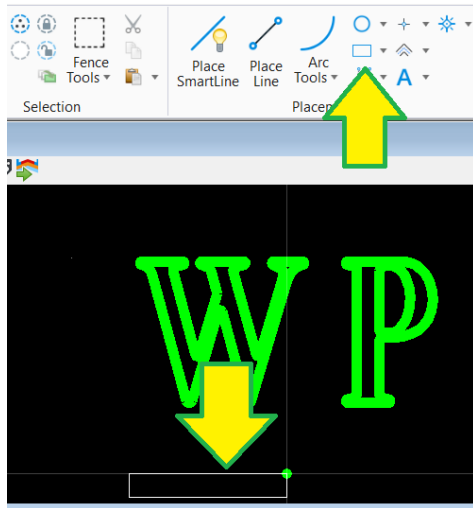


5. Right click on the **TxDOT Decks** and select **Add Template**. Provide a name and description and press **OK**.

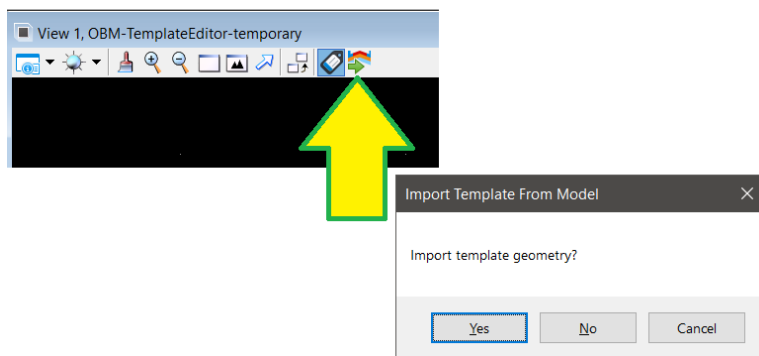
- Name: **LT Offset Deck**
- Description: **Training Deck**



6. Click anywhere in the view 4 previously opened.
7. Once the **WP** appears in the view, use the block tool to place a block by the green point at the bottom of the view.



8. Once the block is drawn, press the *Import template from model* button located at the top of the view. Then press **Yes** in the dialog box to accept the import.



9. Back to the *Template Creation* dialog, we will rename the points of the deck.
 - P_0 > *Top_R*
 - P_1 > *Bott_R*
 - P_2 > *Bott_L*
 - P_3 > *Top_L*

Note: For every change the user must click **Save** to save the changes or point rename.

Points				
Name	Type1	Type2	Variable1	Variable2
Bott_L				
Bott_R				
Top_L				
Top_R				

10. Once the point names have been updated, select the *Top_L*

- In the **Point Constraints** section change
- Mode: *Horizontal and Slope*
- Horizontal Parent: *Top_R*
- Horizontal Value: *-13*
- Horizontal Variable: *DeckWidth*
- Slope Parent: *Working Point*
- Slope Value: *0.02*
- Slope Variable: *DeckSlope*
- Click **Save** to accept the changes.

Edit Details

Name Superelevation Flag

Point Constraints

Mode **Horizontal + Slope**

Type	Constraint	Constraint
Parent	<input type="text" value="Top_R"/>	<input type="text" value="Top_R"/>
Value	<input type="text" value="-13.0000"/>	<input type="text" value="0.0200"/>
Variable	<input type="text" value="DeckWidth"/>	<input type="text" value="DeckSlope"/>

11. Select the *Top_R* and in the **Point Constraints** section change:

- Mode: *Horizontal and Slope*
- Horizontal Parent: *Working Point*
- Horizontal Value: *-10*
- Horizontal Variable: *DeckOffset*
- Slope Parent: *Working Point*
- Slope Value: *0.02*
- Slope Variable: *DeckSlope [Select from drop down list]*
- Click **Save** to accept the changes.

Edit Details

Name Superelevation Flag

Point Constraints

Mode **Horizontal + Slope**

Type	Constraint	Constraint
Parent	<input type="text" value="Working Point"/>	<input type="text" value="Working Point"/>
Value	<input type="text" value="-10.0000"/>	<input type="text" value="0.0200"/>
Variable	<input type="text" value="DeckOffset"/>	<input type="text" value="DeckSlope"/>

12. Select the **Bott_R** and in the **Point Constraints** section change:

- Mode: **Horizontal and Vertical**
- Horizontal Parent: **Top_R**
- Horizontal Value: **0**
- Horizontal Variable: **<Leave Blank>**
- Vertical Parent: **Top_R**
- Vertical Value: **-0.7083 [8.5"]**
- Vertical Variable: **DeckThickness**
- Click **Save** to accept the changes.

Edit Details

Name Superelevation Flag

Point Constraints

Mode

Type	Constraint	Constraint
Parent	<input type="text" value="Top_R"/>	<input type="text" value="Top_R"/>
Value	<input type="text" value="0.0000"/>	<input type="text" value="-0.7083"/>
Variable	<input type="text"/>	<input type="text" value="DeckThickness"/>

13. Select the **Bott_L** and in the **Point Constraints** section change:

- Mode: **Horizontal and Vertical**
- Horizontal Parent: **Top_L**
- Horizontal Value: **0**
- Horizontal Variable: **<Leave Blank>**
- Vertical Parent: **Top_L**
- Vertical Value: **-0.7083 [8.5"]**
- Vertical Variable: **DeckThickness [Select from drop down list]**
- Click **Save** to accept the changes.

Edit Details

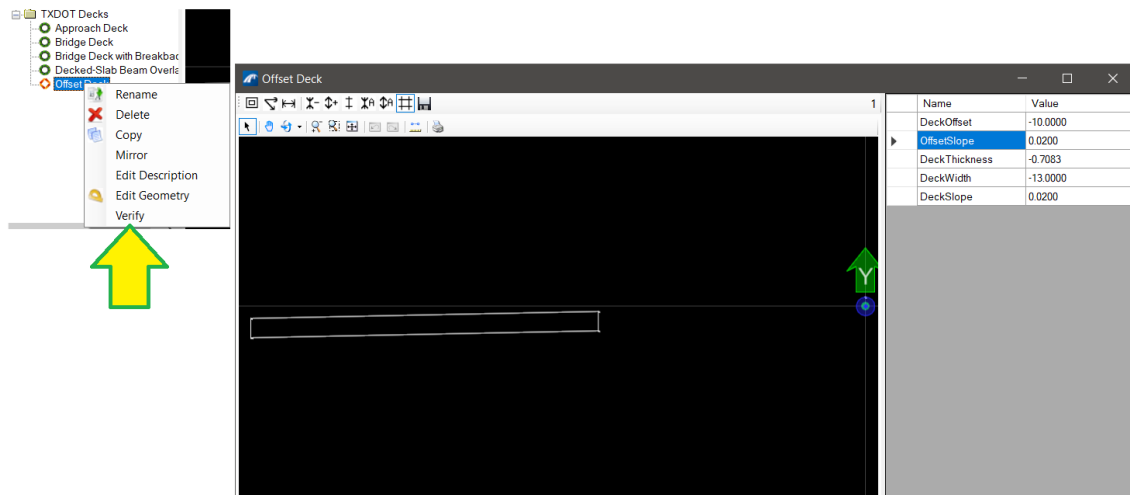
Name Superelevation Flag

Point Constraints

Mode

Type	Constraint	Constraint
Parent	<input type="text" value="Top_L"/>	<input type="text" value="Top_L"/>
Value	<input type="text" value="0.0000"/>	<input type="text" value="-0.7083"/>
Variable	<input type="text"/>	<input type="text" value="DeckThickness"/>

14. Once all variables have been created and all points are constrained, right click on the name of template, and select **Verify**. This will open a separate window where the user can test the variables and the new template.



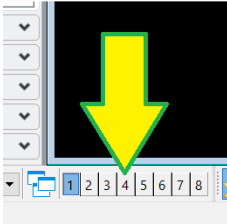
15. The template is meant to be used as the left side of a divided highway or phase construction with a single alignment, to create the right side right click on the template name and select **Copy**, then select the newly copied template, right click on it, and select **Mirror**. The user will need to revise and verify that the mirrored template works properly before using it.
16. This concludes the creation of the deck template. The user can now close the **Template Creation** dialog box.

Note: The user will need to load the library from the network location in order to use any new template since these are not saved in ProjectWise.

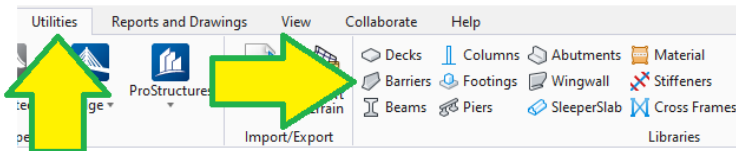
Creating a Rail Template

In this section we will be creating a traffic barrier (T223). The control point will be located outside of the rail element since most rails in TxDOT get placed 1.5" from the edge of the deck.

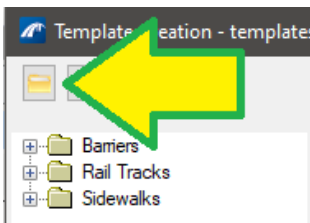
1. Open **View 4** in the view control tool bar.



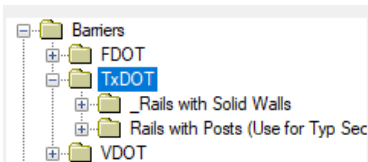
2. Press on the **Barriers** button located in the **Libraries** in the **Utilities** tab.



3. In the **Template Creation** dialog box, press the **Open** button to load the library store in your Network drive. (Libraries stored in ProjectWise cannot be modified at this moment).

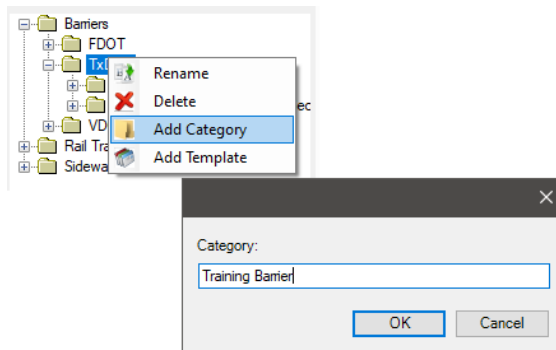


4. In the **Template Creation** dialog box navigate to the **Barriers/TxDOT** folder.

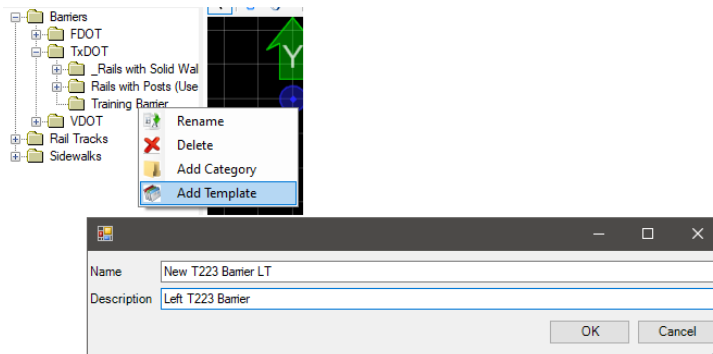


5. Right click on the **TxDOT** and select **Add Category**. Provide a name and press **OK**.

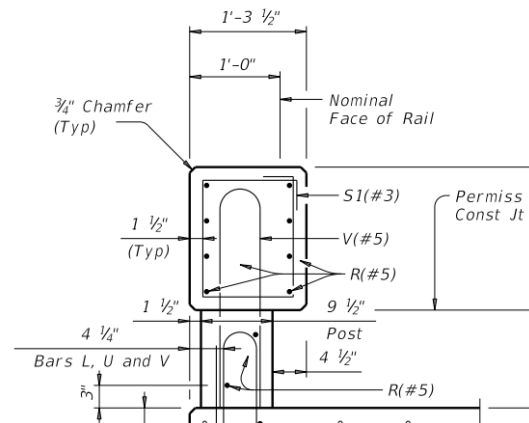
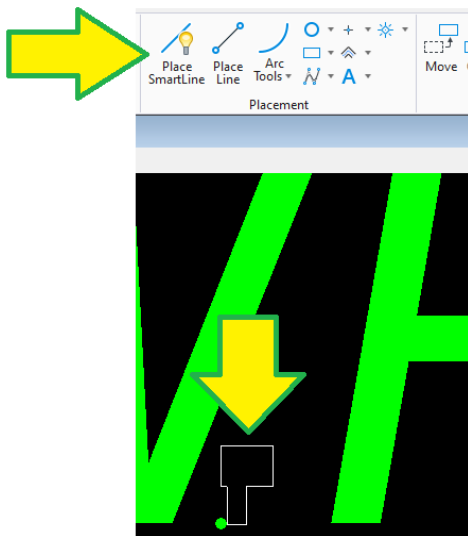
- Name: **Training Barriers**



6. Right click on the **Training Barriers** and select **Add Template**. Provide a name and description and press **OK**.
 - Name: **New T223 Barrier LT**
 - Description: **Left T223 Barrier**

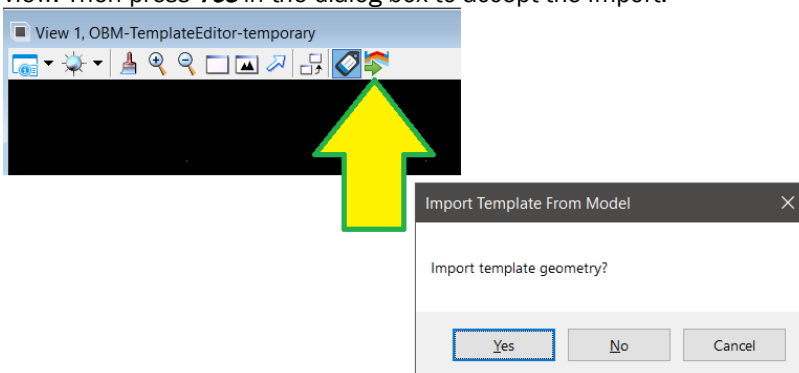


7. Click anywhere in the view 4 previously opened.
8. Once the **WP** appears in the view, use the smart line tool to place a polygon by the green point at the bottom of the view. Trace a shape like the T223 barrier but does not need to be exact.



Note: The polygon does not need to be exact, it only needs the correct number of lines and vertices.

9. Once the polygon is drawn, press the **Import template from model** button located at the top of the view. Then press **Yes** in the dialog box to accept the import.



10. Back to the *Template Creation* dialog, we will rename the points of the deck.

- P_0 > *Post_Bott_R*
- P_1 > *Post_Top_R*
- P_2 > *Barrier_Bott_R*
- P_3 > *Barrier_Top_R*
- P_4 > *Barrier_Top_L*
- P_5 > *Barrier_Bott_L*
- P_6 > *Post_Top_L*
- P_7 > *Post_Bott_L*

Note: For every change the user must click **Save** to save the changes or point rename.

Points				
Name	Type1	Type2	Variable1	Variable2
Barrier_Bott_L				
Barrier_Bott_R				
Barrier_Top_L				
Barrier_Top_R				
Post_Bott_L				
Post_Bott_R				
Post_Top_L				
Post_Top_R				

11. Now we will correct the rail dimensions to match the TxDOT standard size by adjusting the constraints of each point. Select the *Post_Bott_R* and in the **Point Constraints** section change:

- Mode: *Horizontal and Vertical*
- Horizontal Parent: *Working Point*
- Horizontal Value: *0.125 [1.5"]*
- Horizontal Variable: *<Leave Blank>*
- Vertical Parent: *Working Point*
- Vertical Value: *0*
- Vertical Variable: *Drain_Slot_H*
- Click **Save** to accept the changes.

Edit Details

Name

Point Constraints

Mode Horizontal + Vertical

Constraint

Type Horizontal

Parent Working Point

Value

Variable ▼

Constraint

Type Vertical

Parent Working Point

Value

Variable Drain_Slot_H

12. Select the *Post_Bott_L* and in the **Point Constraints** section change:

- Mode: *Horizontal and Vertical*
- Horizontal Parent: *Post_Bott_R*
- Horizontal Value: *0.7916 [9.5"]*
- Horizontal Variable: *Post_Width*
- Vertical Parent: *Post_Bott_R*
- Vertical Value: *0*
- Vertical Variable: *<Leave Blank>*
- Click **Save** to accept the changes.

Edit Details

Name

Point Constraints

Mode

	Constraint	Constraint
Type	Horizontal	Vertical
Parent	<input type="text" value="Post_Bott_R"/>	<input type="text" value="Post_Bott_R"/>
Value	<input type="text" value="9.5/12"/>	<input type="text" value="0.0000"/>
Variable	<input type="text" value="Post_Width"/>	<input type="text"/>

13. Select the *Post_Top_L* and in the **Point Constraints** section change:

- Mode: *Horizontal and Vertical*
- Horizontal Parent: *Post_Bott_L*
- Horizontal Value: *0*
- Horizontal Variable: *<Leave Blank>*
- Vertical Parent: *Post_Top_R*
- Vertical Value: *0*
- Vertical Variable: *<Leave Blank>*
- Click **Save** to accept the changes.

Edit Details

Name

Point Constraints

Mode

	Constraint	Constraint
Type	Horizontal	Vertical
Parent	<input type="text" value="Post_Bott_L"/>	<input type="text" value="Post_Top_R"/>
Value	<input type="text" value="0.0000"/>	<input type="text" value="0"/>
Variable	<input type="text"/>	<input type="text"/>

14. Select the *Post_Top_R* and in the **Point Constraints** section change:

- Mode: *Horizontal and Vertical*
- Horizontal Parent: *Working Point*
- Horizontal Value: *0.125 [1.5"]*
- Horizontal Variable: *<Leave Blank>*
- Vertical Parent: *Working Point*
- Vertical Value: *1.0833 [1'-1"]*
- Vertical Variable: *Post_Height*
- Click **Save** to accept the changes.

Edit Details

Name

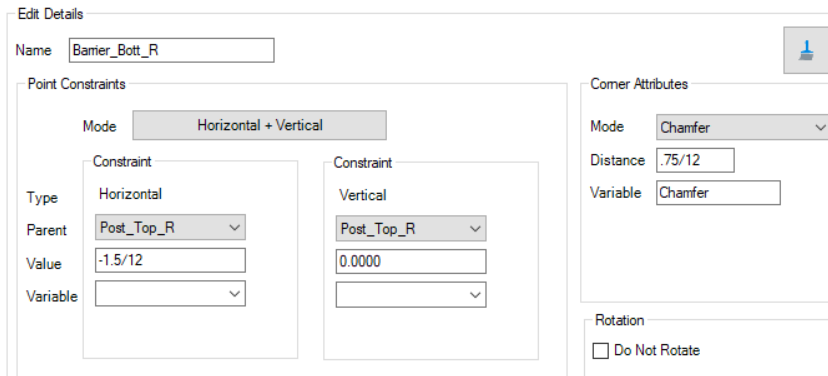
Point Constraints

Mode

Type	Constraint
Horizontal	Vertical
Parent	Working Point
Value	13/12
Variable	Post_Height

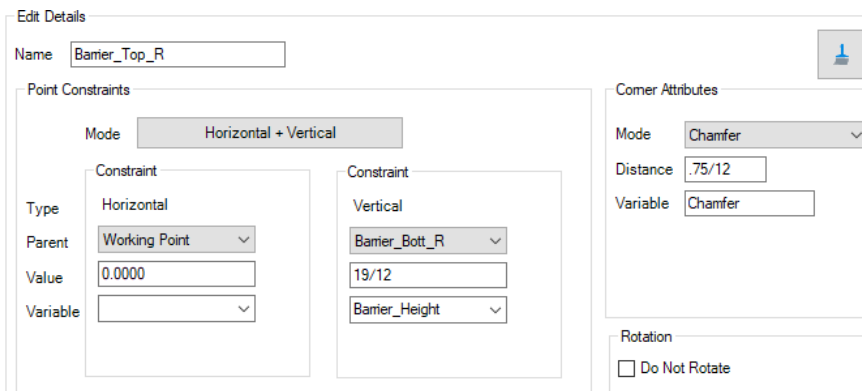
15. Select the *Barrier_Bott_R* and in the **Point Constraints** section change:

- Mode: *Horizontal and Vertical*
- Horizontal Parent: *Post_Top_R*
- Horizontal Value: *-0.125 [1.5"]*
- Horizontal Variable: *<Leave Blank>*
- Vertical Parent: *Post_Top_R*
- Vertical Value: *0*
- Vertical Variable: *<Leave Blank>*
- Corner Attributes Mode: *Chamfer*
- Corner Attributes Distance: *0.0625 [3/4"]*
- Corner Attributes Variable: *Chamfer*
- Click **Save** to accept the changes.



16. Select the **Barrier_Top_R** and in the **Point Constraints** section change:

- Mode: **Horizontal and Vertical**
- Horizontal Parent: **Barrier_Bott_R**
- Horizontal Value: **0**
- Horizontal Variable: **<Leave Blank>**
- Vertical Parent: **Barrier_Bott_R**
- Vertical Value: **1.5833 [1'-7"]**
- Vertical Variable: **Barrier_Height**
- Corner Attributes Mode: **Chamfer**
- Corner Attributes Distance: **0.0625 [3/4"]**
- Corner Attributes Variable: **Chamfer**
- Click **Save** to accept the changes.



17. Select the **Barrier_Top_L** and in the **Point Constraints** section change:

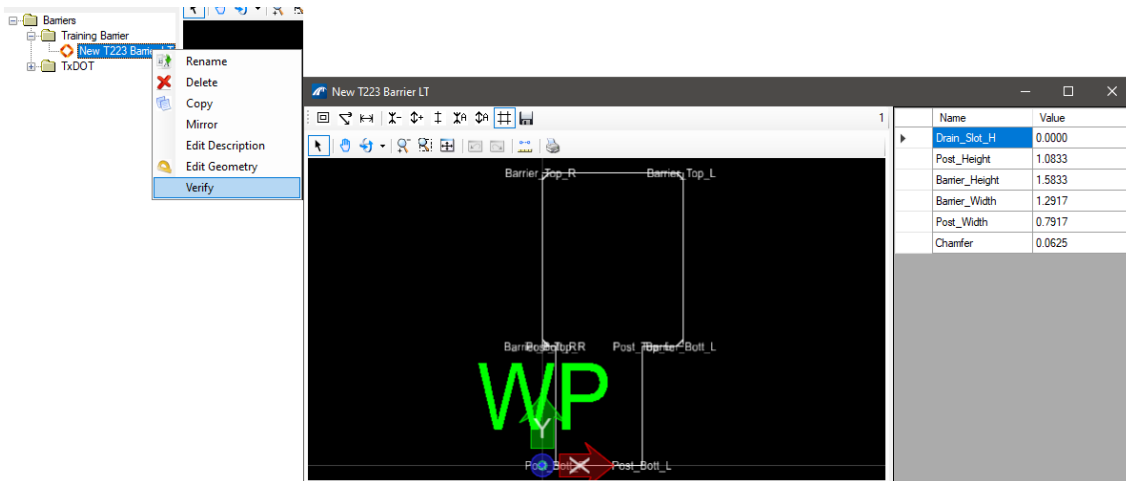
- Mode: **Horizontal and Vertical**
- Horizontal Parent: **Barrier_Bott_L**
- Horizontal Value: **0**
- Horizontal Variable: **<Leave Blank>**
- Vertical Parent: **Barrier_Top_R**
- Vertical Value: **0**
- Vertical Variable: **<Leave Blank>**

- Corner Attributes Mode: **Chamfer**
- Corner Attributes Distance: **0.0625 [3/4"]**
- Corner Attributes Variable: **Chamfer**
- Click **Save** to accept the changes.

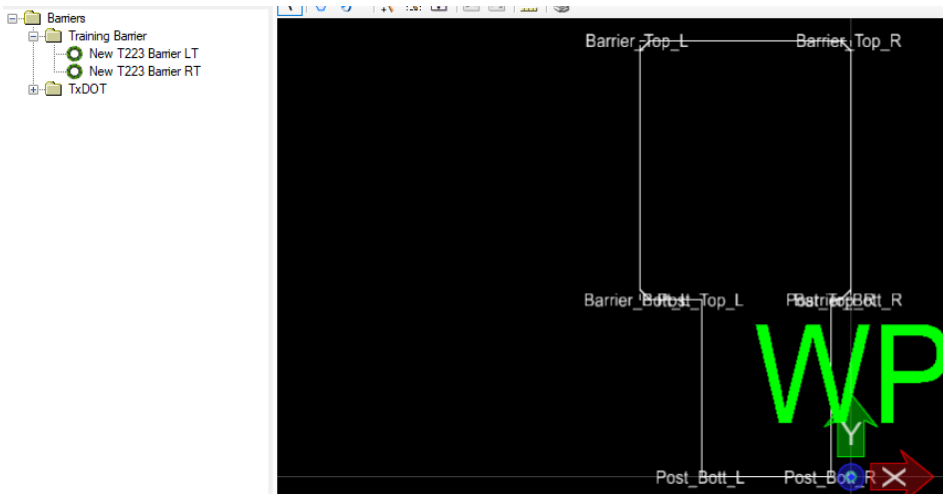
18. Select the **Barrier_Bott_L** and in the **Point Constraints** section change:

- Mode: **Horizontal and Vertical**
- Horizontal Parent: **Barrier_Bott_R**
- Horizontal Value: **1.2916 [1'-3.5"]**
- Horizontal Variable: **Barrier_Width**
- Vertical Parent: **Barrier_Bott_R**
- Vertical Value: **0**
- Vertical Variable: **<Leave Blank>**
- Corner Attributes Mode: **Chamfer**
- Corner Attributes Distance: **0.0625 [3/4"]**
- Corner Attributes Variable: **Chamfer**
- Click **Save** to accept the changes.

19. Once all variables have been created and all points are constrained, right click on the name of template, and select **Verify**. This will open a separate window where the user can test the variables and the new template.



20. The template is meant to be used as the left side of a bridge, to create the right side right click on the template name and select **Copy**, then select the newly copied template, right click on it and select **Mirror** and rename the template so that it indicates is the right side.



21. This concludes the creation of the barrier template. The user can now close the **Template Creation** dialog box.

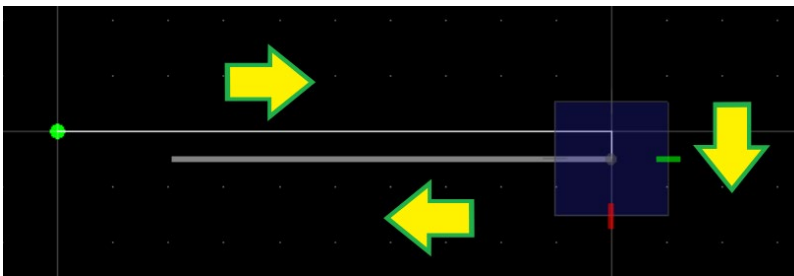
Knowledge Tip: For the barrier in this exercise, we use **Horizontal and Vertical** variables for placement. By doing this we can control the height of the rail and create drain slots of post gaps using the variable constraints dialog box.

The other option for placing barrier is using the **Horizontal and Elevation Provider** variables. The elevation provider places that point directly on top of the deck. However, this option does not allow to change the height of the point in relation to the deck. This option is great for Barriers that will never have Drain Slots or for Sidewalks.

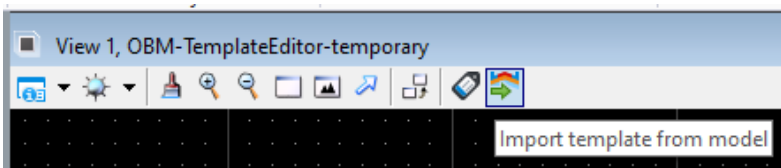
Exercise #4 – Create a Sidewalk Template

This exercise can be completed in the active file. Repeat the steps for creating a rail template (above) to now create a new template for a sidewalk. Sidewalks can be created as a deck template or as a barrier template, for this example it will be created as a barrier template.

1. Navigate to **Utilities > Libraries** and select **Barriers** to open the **Template Creation** dialog.
2. Since sidewalks are modeled longitudinally like a bridge rail, we will create a new template under the Barrier folder. Navigate to **Barrier > TxDOT**, right click to select **Add Category** and name the new folder **Training Sidewalks**.
3. Right click on this new **Training Sidewalks** folder and select **Add Template**.
 - Name: **LT Sidewalk**
 - Description: **Left Sidewalk**
 - Click OK
4. Repeating the process for the rail template, click in view 4, then use the smart line tool to trace the cross section of a sidewalk. For this training, draw a 6" thick, 10 ft wide sidewalk:



5. Select the **Import template from model** button then press **Yes** in the dialog.

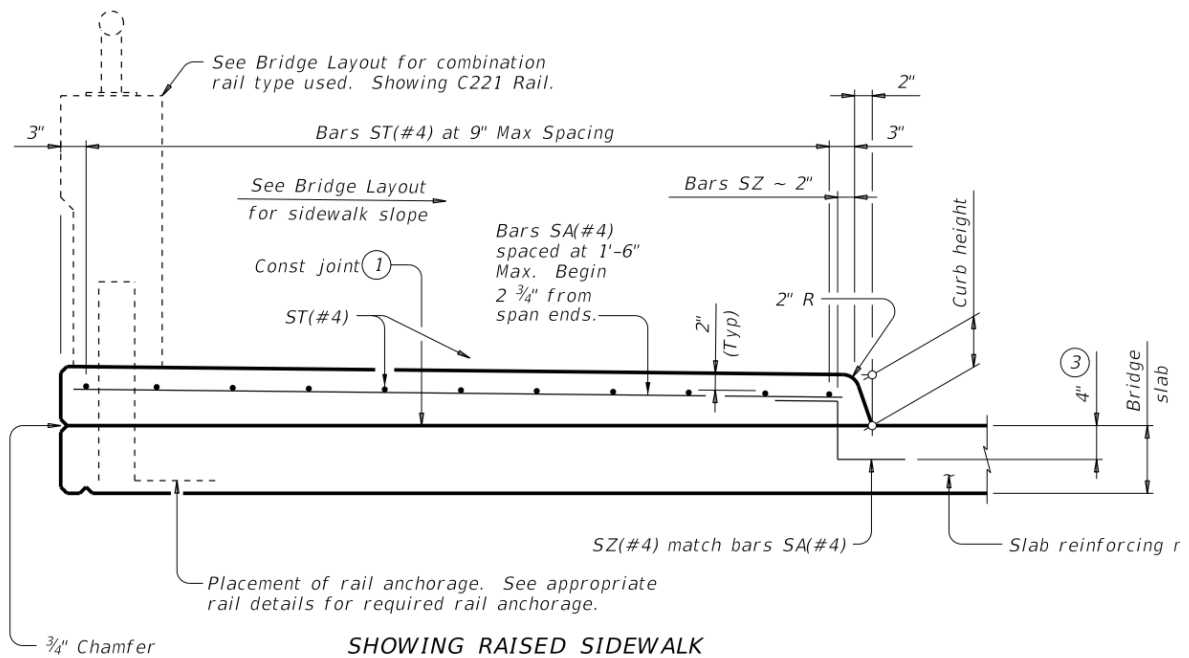


6. Rename the points of the sidewalk, clicking **Save** to update each line:
 - P_0 > **Sidewalk_Top_L**
 - P_1 > **Sidewalk_Top_R**
 - P_2 > **Sidewalk_Bott_R**
 - P_3 > **Sidewalk_Bott_L**

Points				
Name	Type1	Type2	Variable 1	Variable2
Sidewalk_Bott_L				
Sidewalk_Bott_R				
Sidewalk_Top_L				
Sidewalk_Top_R				



- Adjust the point constraints to attach the sidewalk bottom to the bridge deck, add a $\frac{3}{4}$ " chamfer to the left top and left bottom corners of the sidewalk, and add a 2" fillet to the top right corner to represent the curb per TxDOT standard drawing BRSM. See Sidewalk_Top_R Point Constraints on how to adjust your toe offset.



- Select the **Sidewalk_Bott_L** and in the **Point Constraints** section change:
 - Mode: **Horizontal and Elevation Provider**
 - Horizontal Parent: **Sidewalk_Top_L**
 - Horizontal Value: **0**
 - Horizontal Variable: **<Leave Blank>**
 - Elevation Provider: **<Leave Blank>**
 - Corner Attributes Mode: **Chamfer**
 - Corner Attributes Distance: **0.75/12 [3/4"]**
 - Corner Attributes Variable: **Chamfer**
 - Click **Save** to accept the changes

Edit Details
 Name: Sidewalk_Bott_L

Point Constraints
 Mode: Horizontal + Elevation Provider

Constraint 1:
 Type: Horizontal
 Parent: Sidewalk_Top_L
 Value: 0.0000
 Variable:

Constraint 2:
 Type: Elevation Provider
 Parent: Working Point
 Value: 0.0000
 Variable:

Corner Attributes
 Mode: Chamfer
 Distance: 0.0625
 Variable: Chamfer

Rotation
 Do Not Rotate

Save Cancel

- Select the ***Sidewalk_Bot_R*** and in the **Point Constraints** section change:
 - Mode: ***Horizontal and Elevation Provider***
 - Horizontal Parent: ***Sidewalk_Bott_L***
 - Horizontal Value: ***10***
 - Horizontal Variable: ***Sidewalk_Width***
 - Elevation Provider: ***<Leave Blank>***
 - Corner Attributes Mode: ***<Leave Blank>***
 - Click **Save** to accept the changes

Edit Details
 Name: Sidewalk_Bott_R

Point Constraints
 Mode: Horizontal + Elevation Provider

Constraint 1:
 Type: Horizontal
 Parent: Sidewalk_Bott_L
 Value: 10.0000
 Variable: Sidewalk_Width

Constraint 2:
 Type: Elevation Provider
 Parent: Working Point
 Value: 0.0000
 Variable:

Corner Attributes
 Mode: None

Rotation
 Do Not Rotate

Save Cancel

- Select the ***Sidewalk_Top_L*** and in the **Point Constraints** section change:
 - Mode: ***Horizontal and Vertical***
 - Horizontal Parent: ***Working Point***
 - Horizontal Value: ***0***
 - Horizontal Variable: ***<Leave Blank>***
 - Vertical Parent: ***Sidewalk_Bott_L***
 - Vertical Value: ***0.5***
 - Vertical Variable: ***<Leave Blank>***
 - Corner Attributes Mode: ***Chamfer***
 - Corner Attributes Distance: ***0.75/12 [3/4"]***
 - Corner Attributes Variable: ***Chamfer***

- Click **Save** to accept the changes

- Select the ***Sidewalk_Top_R*** and in the **Point Constraints** section change:
 - Mode: ***Horizontal and Vertical***
 - Horizontal Parent: ***Sidewalk_Bott_R***
 - Horizontal Value: ***-2/12 [2"]***
 - Horizontal Variable: ***<Leave Blank>***
 - Vertical Parent: ***Sidewalk_Bott_L***
 - Vertical Value: ***0.5***
 - Vertical Variable: ***<Leave Blank>***
 - Corner Attributes Mode: ***Fillet***
 - Corner Attributes Distance: ***2/12 [2"]***
 - Corner Attributes Variable: ***Fillet***
 - Click **Save** to accept the changes

- Close the Template Creation dialog.
8. Place your new sidewalk template. Select the ***Place Barrier*** tool from **Home > Accessory**.
- Template Name: ***LT Sidewalk***
 - Name Prefix: ***Sidewalk***

Place Barrier

Barrier

Template Name: LT Sidewalk

Start Station Offset: 0.0000

End Station Offset: 0.0000

Horizontal Offset: 0.0000

Vertical Offset: 0.0000

Material

Barrier Material: []

Pay Unit: Linear Unit

Solid Placement

Chord Tolerance: 0.1000

Max Dist Between Sections: 16.4042

Template Orientation: Vertical

Start Cut Orientation: Follow Skew

End Cut Orientation: Follow Skew

Build Order

Barrier Build Order: 1

Feature

Feature Definition: Barrier

Name Prefix: Sidewalk

- Data point on the bridge deck in View 3, right click to reset, then data point again.
- Now we will define a line along the deck to be used as a reference for placing the sidewalk. In the Path Selection dialog, click **Select Guideline from List**


Path Selection

Candidate	--
WP	?

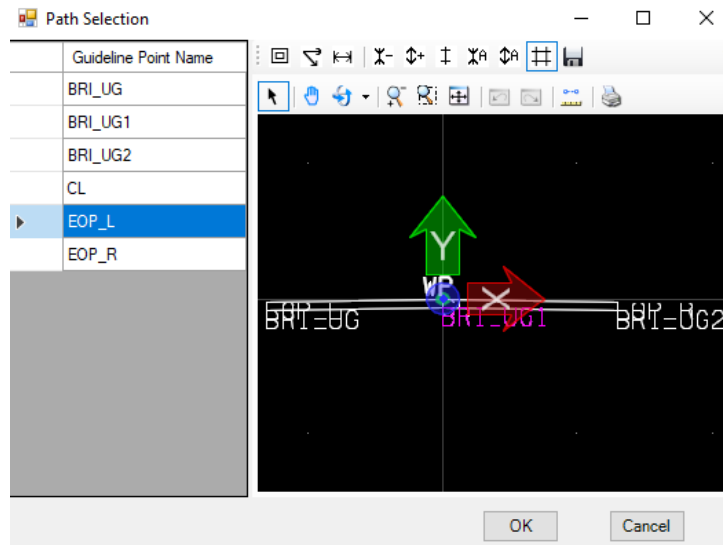
Select Alignment

Select Guideline from List

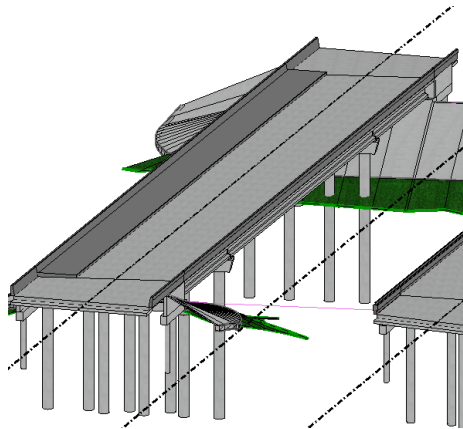
OK Cancel



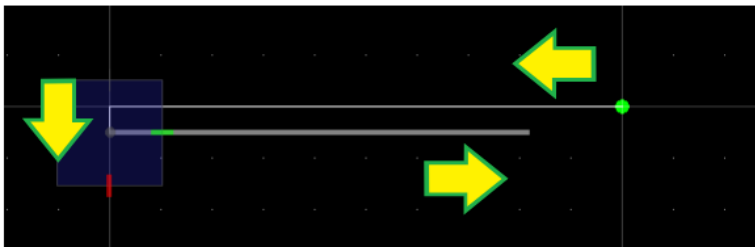
- Since we want to place the left sidewalk along the left top edge of the deck, choose *EOP_L* then click *OK*.



- Click OK to close the Path Selection dialog and place the sidewalk.
- Example result:



9. Practice this exercise once more, this time creating a template named *RT Sidewalk* for the right sidewalk. Keep in mind the **Path Selection** places the element based on the position of the working point, so draw the cross section for the right sidewalk so that the WP will be at the top right corner.



This concludes the tutorial on creating and manipulating bridge templates.

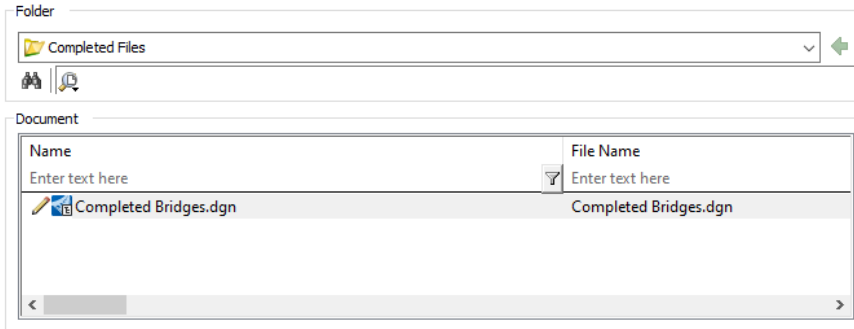
Plan Production Tools

Bridge Layout

In this section we will create a bridge layout using the Plan Production tools within OBM, these tools are the same ones available in MicroStation and ORD. For Bridge Layouts, the process is the same as creating Plan and Profile sheets in ORD. We will create a plan boundary and a profile boundary.

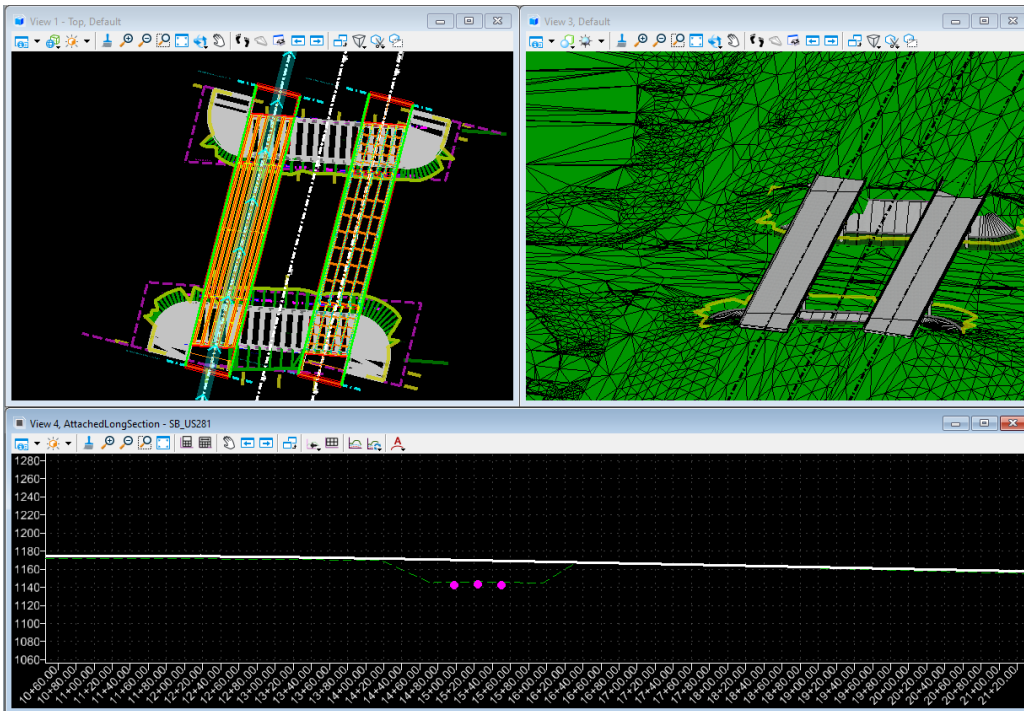
Note: Creation of Bridge Layouts is not fully automated. Bridge Layouts are created with a combination of manually drawn elements and automatic 2D shapes gathered from the 3D models of the bridges.

1. While in OBM, open the **Completed Bridges.dgn** located in the *Bridge\Bridge x\Completed* folder.

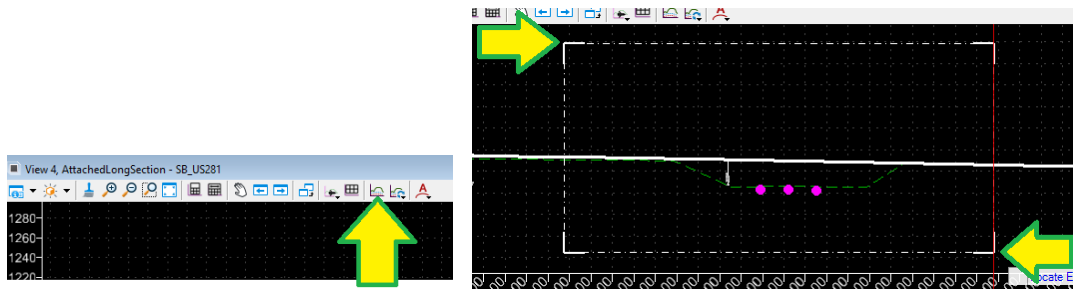


2. Once the file opens, the required views will be already setup.

Note: The views were opened by performing a long right click and selecting *View Control > 3 Views/Plan/Profile/3D* like what was done when the riprap was created to open the profile view of the abutments.

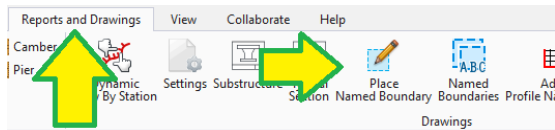


3. Add a 3D Cut to the profile view to display the bridge elements.

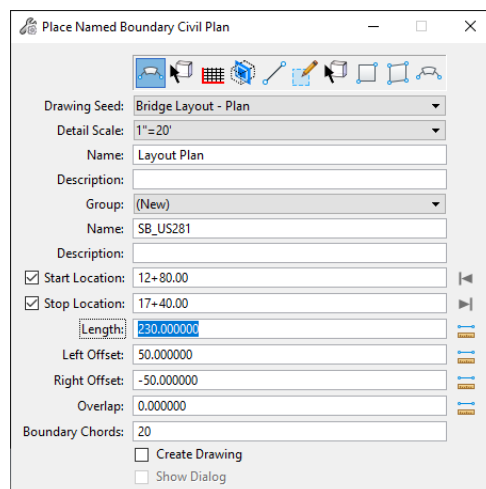


Note: Adjust the 3D Cut offset until the profile is showing what is needed, add additional 3D Cuts with different offsets as needed.

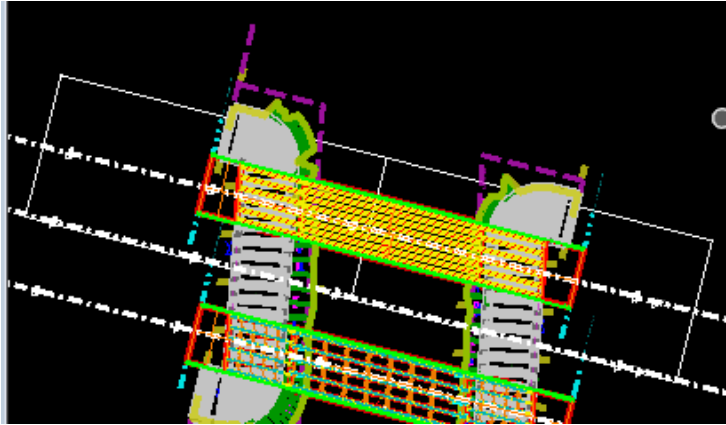
4. Create the plan boundary using the **Place Name Boundary** tool located in the **Drawings** section of the **Reports and Drawings** tab.



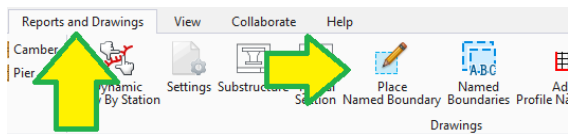
- Press anywhere in the plan view to activate the view.
- Select the first icon at the top of the dialog.
- In the plan view select the **Southbound Alignment**.
- In the plan view select the start and end limits of your sheets, the sheet boundaries will show make sure you only get the needed boundaries to capture the bridge.
- Back to the **Place Boundary** dialog box.
 - Drawing Seed: **Bridge Layout – Plan**
 - Detail Scale: **1"=20'**
 - Name: **Layout Plan**
 - Start Station: **12+80.00**
 - End Station: **17+40.00**
 - Create Drawing: **False**
 - Boundary Chords: **20**



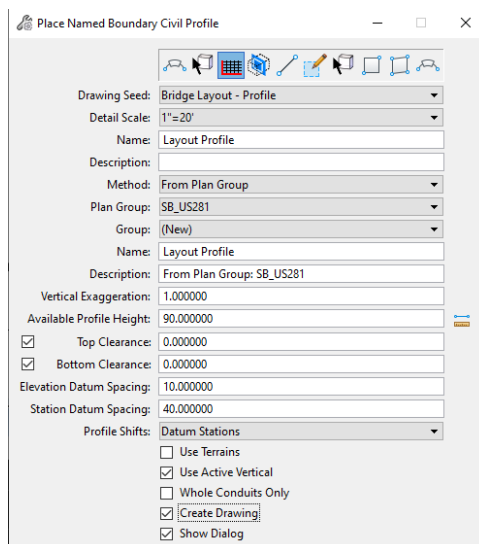
- Press again anywhere in the plan view to complete the creation of the boundaries.




5. Create the profile boundary using the *Place Name Boundary* tool located in the **Drawings** section of the **Reports and Drawings** tab.

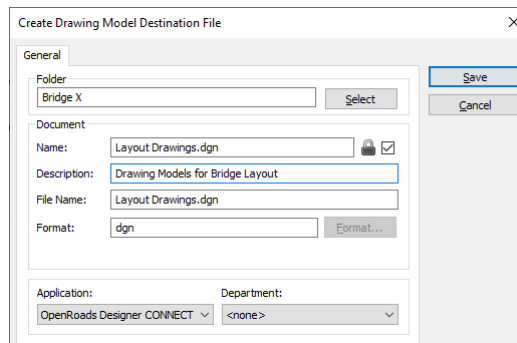


- Press anywhere in the profile view to activate the view.
- Select the third icon at the top of the dialog.
- In the profile view select the white profile line.
- Back to the *Place Boundary* dialog box.
- Drawing Seed: *Bridge Layout - Profile*
- Detail Scale: *1"-20'*
- Name: *Layout Profile*
- Method: *From Plan Group*
- Use Active Vertical: *True*
- Create Drawing: *True*
- Show Dialog: *True*



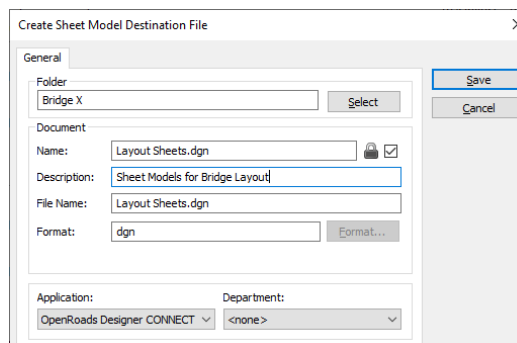
- Press anywhere in the profile view to accept and create the boundaries, and the **Create Drawing** dialog will open.
- In the Plan side (Left)
 - View Name: **Bridge Layout Plan**
 - Drawing Model Name: **Layout Plan 01**
 - Enable the **Filename** field by checking the toggle.


- Press the **Create new Drawing file** 
- Select **No Wizard** and press **OK**
- Save the new file to folder **4 - Design\Bridge\Bridge X**
- File Name: **Layout Drawings.dgn**
- Description: **Drawing Models for Bridge Layout**
- Press **Save** to create file.

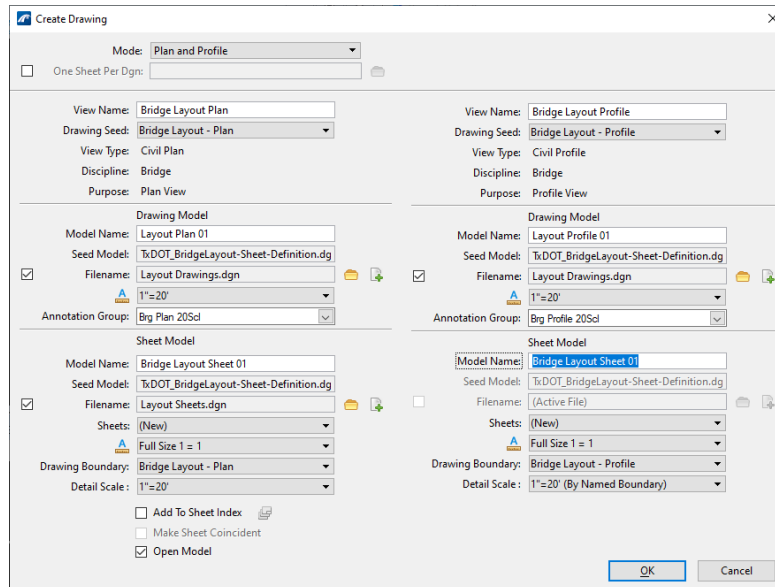


- Scale: **1"=20'**
- Annotation Group: **Brg Plan 20ScI**
- Sheet Model Name: **Bridge Layout Sheet 01**
- Enable the **Filename** field by checking the toggle.

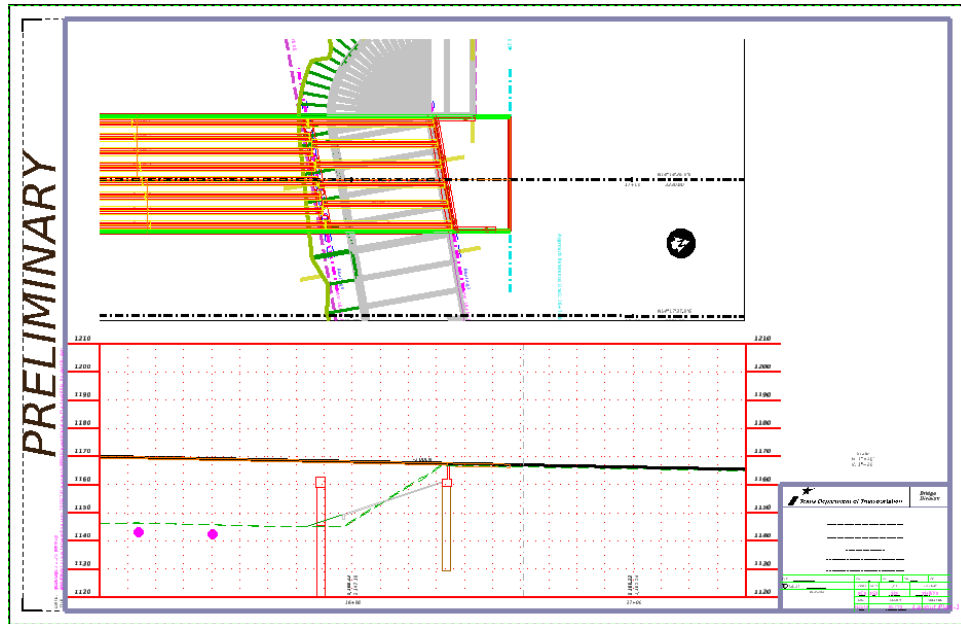
- Press the **Create New Sheet File** 
- Select **No Wizard** and press **OK**
- Save the new file to folder **4 - Design\Bridge\Bridge X**
- File Name: **Layout Sheets.dgn**
- Description: **Sheet Models for Bridge Layout**
- Press **Save** to create file.



- Scale: **Full Scale 1 =1**
- Detail Scale: **1"=20'**
- In the Profile side (Right)
 - View Name: **Bridge Layout Profile**
 - Drawing Model Name: **Layout Profile 01**
 - Enable the **Filename** field by checking the toggle.
 - Press the **Browse Drawing file** 
 - Open the previously created file: **Layout Drawings.dgn**
 - Scale: **1"=20'**
 - Annotation Group: **Brg Profile 20ScI**
 - Sheet Model Name: **Bridge Layout Sheet 01**
 - Scale: **Full Scale 1 =1**
 - Detail Scale: **1"=20'**

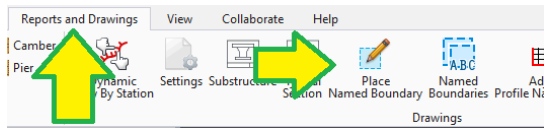


- Press **OK** to create the sheets and drawings.
- The process may take some time depending on the number of sheets getting created and at times the process will ask the users to **Update Server Copy** or to **Check In** files in ProjectWise.
- When the process is done it will open on the Sheet model file, on the last sheet of the process.

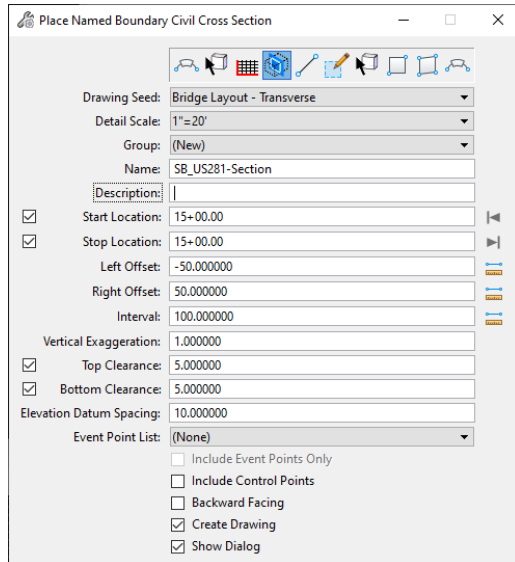




- Return to the *Completed Bridges.dgn* to create the **Typical** section drawing.

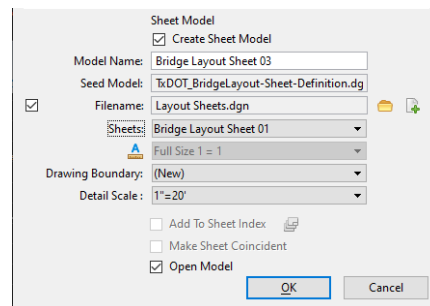
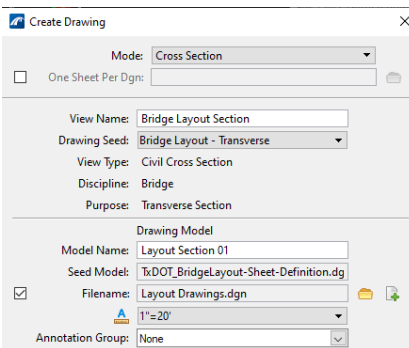
6. Create the typical section boundary using the *Place Name Boundary* tool located in the **Drawings** section of the **Reports and Drawings** tab.



- Press anywhere in the plan view to activate the view.
- Select the fourth icon at the top of the dialog.
- In the plan view select the **Southbound Alignment**.
- In the plan view select the start and end locations for the sections.
- Back to the *Place Boundary* dialog box.
- Drawing Seed: *Bridge Layout – Transverse*
- Detail Scale: *1"-20'*
- Name: *SB_US281-Section*
- Start Station: *15+00*
- End Station: *15+00*
- Top Clearance: *5*
- Bottom Clearance: *5*
- Create Drawing: *True*
- Show Dialog: *True*

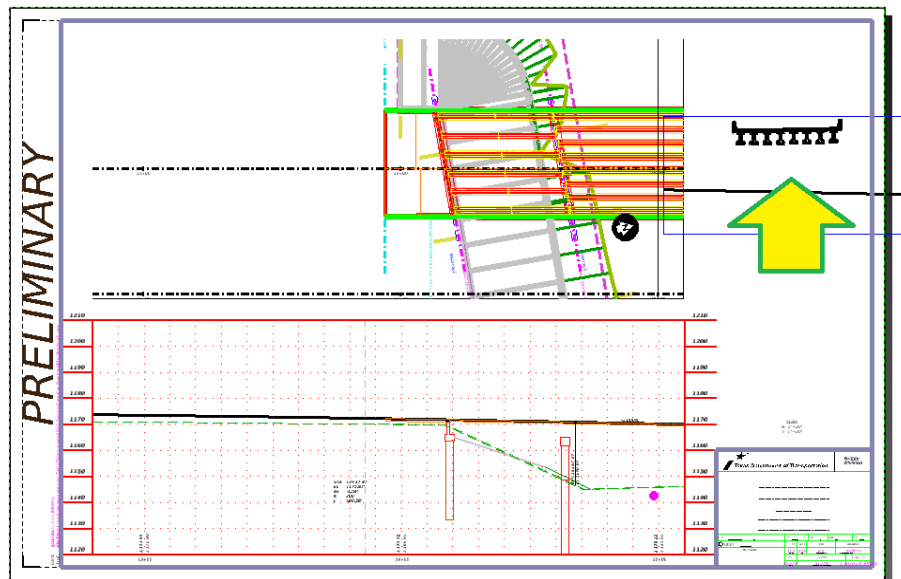


- Press anywhere in the plan view to create the boundary, and the **Create Drawing** dialog will open.
 - View Name: **Bridge Layout Section**
 - Drawing Model Name: **Layout Section 01**
 - Enable the **Filename** field by checking the toggle.
 - Press the **Browse Drawing file** 
 - Open the previously created file: **Layout Drawings.dgn**
 - Scale: **1"=20'**
 - Sheet Model Name: **Bridge Layout Sheet 03**
 - Enable the **Filename** field by checking the toggle.
 - Press the **Browse Sheet file** 
 - Open the previously created file: **Layout Sheets.dgn**
 - Sheets: **Bridge Layout Sheet 01**
 - Scale: **Full Scale 1 = 1**
 - Detail Scale: **1"=20'**



- The section drawing will get referenced into the sheet selected, in this case **Bridge Layout Sheet 01**.

Note: If the bridge varies on the number of beams per span, the user needs to create more sections to reflect the spans and number of beams.



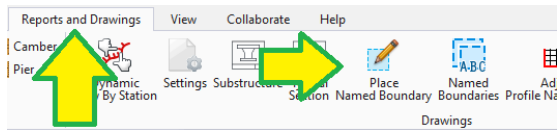
7. Once all drawings are created, all annotations and additional drafting will be done in the Drawing models.
8. Refer to the **Bridge Detailing Guide** and the **Bridge OBM Workflow** documents to finish the detailing of the Bridge Layout. This concludes the Bridge Layout section.

Note: The scale used in the example turned out to be too small, in production the user needs to make the decision that best fits their needs for the scale and if the typical section needs its own sheet.

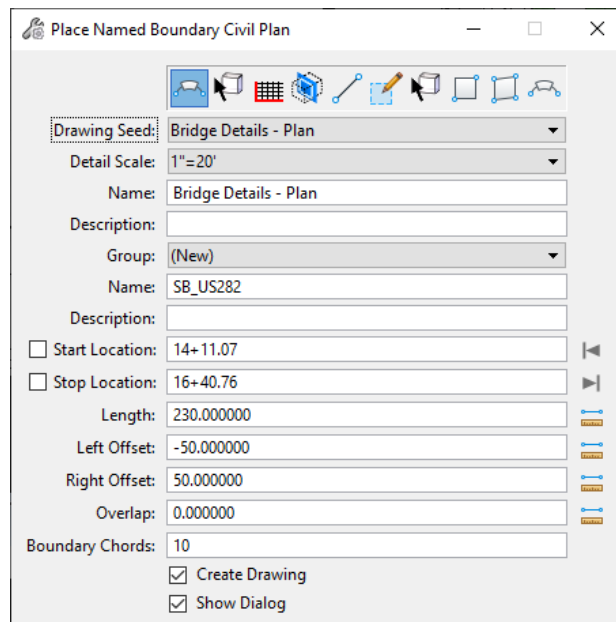
Superstructure Drawings

In this section we will create superstructure drawings using a combination of the previously used **Place Named Boundary** tools. This example will create the span sheet, the same steps can be followed to create the framing plan. This example will not fully annotate the drawings, for that the user will need to refer to the **Bridge Detailing Guide** and the **Bridge OBM Workflow** documents.

1. Create the plan boundary using the **Place Name Boundary** tool located in the **Drawings** section of the **Reports and Drawings** tab.





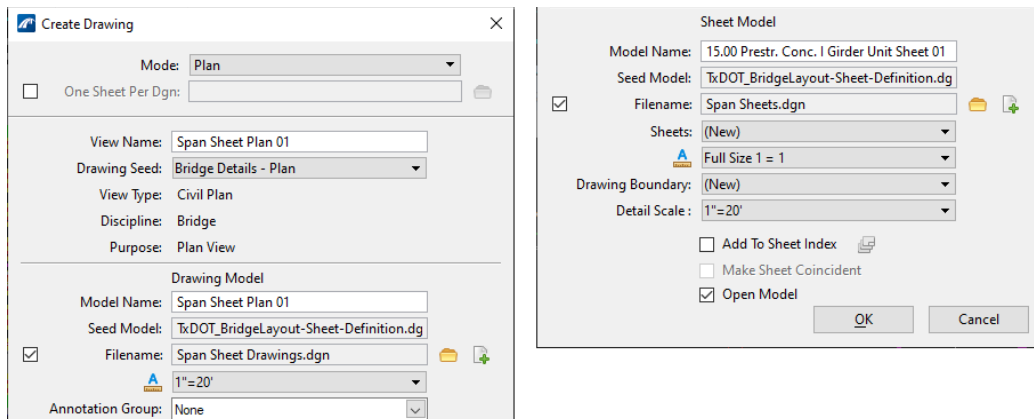
- Press anywhere in the plan view to activate the view.
- Select the first icon at the top of the dialog.
- In the plan view select the **Southbound Alignment**.
- In the plan view select the start and end limits of your sheets, for these sheets the approach slabs do not need to be included.
- Back to the **Place Boundary** dialog box.
- Drawing Seed: **Bridge Details - Plan**
- Detail Scale: **1"=20'**
- Name: **Span Sheet Plan**
- Start Station: **14+11.00**
- End Station: **16+41.00**
- Create Drawing: **True**



- Press again anywhere in the plan view to create the boundaries.

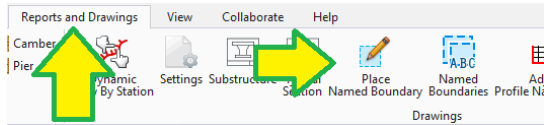
2. In the **Create Drawing** dialog:

- View Name: **Span Sheet Plan 01**
- Drawing Model Name: **Span Sheet Plan 01**
- Enable the **Filename** field by checking the toggle.
 - Press the **Create New Drawing File** 
 - Select **No Wizard** and press **OK**
 - Save the new file to folder **4 - Design\Bridge\Bridge X**
 - File Name: **Span Sheet Drawings.dgn**
 - Description: **Drawing Models for Span Sheets**
 - Press **Save** to create file.
- Scale: **1"=20'**
- Sheet Model Name: **215.00 Prestr. Conc. I Girder Unit Sheet 01**
- Enable the **Filename** field by checking the toggle.
 - Press the **Create New Sheet File** 
 - Select **No Wizard** and press **OK**
 - Save the new file to folder **4 - Design\Bridge\Bridge X**
 - File Name: **Span Sheets.dgn**
 - Description: **Sheet Models for Span Sheets**
 - Press **Save** to create file.
- Scale: **Full Scale 1 = 1**
- Detail Scale: **1"=20'**

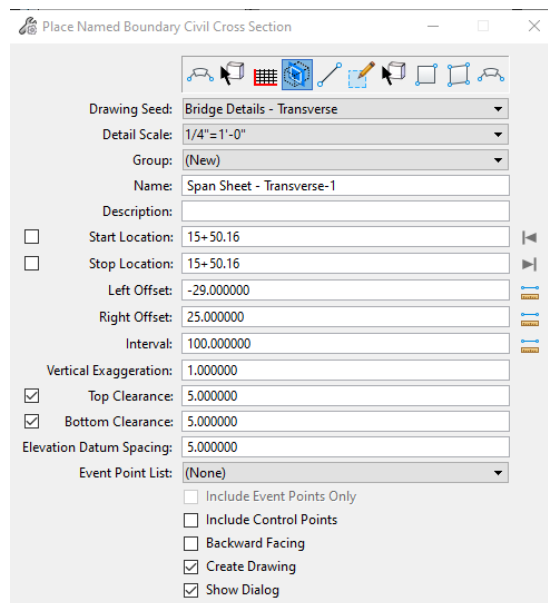


- Press **OK** to create and open the sheets, the process will request the user to update and check in files in ProjectWise as it creates the different models.
- All annotations, element manipulations and additional drafting will be done in the Drawing models of the span sheet. It is always recommended to minimize the amount of “live” data placed in the sheet models.



4. Return to the *Completed Bridges.dgn* to create the transverse section for the span sheets. The process will be like the creation of the plan view. We will create another cross section named boundary for the span sheet.
5. Create the transverse section boundary using the *Place Name Boundary* tool located in the **Drawings** section of the **Reports and Drawings** tab.

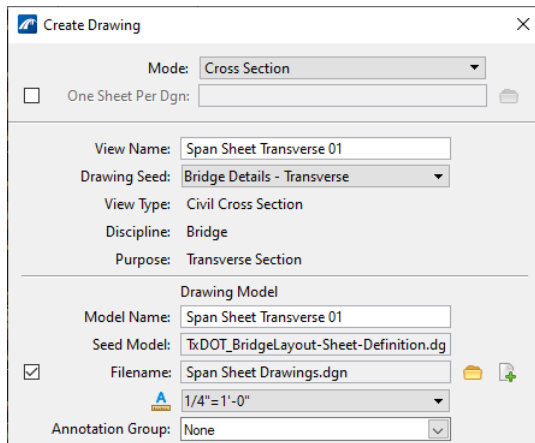
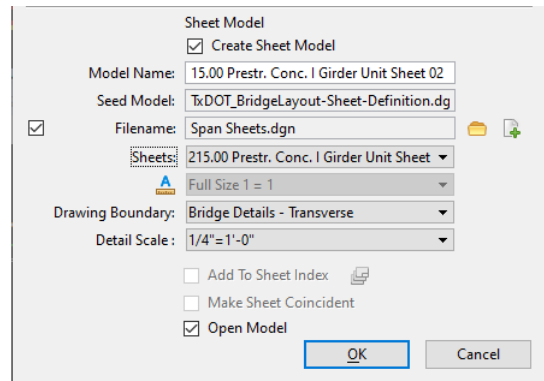


- Press anywhere in the plan view to activate the view.
- Select the fourth icon at the top of the dialog.
- In the plan view select the **Southbound Alignment**.
- Back to the *Place Boundary* dialog box.
- Drawing Seed: *Bridge Details - Transverse*
- Detail Scale: *1/4"=1'-0"*
- Name: *Span Sheet Transverse*
- Start Station: *15+50.16 [Using mouse click around this station]*
- End Station: *15+50.16 [Do not move the mouse and press again]*
- Left Offset: *-29.0*
- Right Offset: *25.0*
- Top Clearance: *5*
- Bottom Clearance: *5*
- Create Drawing: *True*
- Show Dialog: *True*

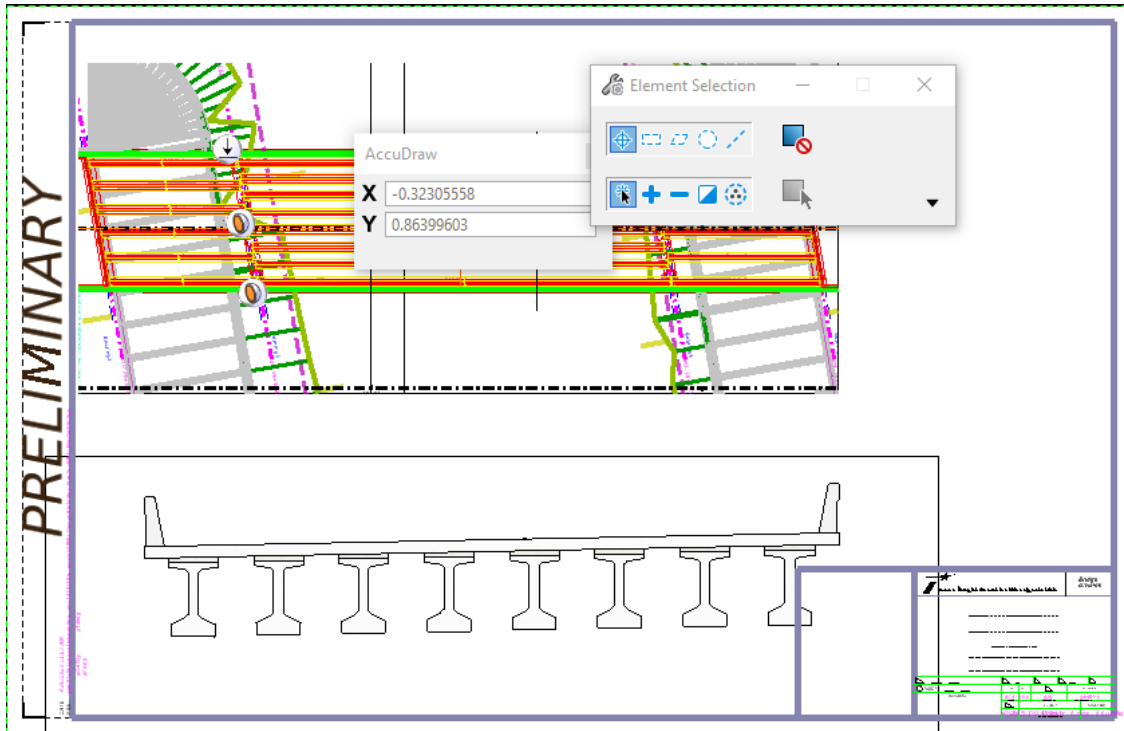


- In the **Create Drawing** dialog.

- View Name: *Span Sheet Transverse 01*
- Drawing Seed: *Bridge Details - Transverse*
- Drawing Model Name: *Span Sheet Transverse 01*
- Enable the *Filename* field by checking the toggle.
 - Press the *Browse Drawing file* 
 - Open the previously created file: *Span Sheet Drawings.dgn*
- Scale: $\frac{1}{4}'' = 1'-0''$
- Sheet Model Name: *215.00 Prestr. Conc. I Girder Unit Sheet 02*
- Enable the *Filename* field by checking the toggle.
 - Press the *Browse Drawing file* 
 - Open the previously created file: *Span Sheets.dgn*
 - Sheets: *215.00 Prestr. Conc. I Girder Unit Sheet 01*
- Scale: *Full Scale 1 = 1*
- Detail Scale: $\frac{1}{4}'' = 1'-0''$

- Press **OK** to create and open the sheets, the process will request the user to update and check in files in ProjectWise as it creates the different models.
- If for some reason the selected scales are not held, simply change the scale of the reference files. The scales will still need to be adjusted to fit the space and the needs of the user.
- Like before, the drawing model needs to be used for all annotations and additional drafting.



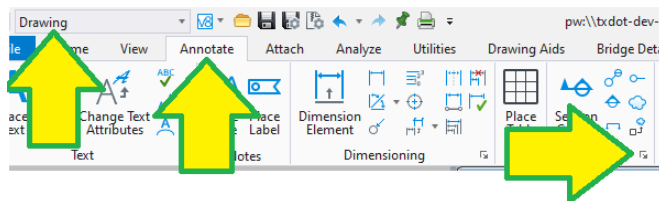
- Repeat steps 1 and 2 to create the drawing and sheet model files for the framing plan, change the view, drawing model, drawing model file, sheet model, and sheet model file names to reflect framing plan.
- This concludes the creation of the superstructure drawings.

Substructure Drawings

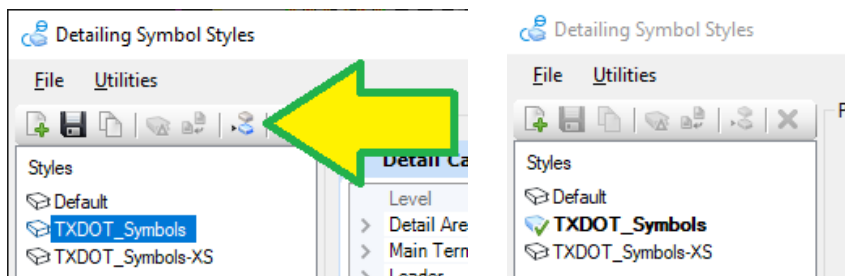
In this section we will create substructure drawings using a combination of the substructure OBM tools and the Drawing Callout tools. This example will create the bent sheet, but the same concept can be applied to create the abutment sheet. This example will not fully detail and annotate the drawings, for that the user will need to refer to the **Bridge Detailing Guide** and the **Bridge OBM Workflow** documents.

Note: If the user is using Pro-Concrete to detail all structural reinforcing the drawing/sheet creation should be performed from the Pro-Concrete Model, for this example we are not using Pro-Concrete, so we are using the OBM Bridge model for the drawing/sheet creation.

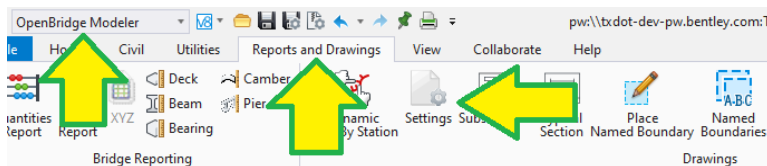
1. First, we need to set the **TxDOT Symbols** as our default detailing symbols. To do so navigate to the **Drawing** task, then select the **Annotate** tab and press on the “Open Dialog” icon of the **Detailing** section.



2. In the **Detailing Symbol Styles** dialog box select the **TxDOT_Symbols** then press the **Activate** button. Once active the style will be preceded by a green checkmark indicating that the style is active. Close the dialog box once the style is activated.

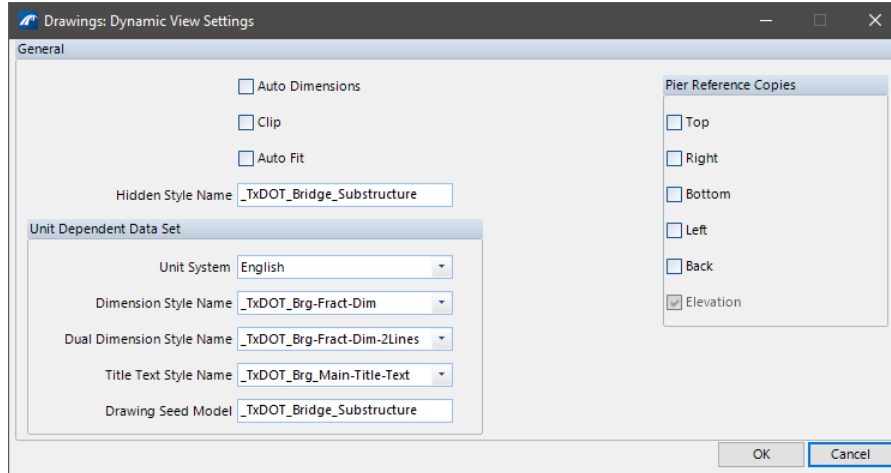


3. Return to the **OpenBridge Modeler** task and setup the OBM drawing settings using the **Settings** tool located in the **Drawings** section of the **Reports and Drawings** tab.



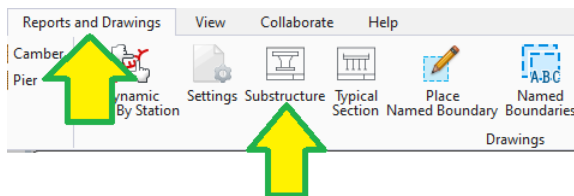
4. In the **Drawings: Dynamic View Settings** dialog box.
 - Auto Dimensions: **False**
 - Clip: **False**
 - Auto Fit: **False**
 - Unit System: **English**
 - Hidden Style Name: **_TxDOT_Bridge_Substructure**
 - Dimension Style Name: **_TxDOT_Brg-Fract-Dim**

- Dual Dimension Style Name: *_TxDOT_Brg-Fract-Dim-2Lines*
- Title Text Style Name: *_TxDOT_Brg_Main-Title-Text*
- Drawing Seed Model: *_TxDOT_Bridge_Substructure*
- Pier Reference Copies: *All Off*
- Click **OK** to accept all settings and close the dialog.

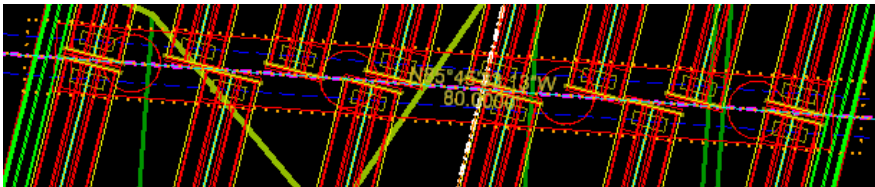


Note: The reason why TxDOT toggles off the options mentioned, is because these tend to label items that we do not usually label and the effort to delete the annotations and re-create the labeling is the same as if the annotation were never there. In addition, the reason why the only view created is the elevation is because TxDOT likes to keep each view in its own drawing model, OBM will create all views in the same drawing model if the reference copies are enabled.



5. Once all settings are setup, press on the **Substructure** tool in the **Drawing** section to start the drawing creation workflow.



6. Click on the **Interior Bent No. 2** OBM element. Then press once again anywhere in the screen to accept the location of the element boundary.

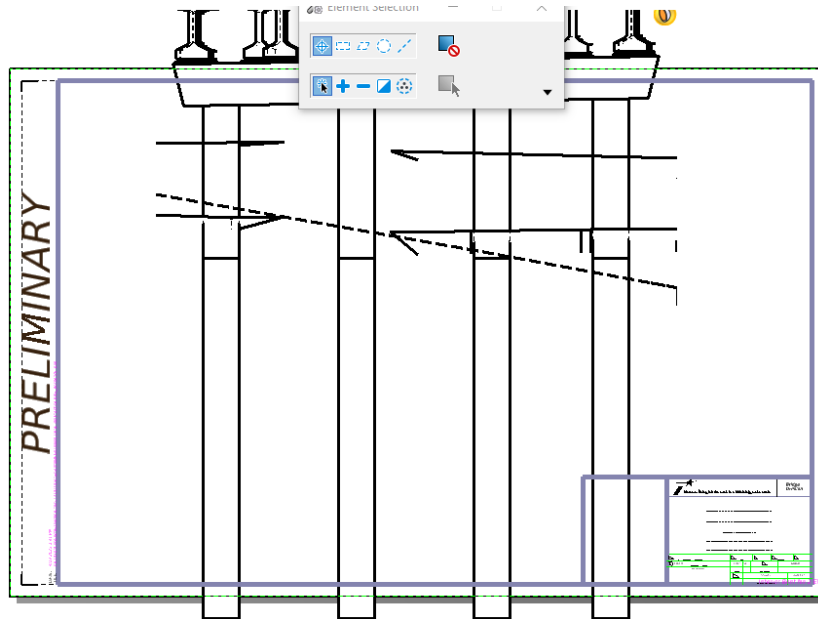


7. In the **Create Drawing** dialog
 - Name: *Interior Bent No 2 Elevation*
 - Drawing Model Name: *Interior Bent Elevation*
 - Enable the **Filename** field by checking the toggle.

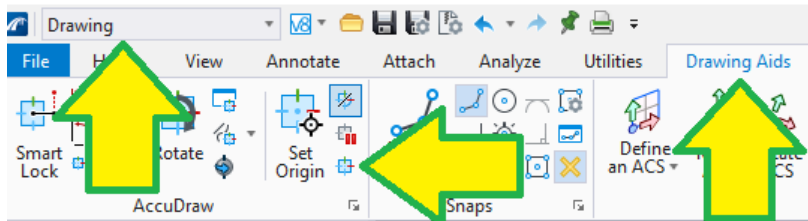
- Press the **Create New Drawing File** 
- Select **No Wizard** and press **OK**
- Save the new file to folder **4 - Design\Bridge\Bridge X**
- File Name: **Bent Drawings.dgn**
- Description: **Drawing Models for Bent Sheets**
- Press **Save** to create file.
- Scale: **1/4" = 1'-0"**
- Sheet Model Name: **Interior Bent No. 2**
- Enable the **Filename** field by checking the toggle.
 - Press the **Create New Sheet File** 
 - Select **No Wizard** and press **OK**
 - Save the new file to folder **4 - Design\Bridge\Bridge X**
 - File Name: **Bent Sheets.dgn**
 - Description: **Sheet Models for Bent Sheets**
 - Press **Save** to create file.
- Scale: **Full Scale 1 = 1**
- Detail Scale: **1/4" = 1'-0"**

- Press **OK** to create the drawing and sheet files and models.

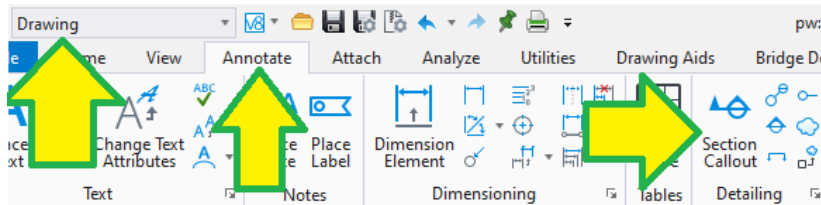
- Like in the layouts, and span sheets the additional detailing and annotations will be done in the drawing models.



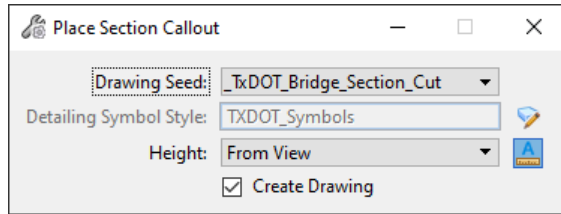
8. Open the *Bent Drawings.dgn*, we will create the section view for the bent in this file.
9. Once the file is open, navigate to the **Drawing** task, then select the *Drawing Aids* tab and enable Accu-draw by pressing on the *Toggle Accu-draw* tool in the **Accu-draw** section.



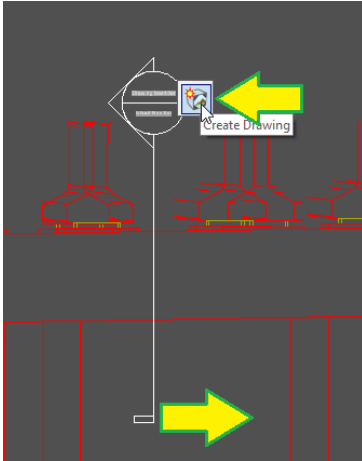
10. Now navigate to the **Drawing** task, then select the *Annotate* tab and press on the *Section Callout* tool in the **Detailing** section.



11. In the **Place Section Callout** dialog
 - Drawing Seed: *_TxDOT_Bridge_Section_Cut*
Note: *_TxDOT_Section* will also work, it has the same settings this seed comes from the *MicroStation* configuration. If the user opens this drawing with *MicroStation* the *_TxDOT_Bridge* seeds will not be available.
 - Height: *From View*
 - Create Drawing: *True*

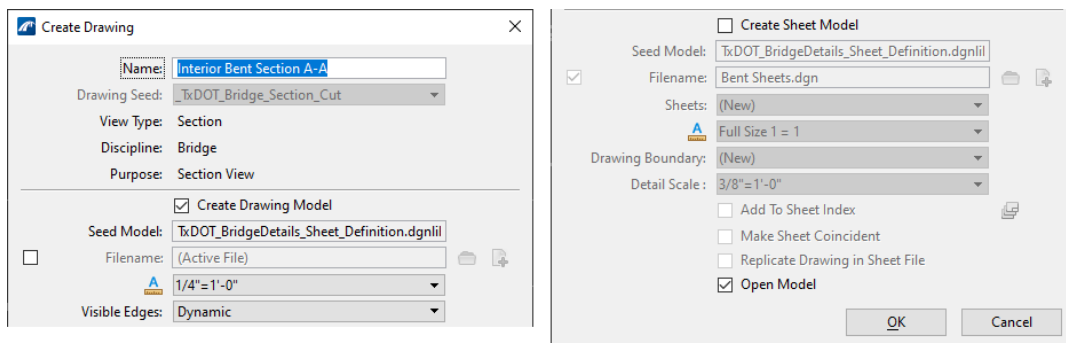


12. Place the section callout in between the columns starting from the top and drawing to the bottom, be sure the section is “looking” to the left side of the bent.



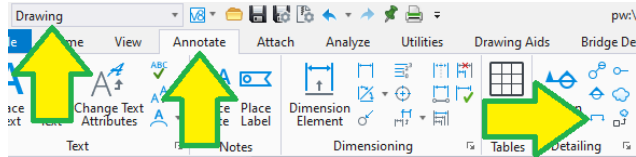
13. In the **Create Drawing** dialog box

- Name: ***Interior Bent Section A-A***
- Be sure the **Filename** toggle is set to **False** or **Untoggled**
- Scale: **$\frac{1}{4}'' = 1'-0''$**
- Create Sheet Model: **False**
- Press **OK** to create the drawing model within the same file.



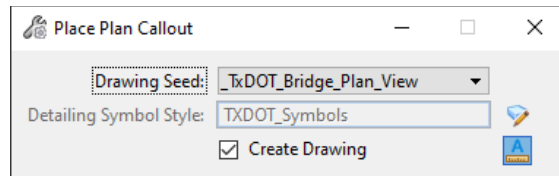
14. Once the section drawing has been created return to the elevation model, so we can create the plan view drawing.

15. Create the plan view using the *Plan Callout* tool in the **Detailing** section of the **Annotation** tab.

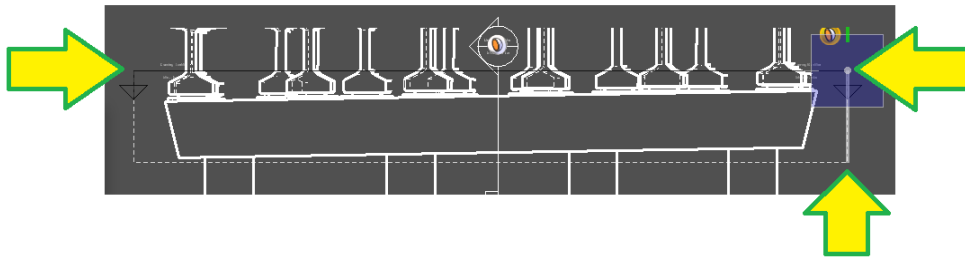


16. In the **Place Plan Callout** dialog

- Drawing Seed: *_TxDOT_Bridge_Plan_View*
Note: _TxDOT_Plan will also work, it has the same settings this seed comes from the MicroStation configuration. If the user opens this drawing with MicroStation the _TxDOT_Bridge seeds will not be available.
- Create Drawing: *True*

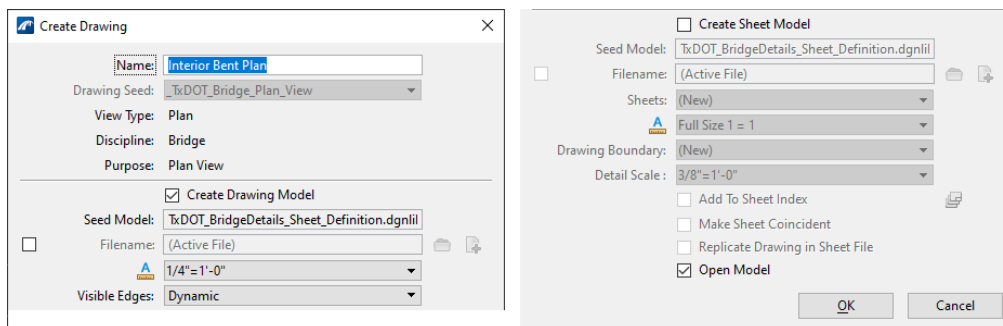


17. Place the plan callout just above the bent, starting from the left side and ending on the right side, and dragging down just enough to capture the height of the cap.



18. In the **Create Drawing** dialog box

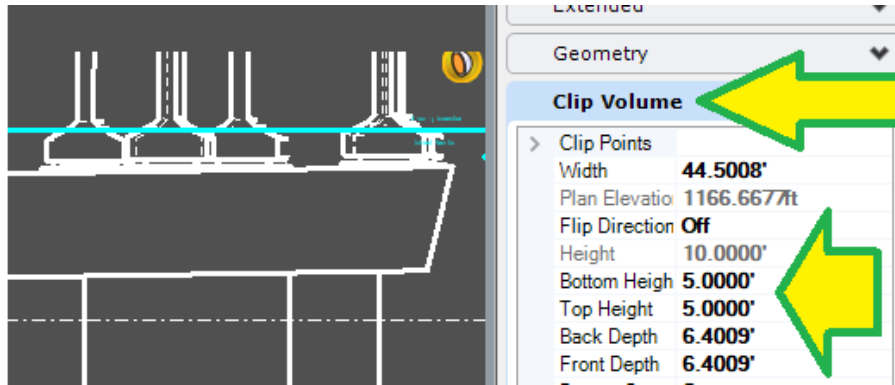
- Name: *Interior Bent Plan*
- Be sure the *Filename* toggle is set to *False* or *Untoggled*
- Scale: *1/4" = 1'-0"*
- Create Sheet Model: *False*
- Press *OK* to create the drawing model within the same file.



Note: When the plan view opens, the user will notice that the **Plan Callout** tool does not have a limit on what to show “In” and “Out” of the page during the drawing creation. This can be changed in the properties of the plan callout.

19. To change the depth of the plan callout, select the plan callout then change the **Bottom Height** and **Top Height** in the **Clip Volume** section in the **Properties** dialog.

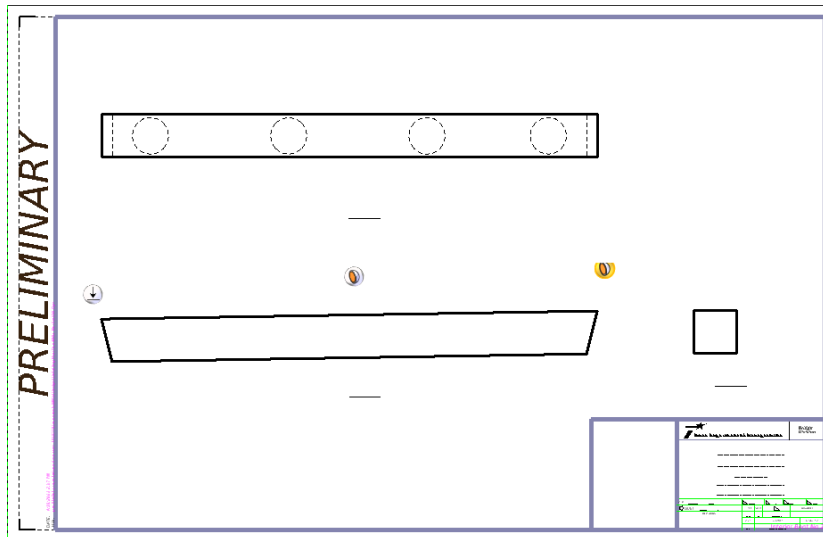
- Bottom Height: 5
- Top Height: 5



Note: Bottom Height controls the distance that in the up-station direction while the Top Height controls the down-station direction. This direction may change in abutments.

20. Once all the additional drawings are created with completed detailing and annotations, the user will need to manually attach the references into the sheets.

- When referencing new drawing models to existing sheet files be sure to have the live nesting enabled and set to 99.



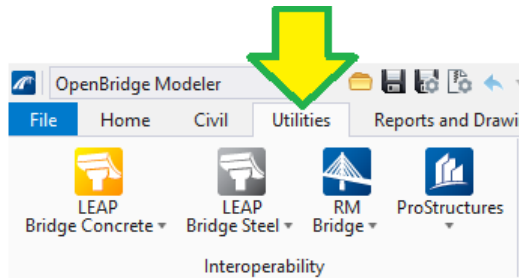
21. This concludes the plan production section. The creation of the other detail sheets is a combination of the tools showed so far, the abutment sheets will have more drawings since there are more sections required. See Appendix A for example sheets created using this same process.

22. This concludes the substructure drawings section.

Interoperability

This section will focus on the export tools and what is exported to each of the supported applications.

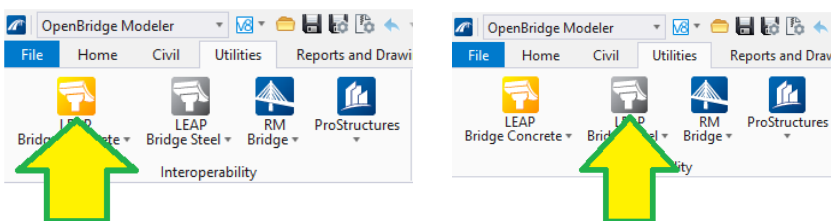
The Interoperability section is in the Utilities tab in OBM, this section contains all the export/import tools for the supported applications.



Exporting to LEAP Concrete or LEAP Steel

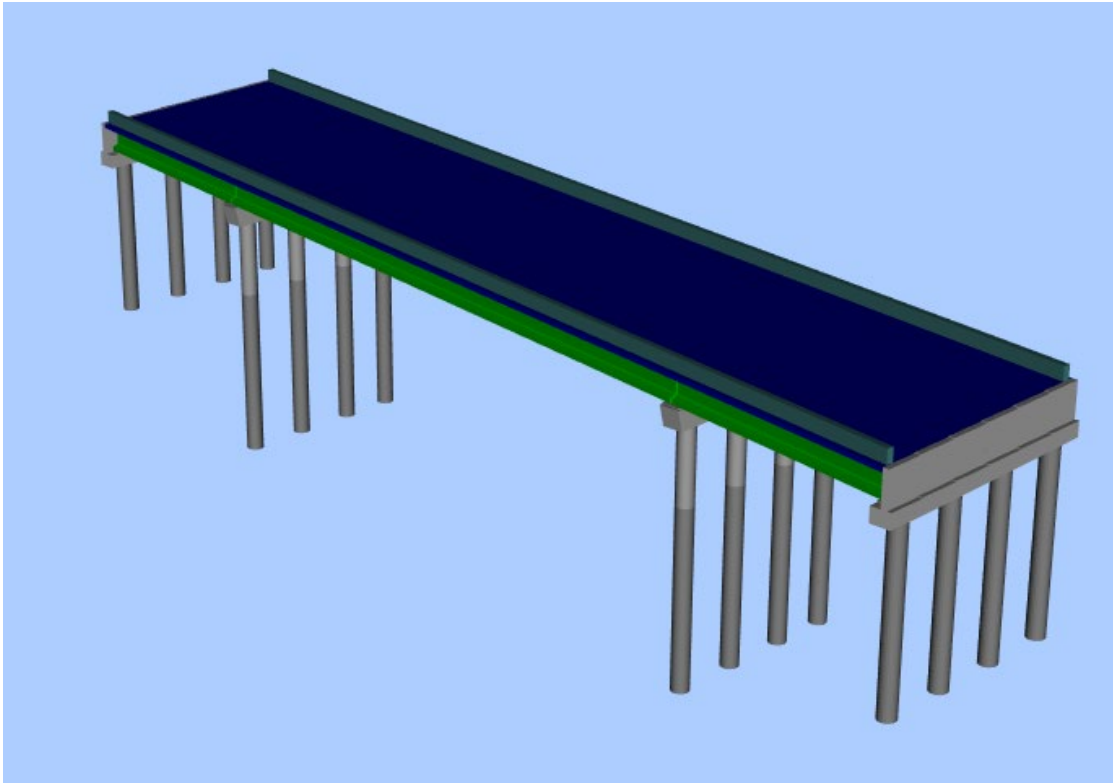
- To export to LEAP Concrete, the OBM Bridge superstructure unit can be any bridge type except Beam Slab (Steel Girders) and must be active.
- To export to LEAP Steel, the OBM Bridge superstructure unit must be defined as Beam Slab (Steel Girders) and must be active.
- When exporting a bridge to LEAP Concrete and the user is using OBD/OBM, the LEAP file will be saved within the OBD file. When the user is using OBM standalone, the user must have a standalone version of LEAP installed. Since Bentley has stopped developing standalone LEAP applications, if the user intends to use LEAP and RM, install OBD rather than OBM standalone.
- There is no tool to import a bridge model created in LEAP into OBM, OBM can only read analytics information of a bridge model originally created in OBM.
- If the bridge has multiple units, OBM will only transfer the active unit.
- When the user sets up the OBD workflow as Standalone, the user can modify the model in LEAP, however, the changes in the model will not be pushed back. In the BIM workflow the OBM model controls all the model changes.

1. To export a model to LEAP, press the **LEAP Bridge Concrete** icon or the **LEAP Bridge Steel** icon.

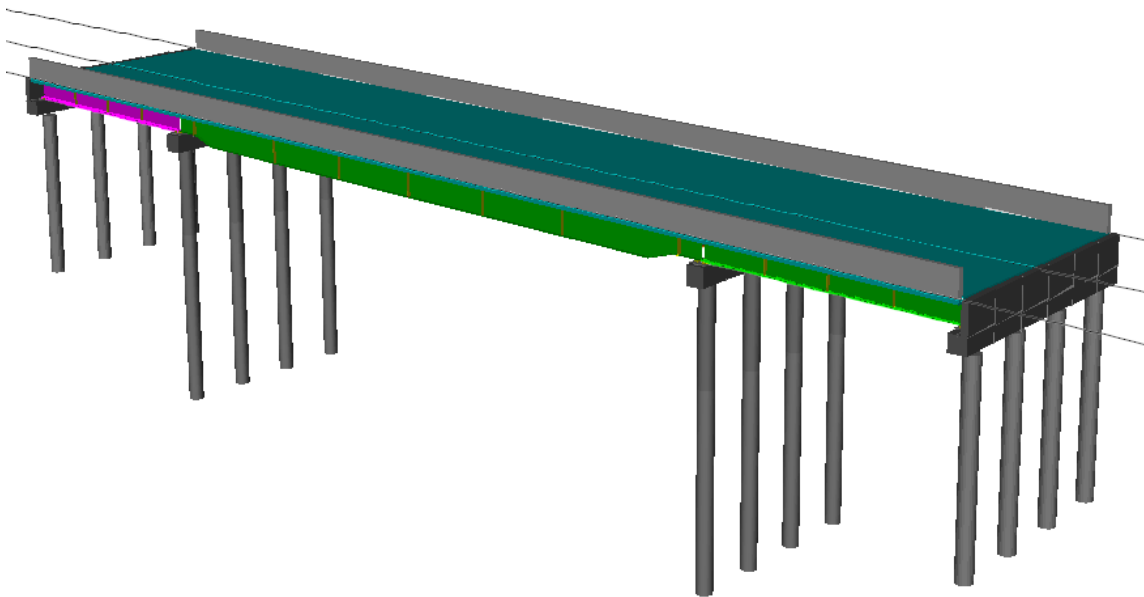


2. Please refer to Appendix B or Appendix C for the OBD 2022 R2 transfer report to see the assumptions and limitations of the transfer in LEAP Concrete and LEAP Steel

3. Example model export in LEAP Concrete



4. Example model export in LEAP Steel

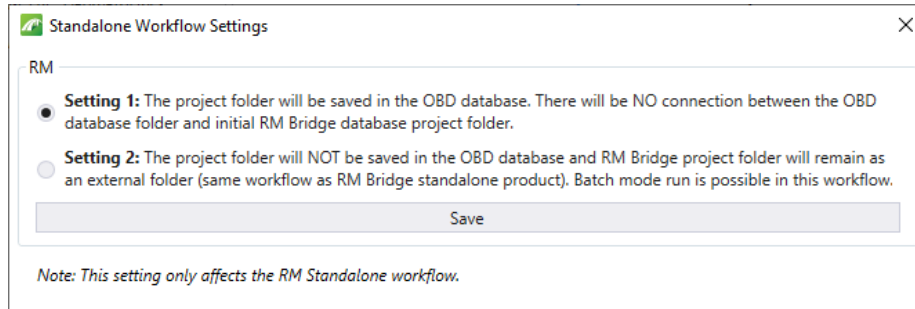


This concludes the exporting to LEAP tutorial.

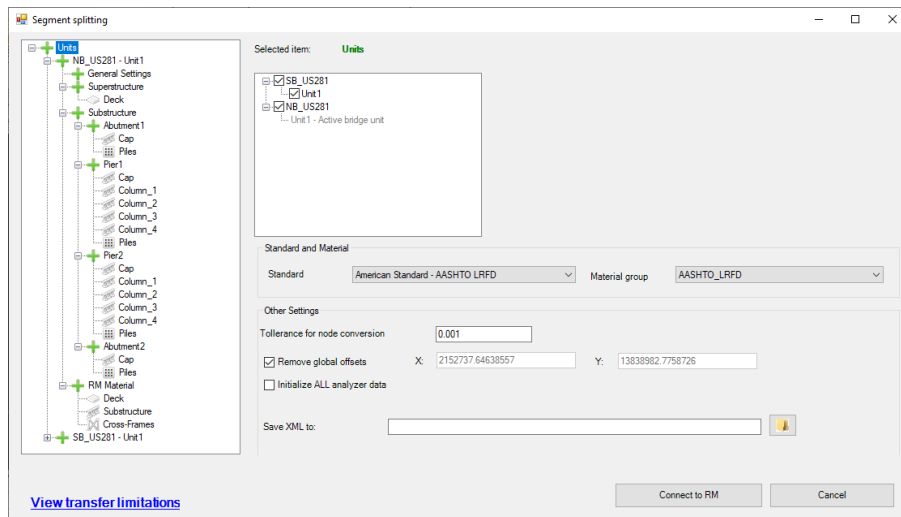
Exporting to RM Bridge

RM Bridge can accept Concrete or Steel superstructures.

RM Bridge files can be saved within the OBD file or outside in a separate directory. This option can be changed in **File > Settings** in the OBD dialog box, however, this is only when the user is working as a standalone workflow, when the users are in the BIM workflow the option gets ignored and the RM bridge files are stored in the OBD file.

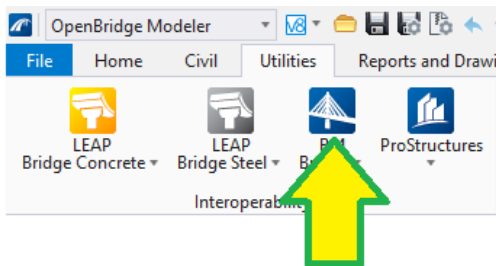


Unlike LEAP, the user can select exactly what components to transfer to RM, and the user can select all units, and all bridges, RM will always export the active Bridge/Unit.

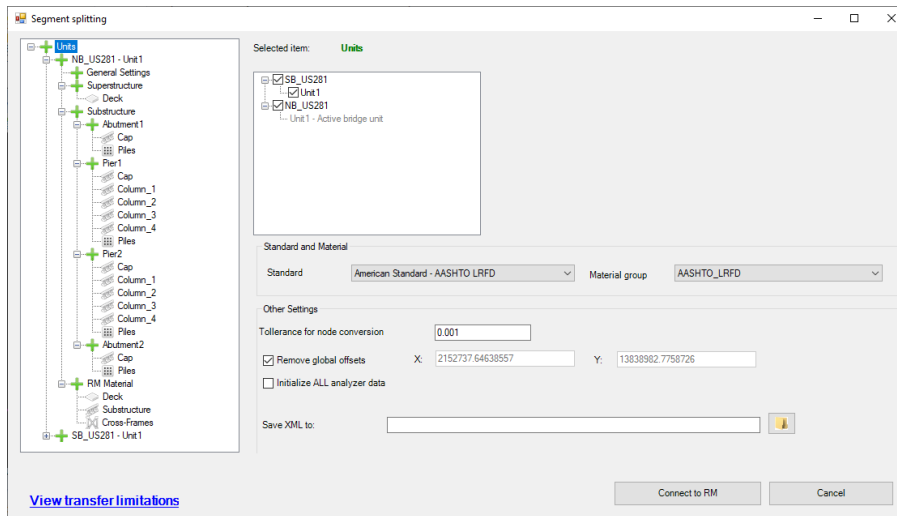


As mentioned before, the materials and build order are important for RM Bridge as those are get used to analyze and create the stages when the model gets exported.

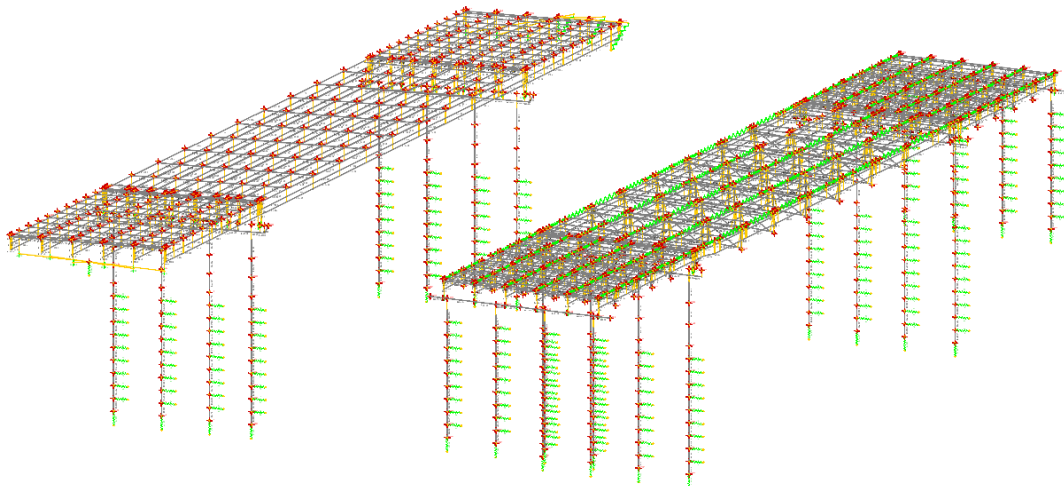
1. To start the export to RM Bridge, press the **RM Bridge** icon.



- In the export dialog box, the user can define the structural analysis behavior of each of the elements. This information will not be covered in this manual.



- Example model export in RM Bridge.



- RM Bridge assumptions and limitations can be found in Appendix D. This concludes the exporting to RM Bridge tutorial.

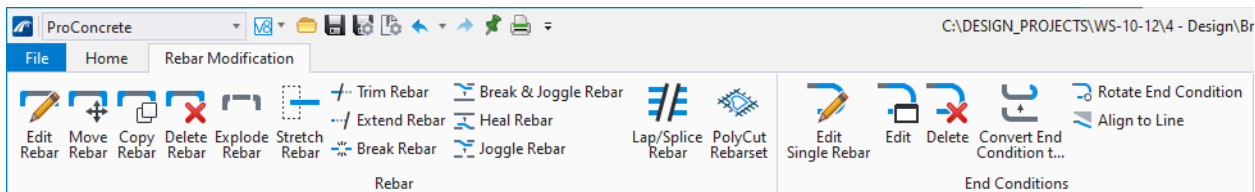
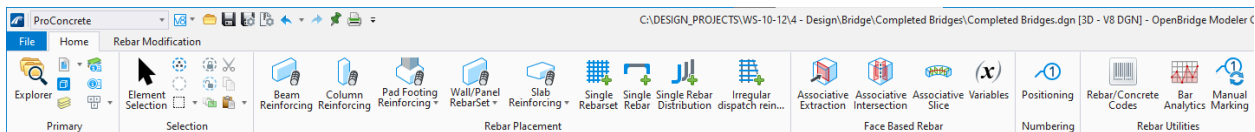
Interoperability with ProStructures

OBM now includes a vast number of tools from ProStructures within the OBM application. When the user **Activates** ProStructures within OBM the DGN will be branded as a ProStructures file. It is recommended to create a new blank OBM DGN file and then reference the original DGN to perform all ProStructures tasks in the new file.

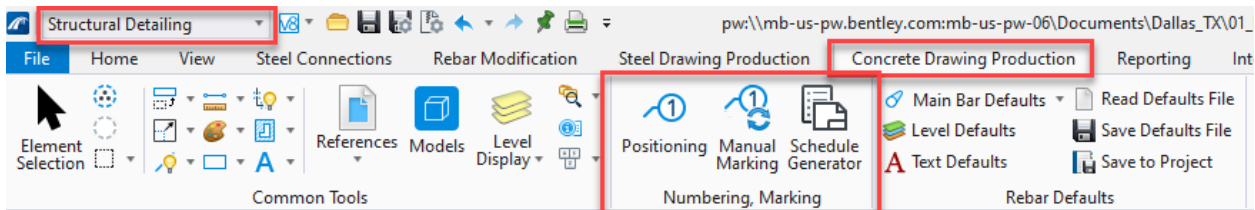
Note: There are known compatibility issues with ProStructures files created in ProStructures and the ones created within the OBM ProStructures plug-in. Reinforcement created in one cannot be modified in the other program.

This manual will not cover any of the ProStructures tools as they are very extensive, a new training manual just for ProStructures will be created and used for the detailing of Concrete and Steel bridges.

ProConcrete tools are in the **ProConcrete** task. The user can reinforce beams, footings, walls, columns amongst other elements. This task also has limited tools to create and modify rebar definitions.



Placement of rebar schedules is available in OBM when the ProStructures plug-in is activated. Another task becomes available labeled Structural Detailing. In this task, there is a Concrete Drawing Production Tab and a Numbering, Marking section with the rebar scheduling tools.

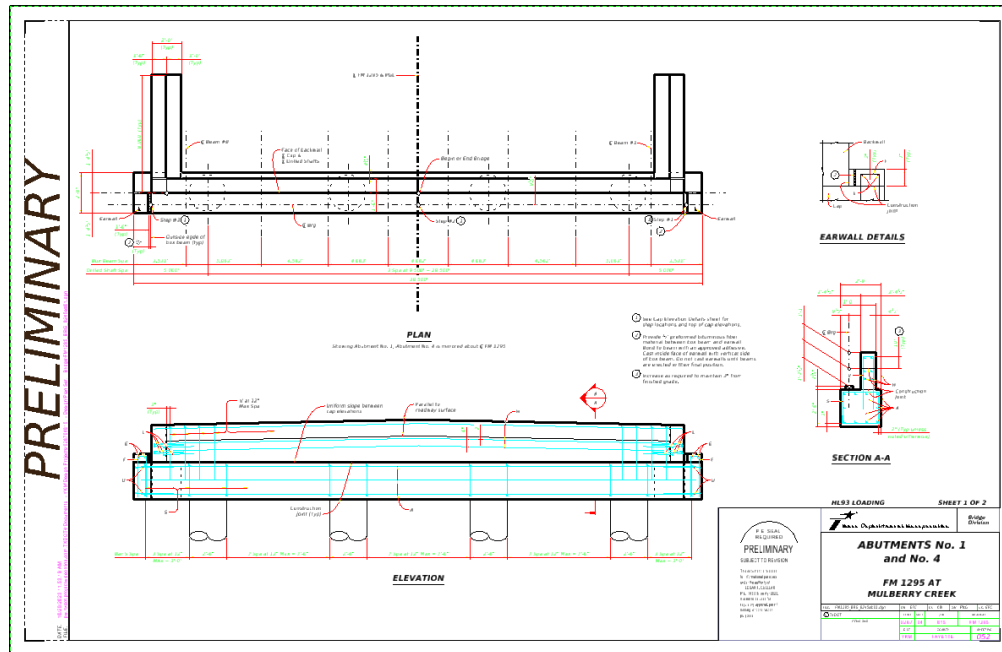


This concludes the ProStructures interoperability section.

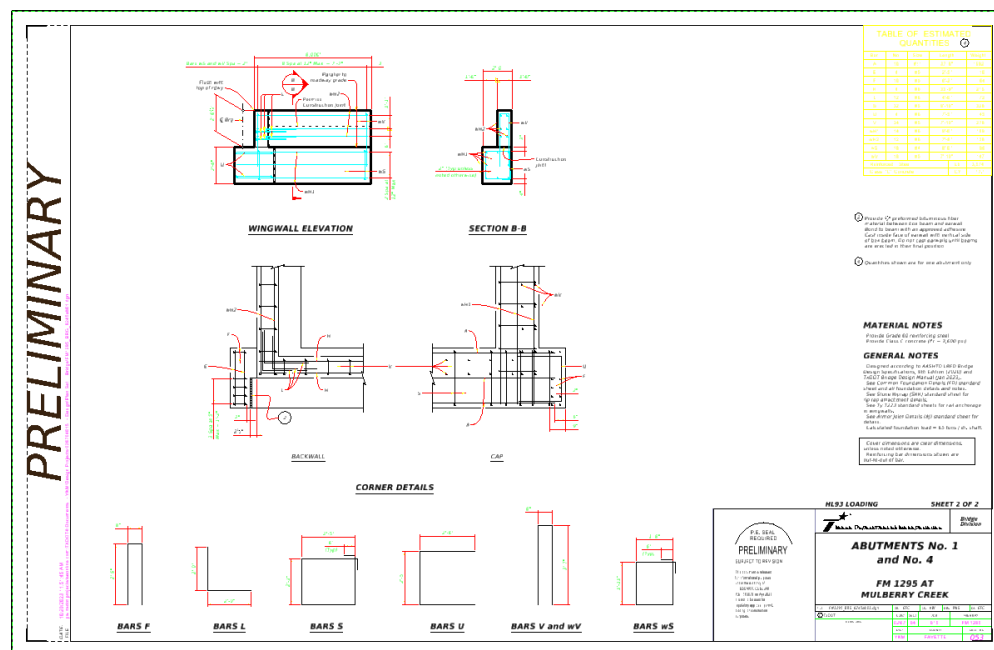
Appendix A – Plan Production Examples

For the abutment sheets, details like the earwall detail and corner details were copied from the standards for simplicity. These drawings can also be done using OBM plan production tools. Some lines were drafted manually, and some edges were masked using a line the same color of the background.

All annotations were done manually.



Example Abutment Sheet of Box Beams



Example Abutment Sheet of Box Beams

Appendix B – LEAP Bridge Concrete (LBC) – Assumptions and Limitations

LEAP Bridge Concrete (LBC)

Please be aware of the following assumptions and limitations when transferring the physical model from OBM to an analytical model in LBC, and bringing changes back from LBC to OBM.

1. *Data Transfer: In version 10.12.01.xx, the data transfer is bi-directional, e.g. from OBM to LBC (for all supported bridge types), and back from LBC to OBM (for prestressed concrete girder bridges). While the entire model is transferred from OBM to LBC, on the way back only selected superstructure (beams and beam layout) and all substructure information is transferred. In LBC, use the Tools > OBM Sync > Send to OBM option to write information back to OBM via an XML file. In OBM on the Utilities tab of the ribbon toolbar, select LBC > Update from Analytics to select the same transfer XML file, and start the process of updating the OBM model with LBC data changes if any. At this time, other than footing design reinforcement, any other design reinforcement, strands or tendon information will not be transferred back from LBC to OBM.*
2. *Model: Model must be completed in OBM, with all super and substructure including bearings defined, before transferring to LBC.*
3. *Deck Slab Thickness: For a bridge model with varying deck thickness in spans, or across the cross-section in a single span, OBM will transfer the minimum thickness of the slab across all cross-sections and all spans to LBC. The deck thickness is not transferred back from LBC to OBM.*
- 3a. *Multiple Decks: In the properties window, setting the Analytical Flag = true allows the deck to be transferred to LBC. Users should not mark approach slabs as analytical decks. A series of contiguous decks can also be transferred to LBC.*
4. *Haunch Thickness: While OBM models a very accurate haunch considering the slope of the deck transversely, and varying haunch thickness filling the gap between the top of the beam and the bottom of the slab, the analytical model in LBC uses a constant haunch thickness. OBM will conservatively transfer the maximum thickness from among all beams in all spans to LBC. The haunch thickness is not transferred back from LBC to OBM.*
5. *Beam Layout: LBC only supports prestressed beams spanning between supports. End blocks modeled in OBM with different sections will not be transferred to LBC. Beam Layout (including spacing of beams) changes in LBC can be transferred back to OBM. User will have an opportunity to view and accept or reject changes before coming back to OBM.*
6. *Beam Cross-sections: While transferring a beam cross-section from the non-LEAP library, e.g. a custom section which are typically drawn using MS drawing tools from OBM to LBC, LBC will first search for a matching name through its existing beam library, and if not will attempt to automatically create a new beam library object by interpreting a shape as close to the MS drawing as possible. The user may need to verify and modify this library object with appropriate structural properties and strand templates before continuing the design in LBC. When data is sent from LBC to OBM, changes to the Beam cross-section, if any, are flagged, and the user will have the opportunity to view and accept or reject the changes.*

7. *Diaphragm: Diaphragm defined in OBM is transferred in terms of the locations and equivalent point loads on concrete beams in LBC.*
8. *For CIP P/T Box Girder bridges and RC or P/T Slab bridges: OBM will transfer an interpreted cross-section, by populating the parametric variables, by intelligently interpreting the appropriate point pairs from OBM template. A screen showing the OBM Template and the interpreted cross-section is presented to the user before the final transfer to LBC. In this screen the user can modify the points used for picking up the points from the OBM templates. Changes from LBC to OBM for this bridge type is currently not supported.*
9. *Bearings: LBC can currently only handle rectangular shape bearings. Any other shape of bearing coming from OBM is converted to equivalent rectangular bearing during transfer. Grout pads on top of the bearings in OBM are not transferred to LBC, but the thickness at the center is added to the bearing seat thickness to compensate. Changes from LBC to OBM for bearings is currently not supported.*
10. *Materials: Beam material properties are transferred from OBM to LBC, and back into OBM if changes are made in LEAP. A new entry is created in the OBM materials library if an exact match of the materials modified in LEAP is not found.*
11. *Substructure:*
 - a. *Pier Location offset is measured in OBM, along the SupportLine, whereas in LBC it is measured perpendicular to the alignment. The conversion is done automatically when data is transferred from OBM to LBC.*
 - b. *Since LBC does not support inclined/sloped pier cap, when such a cap is transferred from OBM, it is treated as a straight/level cap and the bearing seats adjusted to fill in the gap under bearings/beams.*
 - c. *Other than the Oval column shape from OBM, all other 'regular' column shapes are supported in LBC. The Oval shape column is converted to an equivalent rectangular shape with fillets. When transferring template based column cross-sections from OBM, columns come in with a cross-section represented by a bounding rectangle around the shape. Variable pier caps with parabolic or circular variations are approximated by linear variations*
 - d. *User defined templates for footings and abutments are transferred as equivalent rectangles.*
 - e. *For Abutments, to accommodate various agency practices, OBM allows users to set three different locations (front face of backwall, centerline of abutment cap, back of abutment) as the reference line for placing abutments. Since LBC only allows one reference line at center of abutment, OBM on data transfer will maintain the accurate lengths of the girders, and adjust the position of abutment for an additional offset distance. Wingwalls are not transferred from OBM to LBC at this time.*

- f. Integral substructures for Box Girder bridges and RC Slab bridges, with the integral cap taking the shape of the superstructure are currently not supported in OBM. These will need to be modeled in LBC, after initial model transfer from OBM.*
 - g. All geometry changes made to substructure in LBC can be brought back to OBM. The user will have the opportunity to view and accept or reject the changes when updating the model in OBM using the transfer XML format file.*
 - h. If you have modified the column length in LEAP and you want to update the column length in OBM, please be sure to have the footings elevation constraints unchecked in order to see the updated model.*
 - i. For Variable Columns, defined using Templates, transfer to LBC is not possible at this time.*
- 12. Barrier: OBM will transfer Barriers from OBM to LBC as equivalent loads, and will also transfer the barrier width and location. User should check these loads and dimensions in LBC as these could affect the design.*
- 13. File Name: When attempting to transfer data from OBM to LBC, user can provide a file name and path for the LBC data file. If such a file already exists, OBM will replace only the geometry and material data and retain all loads and other design parameter information.*
- 14. Camber and Deflection results: If prestressed concrete beams are designed (with strands) in LBC, the results can be transferred back to OBM. Using the Reports > Camber option, user can view the estimated beam elevation values at erection, and deck screed elevation reports.*
- 15. For offset (from alignment) bridges, OBM and LEAP Bridge support line stationing could be different due to differences in assumptions on layout in these two products. While the conversion is done on the fly and the bridge will be located geometrically accurate, future versions will address this issue.*
- 16. Steel Cross Frames for Concrete beams modeled in OpenBridge Modeler will be transferred to LEAP Bridge Concrete as loads.*

Appendix C – LEAP Bridge Steel (LBS) – Assumptions and Limitations

LEAP Bridge Steel (LBS)

Please be aware of the following assumptions and limitations when transferring the physical model from OBM to an analytical model in LEAP Bridge Steel and bringing selected changes back to OBM.

1. **Data Transfer:** In version 10.12.01.xx, the data transfer is bi-directional, e.g. from OBM to LBS, and back from LBS to OBM, for selected changes in superstructure and substructure. While the entire model is transferred from OBM to LBS, on the way back only selected superstructure (beams and beam layout) and all substructure information is transferred. In LBS, use the OpenBridge Modeler > Save to OBM option to write information back to OBM via an XML file. In OBM on the Utilities tab of the ribbon toolbar, select LBS > Update from Analytics to select the same transfer XML file, and start the process of updating the OBM model with LBS data changes if any. You will be prompted with a dialog showing what information has changed, along with options to bring in select information into OBM. In this release, stiffeners, cross-frames, field splices and shear studs are written from OBM to LBS, but any changes made in LBS, cannot be sent back to OBM.
2. **Stiffeners and Cross Frames** defined in OBM can now be transferred to LEAP Bridge Steel along with the all other bridge elements defined. At this time, the transfer is only one way from OBM to LBS.
3. **Model:** Model must be completed in OBM, with all super and substructure including bearings defined, before transferring to LBS.
4. **Deck Slab Thickness:** For a bridge model with varying deck thickness in spans, or across the cross-section in a single span, OBM will transfer the minimum thickness of the slab across all cross-sections and all spans to LBS. The deck thickness is not transferred back from LBS to OBM.
5. **Haunch Thickness:** In both OBM and in LBS, haunch thickness is measured from the bottom of the top flange to bottom of deck. OBM will conservatively transfer the maximum thickness from among all beams in all spans to LBS.
6. **Beam Layout:** To cover a wide variety of possible scenarios, LBS will always bring in beam paths from OBM as custom beam paths. While the user can modify these beam paths in LBS and send the information back to OBM, deleting and adding entirely new beam layouts and attempting to transfer this information back to OBM is not supported.
7. **Beam Cross-sections:** When using Rolled Beam Shapes, OBM transfers the appropriate name to LBS, and a corresponding section is picked from the Standard Sections list in LBS. For Built-up shapes, all transfers are by plate dimensions, a much simpler transfer. Steel Tubs can be transferred from OBM to LBS, but not vice-versa. The rotations of these sections from OBM are not supported in LEAP Bridge Steel, and they will be modeled without the rotation following the deck slope.
8. **Bearings:** LBS can currently only handle rectangular shape bearings. Any other shape of bearing coming from OBM is converted to equivalent rectangular bearing during transfer. Grout pads on top of the bearings in OBM are not transferred to LBS, but the thickness at the center is added to the bearing seat thickness to compensate. For Steel Tub girders supported by a single bearing in OBM, LEAP will automatically create two bearings due to current limitations.

9. Substructure:

- a. Pier Location offset is measured in OBM, along the SupportLine, whereas in LBS it is measured perpendicular to the alignment. The conversion is done automatically when data is transferred from OBM to LBS.
 - b. Since LBS does not support inclined/sloped pier cap, when such a cap is transferred from OBM, it is treated as a straight/level cap and the bearing seats adjusted to fill in the gap under bearings/beams.
 - c. For Abutments, to accommodate various agency practices, OBM allows users to set three different locations (front face of backwall, centerline of abutment cap, back of abutment) as the reference line for placing abutments. Since LBS only allows one reference line at center of abutment, OBM on data transfer will maintain the accurate lengths of the girders, and adjust the position of abutment for an additional offset distance.
 - d. LBS can have round, rectangular and rectangular-variable column shapes. OBM supports the following additional shapes: rectangular-chamfered, rectangular-filleted, rectangular-beveled and oval. All are transferred from OBM as standard rectangular columns in LBS. When transferring template based column cross-sections from OBM, columns come in with a cross-section represented by a bounding rectangle around the shape. Variable pier caps with parabolic or circular variations are approximated by linear variations.
 - e. Integral substructures in LBS will not transfer to OBM in this release of OBM.
 - f. LBS does not support Struts between columns or wingwalls. So transfer from/to OBM is not yet supported for these elements.
 - g. If you have modified the column length in LEAP and you want to update the column length in OBM, please be sure to have the footings elevation constraints unchecked in order to see the updated model.
 - h. For Variable Columns, defined using Templates, transfer to LBS is not possible at this time.
 - i. User defined templates for footings and abutments are transferred as equivalent rectangles.
10. Auxiliary/Barrier: In this release OpenBridge Modeler will transfer Barriers from OpenBridge Modeler to LEAP Bridge Steel as equivalent loads. User should verify and adjust these elements in LEAP Bridge Steel as needed.
11. File Name: When attempting to transfer data from OBM to LBS, user can provide a file name and path for the LBS data file. If such a file already exists, OBM will replace only the geometry and material data and retain all loads and other design parameter information.
12. For offset (from alignment) bridges, OBM and LBS support line stationing could be different due to differences in assumptions on layout in these two products. While the conversion is done automatically and the bridge will be located geometrically accurate, future versions will address this issue.

13. *Field Splices and Shear Studs defined in OpenBridge Modeler can be transferred to LEAP Bridge Steel. At this time, the transfer is only one way from OpenBridge Modeler to LEAP Bridge Steel.*

Appendix D – RM Bridge Connect – Assumptions and Limitations

RM Bridge CONNECT

Please be aware of the following limitations when transferring the physical model from OBM to RM Bridge CONNECT:

1. Steel girder top cover plates: they are not supported on transfer to RM because it will generate cross section elements overlapping which invalidates the geometrical model in RM.
2. Barriers: they are not transferred because they can be simulated on RM side as a load on the side of the bridge.
3. The following elements modeled in OBM are currently not transferred to RM:
 - wing walls
 - approach slab
 - pile rock sockets
 - advanced variable columns
 - steel girder haunch extensions
4. Materials: if no material is assigned to a structural element, a default material will be added on transfer to RM.
5. Support springs on multi-unit transfer: Bearing springs will not generate correctly in cases where both side of the common pier have girder slab bridges. These springs can be corrected in RM Modeler manually.